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PROPOSED LAKEFILL POLICIES

Prepared for -

The Ontario Ministry of the Environment

by

The Lakefill Policy Committee

July 1988

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SUMMARY

This report documents the findings of the Lakefill Policy Committee, formed in March 1988, to develop a policy proposal related to lakefilling activities in Ontario.

The committee was comprised of representatives from Ontario Ministries of Environment and Natural Resources, Environment Canada and the City of Toronto. Under a steering committee, two working groups were formed to address the various objectives of the committee. Working Group I examined the administrative and implementation options and Working Group II outlined environmental concerns, information requirements for design and construction and developed criteria for lakefilling activities.

The environmental criteria outlined in section III of the report will assist in preventing environmental degradation during lakefilling. In order to assist proponents in identifying potential problems, a list of information required on design and construction is provided in Appendix B.

The issue of "need" with regards to a lakefill structure was beyond the mandate of the committee and as a result the committee's findings do not provide any guidance in this regard. It may be impractical to locate a lakefill structure at a

proposed site because of the constraints the structure may place on existing water uses at that location. The onus is on the proponent to adequately demonstrate that a project will not result in a degraded environment or in alterations to existing water uses.

The committee concluded that a new regulation under part IV of the Environmental Protection Act, dealing specifically with lakefilling offers, the best mechanisms of ensuring that concerns are adequately addressed and conditions governing the undertaking are adhered to. Provisions will be made to exempt small projects with no significant environmental impacts from the detailed scrutiny that will apply to larger projects. Projects that would normally fall under the Environmental assessment Act, will continue to be evaluated under this Act with the added requirement that any environmental conditions resulting from the E.A. process be placed in a Certificate of Approval.

The committee was asked to address the issue of managing excavated material. It was determined that the management of such material extended beyond lakefilling and concluded that disposal of such material can best be handled under the programs of the MOE Waste Management Branch.

PREFACE

In March 1988, a committee was formed to develop policies on lakefilling. The committee was comprised of representatives from the Ontario Ministries of the Environment and Natural Resources, Environment Canada and the City of Toronto. The structure and membership of the committee are outlined in Appendix A.

The objectives of the committee were:

1. To develop a comprehensive set of policies on environmental protection during lakefilling activities by:
   a) developing administrative procedures for regulating lakefilling;
   b) developing protocols and guidelines to ensure lakefilling does not significantly impair water quality and uses.
2. To set a procedure for implementing the policies and;
3. To recommend a course of action to deal with excavated material.

This report documents the findings and recommendations of the committee.

Section I provides a background to lakefilling. Section II outlines the administrative options for dealing with lakefilling (objective 1a). Section III describes environmental concerns and criteria (objective 1(b)) and; Section IV outlines an implementation procedure (objective 2). With regards to objective 3, related to a procedure for dealing with excavated

material (i.e. material not designated for lakefilling), the committee concluded that excavated material can be dealt with under existing programs of the Waste Management Branch.

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Acknowledgement

The Steering Committee gratefully acknowledges the valuable contributions of Ms. L. Sarazin (DOE); Ms. J. Weninger and Mr. J. De'abramo (City of Toronto); Dr. R. Biette, Mr. D. Fay and Mr. N. Goldstein (MNR); Messers L. Fitzpatrick, J. Patterson and J. Ralston (MOE).

The committee also acknowledges the added support of Dr. J. Pimenta and Mr. A. Hayton in organizing and editing the pre-draft report.

I. Introduction

Lakefilling refers to the placement of solid material (e.g. loose earth, rubble, broken concrete) in or abutting a waterbody to create structures for flood and erosion control (eg. shoreline protection or stabilization works), land creation (eg. waterfront parks and recreational boating facilities) and; confined disposal facilities for dredged material.

Most of the large lakefills for the purpose of land creation have been centred in the western basin of Lake Ontario, especially the area adjacent to the Metro Toronto Waterfront. Areas south of Front Street in the City of Toronto were created by filling in the lake. This activity has been carried out over several decades during the development of the city and continues today.

The Toronto Harbour Commission (THC), under Federal charter, has been using this technique to develop the Toronto waterfront since 1911. The first area filled by THC was the marsh at the mouth of the Don River. Here, dredged material from the lake was used to create land for harbour development. Subsequently, fill was placed off the Toronto Islands to create parkland and in the 1930's to provide the necessary land for the Toronto Island Airport. Over the past 25 years, the Commission has been involved in the construction of the Eastern Headland (also known as the Leslie Street spit) which is the largest lakefill

structure built in Lake Ontario. Hamilton Harbour has also been altered substantially as various industries and the Hamilton Harbour Commission has used the harbour for slag and dredged material disposal to create additional land.

During the late 1960's and 1970's, the conservation authorities bordering western Lake Ontario and other government agencies proposed shoreline plans which included varying degrees of land creation through lakefilling. The land base for both Ontario Place and Darlington Nuclear Generating Station was partially created using this technique. The 1967 Waterfront Plan proposed by the Metropolitan Toronto and Region Conservation Authority (MTRCA) included considerable lakefilling for the creation of parkland and marinas to provide better recreational access to Lake Ontario.

Implementation of this plan began in 1972 and filling is now completed at the Humber Bay, Ashbridges Bay and Bluffers Park. Additional lakefilling is currently on-going or being considered by various agencies in the western basin of Lake Ontario. One of the other three sites in the 1967 MTRCA Waterfront Plan, the Colonel Samuel Bois Smith, is now under construction following a hearing pursuant to the Environmental Assessment Act in 1980. The site was approved by the Environmental Assessment board (EAB) with certain conditions (E.A. Board, 1980). The Credit Valley Conservation Authority has one site (lakefront Promenade Park) under construction, while Hamilton Region Conservation Authority

has completed construction of the Fifty Point Lakefill.

With lake front property commanding a premium price, the creation of new land resources through filling in the littoral zone is a very appealing concept, particularly in the heavily populated western basin of Lake Ontario. Simplistic cost-benefit analysis would favour this method of obtaining shoreline real estate since the initial construction costs are lower than direct purchase of equivalent property. In many cases lakefills provide recreational opportunities that would otherwise not exist and could not be provided through the purchase of existing shoreline properties. In addition, the filling activity provides construction interests with an inexpensive means of disposing of abundant waste excavation material.

Recently however, concerns have been raised over the environmental implications of lakefilling. The impact on the aquatic environment of building lakefills using the present methodology has not always been adequately assessed.

Monitoring of existing sites has, in some cases indicated degraded water and sediments quality and health impairment of aquatic life in the vicinity of lakefill structures. The hidden costs to society of a potentially degraded aquatic environment has not been included in the cost-benefit of these lakefill sites in the high-energy littoral zone.

The sections that follow identify the concerns associated with lakefilling and outline criteria to be met in order to eliminate these concerns (Section III). In order to ensure that lakefill projects that are built do not result in degradation to the environment, assurance must be provided that the project will be sited, constructed and maintained in an environmentally acceptable manner. Section II and IV, respectively, outline administrative and implementation procedures that will allow for the adequate review of proposed projects to ensure that these assurances are provided. While the administrative procedure requires that all lakefill projects be submitted for evaluation, some small-scale projects, because of the type of construction (e.g. clean, granular fill), may not require the detailed scrutiny of other projects. The implementation procedure contains a mechanism for identifying such projects during the project planning stages.

II. Administrative Options

A variety of Acts and Regulations were reviewed with respect to their potential for use by this Ministry as a control mechanism for lakefilling activities in Ontario.

Federal Acts such as Navigable Waters Protection Act and the Canada Fisheries Act were reviewed but not seriously considered because the Ministry of the Environment has no authority under these Acts. Projects operating under federal authority, such as those routinely carried out by Harbour Commissions and Small Craft Harbours Department are not subject to provincial laws. Control mechanisms for these projects must be found through Federal legislation and the cooperation of agencies such as Environment Canada.

All other proponents such as provincial ministries, municipalities, conservation authorities and the private sector are subject to provincial legislation.

Provincial legislation reviewed included; Environmental Protection Act (E.P. Act), Ontario Water Resources Act, Environmental Assessment Act (E.A. Act), Lakes and Rivers Improvement Act, Conservation Authorities Act, Beds of Navigable Waters Act, Public Lands Act and the Planning Act. Among these, the best mechanism for the protection of the environment would be through a combined use of the Environmental Assessment Act and

the Environmental Protection Act.

The Environmental Assessment Act applies to provincial and municipal undertakings over $3.5 million and conservation authority undertakings over $1 million. It may also apply to smaller public sector projects or private sector undertakings if specifically designated by the Minister. While the E.A. Act allows for an overall evaluation of the environmental impacts associated with a project, it lacks the specific control mechanisms to ensure that the Ministry's concerns are addressed.

For this reason, the committee recommends the promulgation of a regulation under Part V of the Environmental Protection Act. This regulation would require that all proponents apply for and receive a certificate of approval. This certificate provides the Ministry with the means to address environmental concerns in three important aspects.

- The proponent is required to submit a project plan and receive approval from the Ministry before construction can commence.
- By means of conditions attached to the certificate, the Ministry can ensure that the project will proceed only if the environmental concerns have been addressed.
- Non-compliance with the conditions of a certificate of approval constitute grounds for enforcement action.

The regulatory controls would be structured so that small projects (those with no significant environmental impacts as

judged by criteria outlined in Section III) would be addressed by the Ministry of Natural Resources through its current review program under the Lakes and Rivers Improvement Act. Other projects would require a Certificate of Approval under the E.P. Act before work could commence. Projects normally requiring an Environmental Assessment will continue to be evaluated under the E.A. Act. However, such projects will also require a Certificate of Approval under the E.P. Act as a means of ensuring that the concerns arising from the E.A. Act are addressed.

This approach provides the Ministry with the flexibility to allow for detailed site-specific conditions, and public input and review when warranted. It ensures a hierarchy of controls that will help the Ministry to allocate its resources in an efficient manner.

III ENVIRONMENTAL CONCERNS AND CRITERIA

The information provided in this sectin addresses the aquatic environmental concerns and highlights some of the non-aquatic issues associated with lakefilling. With respect to the water quality issues, the measures outlined in this section are to ensure that lakefilling activities are conducted in accordance with the MOE water quality management goal - "To ensure that the surface waters fo the province are of a quality which is satisfactory for aquatic life and recreation". (MOE - 1984). In this regard, lakefilling will be considered equivalent to an effluent discharge during the construction phase and appropriate guidelines will be applied within a mixing zone.

For purposes of this discussion, lakefilling activities are grouped under two headings namely, construction phase (short-term) and operational phase (long-term).

Currently, there are no sediment quality guidelines for the protection of aquatic life and until guidelines are in place the procedure will employ the open-water disposal guidelines in order to protect aquatic life against bioaccumulation and toxicological effects. Adverse effects from contaminants would not be expected if the sediments meet the open-water disposal guidelines.

CONSTRUCTION PHASE - AQUATIC EFFECTS

OVERVIEW

During construction of a lakefill, the major aquatic effects are associated with loss of fill material along with the contaminants associated with the fill. These may be chemical or physical.

Chemical effects are associated with changes to water and sediment quality. In order to avoid detrimental changes to water and sediment, criteria are used to determine the acceptability and on-site placements of lakefill materials. These criteria are the Provincial Water Quality Objectives (PWQO) for the protection of water quality and the open-water disposal guidelines for sediment protection.

Three categories of fill, identified for lakefilling, include -: unrestricted, restricted, and confined fill.

- Unrestricted fill: any material that is of a chemical quality equal to or better than the open-water disposal guidelines (Appendix D) and the other criteria listed below.

- Restricted fill: material that exceeds the open-water disposal

guidelines but does not exceed 10 times the PWQO in a distilled water leach test, (Appendix E).

- Confined fill: material exceeding the above guidelines but passing Schedule IV of the Waste Regulation 309 (Appendix F).

Physical effects are two fold: the effects of suspended sediment on water quality, specifically, on turbidity; and, the effects of deposited sediments on aquatic habitat.

CHEMICAL EFFECTS

Unrestricted Fill Criteria

Unrestricted Fill can be utilized at any location within a lakefill site provided that:

1). The terms and conditions of a mixing zone (MOE 1984) are met (i.e. no significant bioaccumulation and no rapid lethality to aquatic life).

2). The Provincial Water Quality Objectives (PWQO) are met at the edge of the mixing zone (MOE 1984) and;

3). The Open-Water Disposal guidelines (Appendix D) are met.

Conditions

Adherence to the above criteria could be ensured through the direct monitoring of the receiving water during construction, however any violations would be after-the-fact and the costs

associated with such monitoring may be prohibitive. A more practical solution is to ensure compliance by carrying out the following tests prior to placing the fill material at a lakefill site.

TESTS

1. No Rapid lethality in the mixing zone. This will be determined through a standard toxicity test which stimulates the water column at the fill face. The test will be carried out by placing one part of fill material to twenty parts of water on a weight to volume basis and agitating the mixture for 24 hrs. (Appendix G). An aliquot of the supernatant will be extracted and used in the standard 48-hour LC 50 Daphnia test (MOE 1988) or an equivalent test approved by the MOE.

2. Bioaccumulation. An aliquot of the above supernatant will be removed and tested for the bioaccumulative substances list in Appendix H. Only those substances suspected of being present will be analyzed. The concentration of these substances must be below the PWQO in the aliquot.

3. PWQO compliance. An aliquot of the above mixture must not exceed more than 10 times the PWQOs for a standard set of parameters (~~Appendix E~~ MOE - 1984). (This assumes a 10 fold dilution between the fill face and the edge of the mixing zone). In cases where it is ascertained that dilution in the mixing zone will be less than 10:1 the dilution factor will be reduced accordingly.

4. Sediment Quality compliance. Contaminant levels determined in a bulk chemical analysis of the sediment must meet the open-water disposal guidelines (Appendix D).

Restricted Fill Criteria

FIll material that does not meet all of the criteria for unrestricted fill may be deposited in a lakefill provided that -: 1) no fill be lost to the aquatic environment 2) that the contaminants in fill will not migrate in the groundwater and hence contaminate the receiving water in either the short-term or long-term. i.e. Leachate from the fill will not exceed ten times PWQOs in a standard distilled water leach test (Appendix E). 3) The structure shall be designed to withstand the 50-year storm with no loss of core material.

Confined Fill

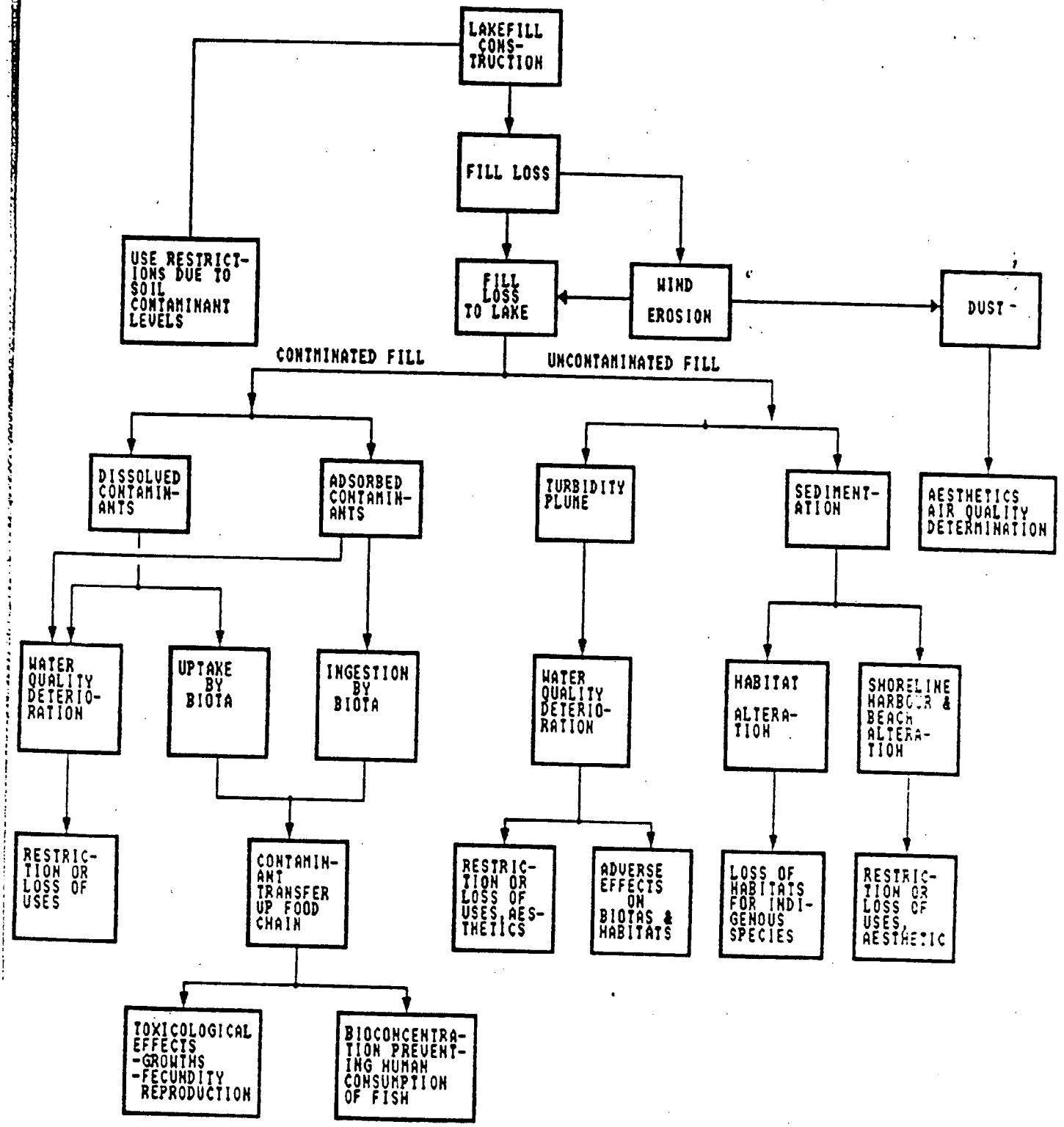
Fill that exceed the criteria for the above two categories but passes the Waste Regulation 309 Schedule IV (Appendix F) may be deposited in a lakefill structure provided -: 1) the structure is designed to protect the fill against loss for a minimum of up to the 100-year storm. 2) the fill is deposited in a totally confined cell designed to prevent the migration of contaminants in the ground water.

Rationale - Chemical effects

When contaminants in fill are lost to the aquatic environment they will either become dissolved in water or remain associated with particulate matter which will eventually settle to the bottom. Contaminants associated with material in a lakefill may also migrate through groundwater and enter the water column.

Contaminants in the water column, either in solution or associated with suspended particulate matter can have a wide range of effects (Fig. 1). These could result in exceedence of drinking water objectives (and hence may affect human health); cause direct toxicological effect on aquatic biota and/or result in bioaccumulation of contaminants through the food chain with possible toxicological effects on terminal predators, or require consumption restrictions on sport fish.

Violations of PWQOs have occurred on occasions in the vicinity of lakefills. However, most studies have concluded that, for the most part, lakefilling does not appear to significantly contaminate the water column. Neither acute nor chronic effects on pelagic species have been documented, however, detecting such effects in the field would be a difficult task. Since PWQOs are designed to protect the most sensitive water use whether it be aquatic biota, recreation or other uses, PWQOs can be used as the "no effect" level and since the PWQOs are not routinely violated it can be assumed that lakefilling has not had acute


LAKEFILL CONS-TRUCTION
FILL LOSS
USE RESTRICT-IONS DUE TO SOIL CONTAMINANT LEVELS
FILL LOSS TO LAKE
WIND EROSION
DUST -
CONTAMINATED FILL
UNCONTAMINATED FILL
DISSOLVED CONTAMIN-ANTS
ADSORBED CONTAMIN-ANTS
TURBIDITY PLUME
SEDIMENT-ATION
AESTHETICS AIR QUALITY DETERMINATION
WATER QUALITY DETERIO-RATION
UPTAKE BY BIOTA
INGESTION BY BIOTA
WATER QUALITY DETERIO-RATION
HABITAT ALTERA-TION
SHORELINE HARBOUR & BEACH ALTERA-TION
RESTRIC-TION OR LOSS OF USES
CONTAMIN-ANT TRANSFER UP FOOD CHAIN
RESTRIC-TION OR LOSS OF USES, AES-THETICS
ADVERSE EFFECTS ON BIOTAS & HABITATS
LOSS OF HABITATS FOR INDI-GENOUS SPECIES
RESTRIC-TION OR LOSS OF USES, AESTHETIC
TOXICOLOGICAL EFFECTS -GROWTHS -FECUNDITY REPRODUCTION
BIOCONCENTRA-TION PREVENT-ING HUMAN CONSUMPTION OF FISH

toxicological effect on pelagic biota. However, chronic effects may have occurred in localized areas near active filling, where PWQOs are exceeded.

Although the movement of contaminants in groundwater are long-term, they are, to a large extent, determined by the quality of fill and are, therefore, considered in this section rather that in the operational phase. Contaminants in fill can enter the groundwater and, in both the short and long-term, migrate to the water column. The rate of migration of groundwater is expected to be slow, nevertheless, some migration is expected.

Contaminated groundwater has been found at lakefills but only in one case was there evidence that contaminants are migrating to the open-water. Nevertheless, the proximity to sensitive water uses and the long-term environment considerations would require that this potential source of contamination be guarded against.

Fill lost to the aquatic environment is eventually deposited on the bottom. Some will be deposited in the vicinity of the lakefill, at least on a temporary basis. Some studies conclude that, while some sediment parameters exceed the open-water disposal guidelines in the vicinity of lakefills, the native sediment is not contaminated by the lakefilling process. Studies at other locations have found elevated levels of some contaminants in biota; however, it is difficult to separate the effects of lakefilling from the numerous other sources of

contaminants often found nearby. It may be argued that because sediments lost from the lakefills are no more contaminated than from other sources such as STPs, the addition of contaminated sediments from lakefills to the bottom may increase the quantity of material deposited, but will not influence the overall quality.

There is little data on uptake of contaminants by biota in the vicinity of lakefills under construction; however, it can be reasonably assumed that, if the sediments lost during the filling process are contaminated, and there are no other significant sources of contaminants, then aquatic biota will have higher contaminant body burdens than in areas not influenced by lost fill.

At the present time there are no sediment quality guidelines for the protection of aquatic life and until guidelines are in place the open-water disposal guidelines are being adopted to protect aquatic life against bioaccumulation and toxicological effects. Given this assumption, adverse effects from contaminants would not be expected if the fill meets the open-water disposal guidelines. Conversely, if material not meeting the open-water disposal guidelines is deposited in the water body, adverse effects may occur. The criteria outlined above reflect this assumption.

Physical Effects

Turbidity Criteria

1. During filling operations turbidity levels will be minimized. Specific mitigative measures will be determined on a site-specific basis but will include the following general measures:

a) Filling in areas exposed to wave action will occur only during a defined "calm" period. During other periods, filling will occur only in protected areas, not prone to wave attack.

b) The exposed fill face will be restricted to a specific length, usually 15 metres. All other areas must be protected with aggregate material to withstand as a minimum the annual storm event.

c) All areas exposed to wave attack must be protected prior th the end of the calm period against the 25 year storm.

2. Where sensitive water uses are identified, turbidity levels must be within the specifications of the PWQO. Site monitoring may be required to ensure compliance with PWQOs. If violations occur, then corrective action will be taken immediately. Prior to undertaking the project the proponent will identify mitigative measures to be taken if violations occur. Such measures may include installations of silt curtains or filling only behind dikes constructed of aggregate material.

Rationale Turbidity

In extreme cases turbidity has adverse effects on biota. The short-term levels of suspended sediment (which is one component of turbidity) required to adversely affect biota are higher than levels resulting from lakefilling. Localized, long-term levels of suspended solids above 25 mg/L (which is the generally accepted no effect level) may occur close to the active fill face; however, beyond the mixing zone, such levels are not expected.

At low levels, turbidity affects water uses such as bathing, industrial water uses and aesthetics. There are specific PWQOs to protect against adverse effects on these uses.

Studies indicate that turbidity increases due to lakefilling activities are usually difficult to discern over natural background levels, although violations of the PWQO have been documented. These studies have been carried out in Lake Ontario in the Toronto area where background turbidity levels can be high, obscuring increases from lakefilling. In areas where background turbidity levels are low, violations of the PWQO would be expected close to active lakefilling if unconsolidated material (soil) is being dumped directly into the water.

There is no doubt that with current lakefilling practices, localized increases in turbidity occur and that on occasion

exceed PWQOs. The biological effects resulting from localized, intermittent turbidity plumes should be minimal. However, turbidity plumes from lakefilling have the potential to adversely affect adjacent water uses.

SEDIMENTATION CRITERIA

1. Sediment losses will be minimized and the mitigative measures outlined above to reduce turbidity will be required.

2. All sensitive water uses within the area where sedimentation is likely to occur will be protected. (The proponent will identify mitigative measures prior to undertaking the project as well as remedial measures that will be taken if impacts do occur).

Rationale - Sedimentation

Fill lost during the lakefilling process will be deposited either along adjacent shorelines or off shore and could affect navigation routes, water intakes and discharges, and aquatic habitat. The most significant effects are likely to occur to aquatic habitat.

Deposition of fine-grained sediments and a concomitant change in biota have been documented in the vicinity of lakefills as a direct result of the loss of fill. In extreme cases, close to active filling, benthic communities are absent. Except in protected areas such as embayments and in small water bodies, changes in sediments as a result of lost fill will be temporary and the material will eventually be transported to depositional areas. Permanent sediment changes resulting from the change in nearshore physical process will be considered later.

OPERATIONAL PHASE ACTIVITIES

OVERVIEW

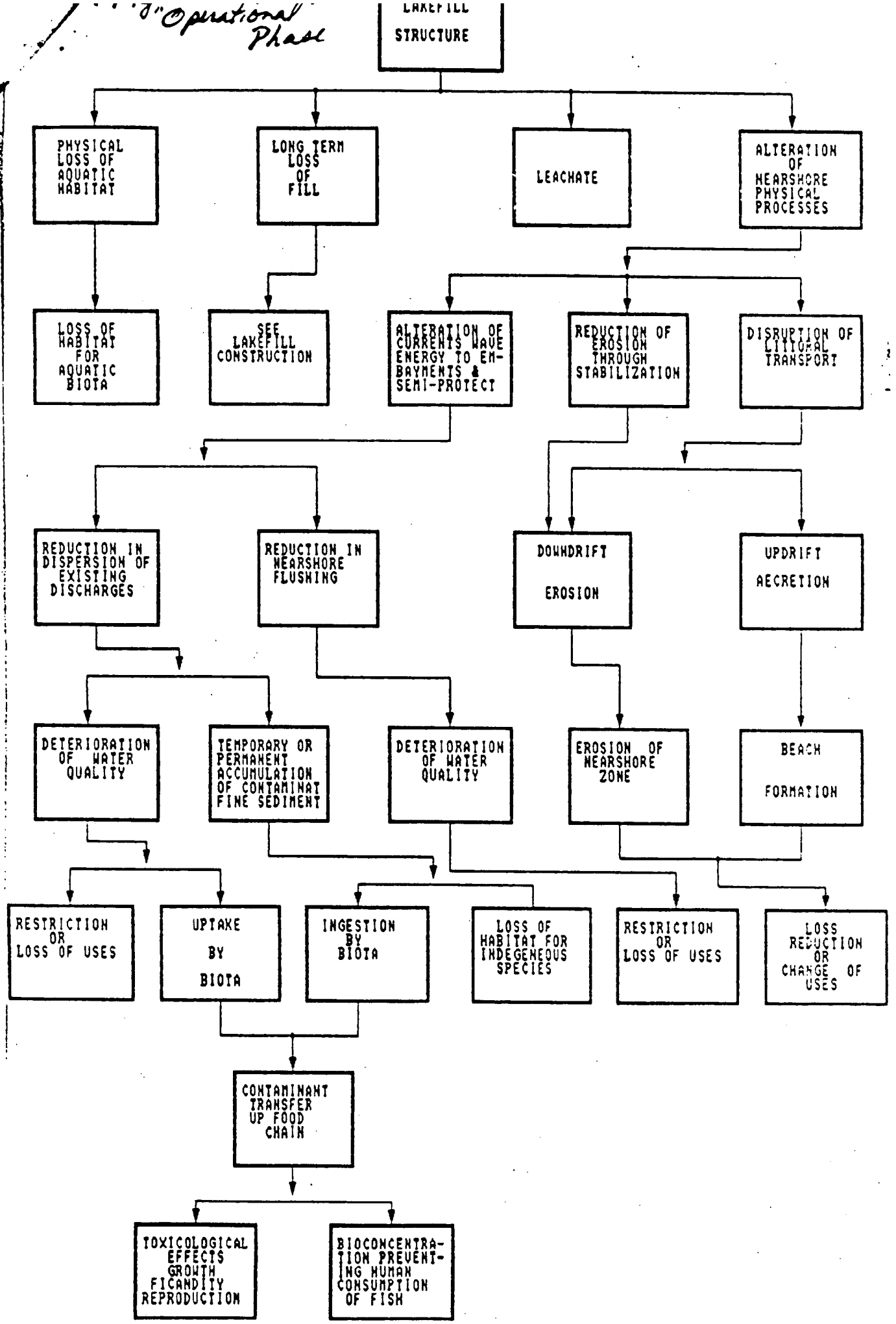
Figure 2 provides, in schematic form, a summary of the potential impacts that may result from a lakefill structure following construction.

Once a lakefill structure has been built, all "long-term" impacts are essentially irreversible. It is therefore, critical that careful planning go into the setting and design of the structure to ensure such impacts do not result. The information that follows is intended to assist a proponent in identifying and addressing potential concerns prior to proceeding with the undertaking. It provides minimum performance criteria and the rationale for setting such criteria. Information requirements to assist the proponent in meeting these criteria are outlined in Appendix B.

Nearshore Process Criteria

1. Where there is the potential for accretion of sediment to occur, the lakefill should be designed such that the accretion of sediments must not:
    a) affect areas beyond the property of the proponent, unless agreed upon by all potentially affected property owners;
    b) affect onshore discharges, offshore discharges,water intakes, or navigation routes.

"Operational Phase



2. Where there is the potential for downdrift erosion to occur, the lakefill should be designed such that erosion must not affect:

   a) beaches, barrier beaches or shorelines beyond the property of the proponent.

   b) offshore discharges or intakes, structurally.

3. A lakefill structure must not alter the configuration of adjacent mixing zones or zones of non-compliance. In some cases, changes in configuration, but not increases in size, may be permitted.

Rationale - Nearshore Processes

In most of the larger lakes, such as the Great Lakes, nearshore physical processes (i.e. longshore, onshore and offshore currents and wave action) can influence the shoreline configuration, sediment type and water quality. Lakefill structures built into the littoral zones of these lakes can alter thee nearshore processes by interrupting the longshore transport of sediment (or littoral drift); disrupting currents which disperse contaminants and; reducing wave energy which in conjunction with currents removes fine-grained sediments from the nearshore zone.

The stability of many shorelines is maintained by material transported along the shoreline. Any change in the quantity of material (either a reduction or increase) will change the configuration of the shoreline. Along shorelines maintained through littoral transport of material, a lakefill will reduce the quantity of material on the "net" downdrift side of the structure thereby "starving" the shoreline of sediment. As a result, beaches and barrier beaches which have recreational value and also protect the shoreline from erosion may disappear and serious erosion of the shoreline adjacent to the beaches may occur.

On the net updrift side of the lakefill structure, material that would normally be transported along the shoreline will tend to accumulate. This will result in an increase in the size of the

beach and a decrease in the depth of water. With decreasing water depths, both onshore and offshore discharges and intakes may be adversely affected.

Updrift accretion and downdrift erosion have been documented in areas where littoral drift maintains the shorelines. In one case, there is convincing evidence that a major offshore discharge has been adversely affected through changes in the deposition pattern of sediments. However, there is no evidence of adverse effects along bedrock shorelines or in small water bodies.

Lakefills can alter current patterns such that the dispersion of effluents from industrial or municipal discharges including storm sewers is reduced or, the dispersion pattern of the effluents may be changed to such that an extent that existing water uses such as bathing beaches, are impacted. Studies have shown that lakefill embayments entrap water contaminated from other sources and as a result, these embayments are often of lower water and sediment quality than adjacent open-lake areas.

Sediment Alteration Criteria

Lakefills will be designed to:

a) - minimize the amount of semi-protected shoreline;

b) - minimize the area of embayments

c) - maximize flushing of embayments, thereby reducing the deposition of sediments

d) - avoid direct input of storm sewers or other discharges into protected areas.

Rationale-Sediment Alteration

Without lakefills, fine-grained sediments from industrial/municipal discharges, storm sewers, surface runoff or rivers are deposited on a temporary basis in the nearshore zone. When a lakefill, is constructed in the nearshore zone, these sediments are deposited permanently in the embayments and for extended periods in semi-protected areas. Studies indicate that much of this material is contaminated above the Open-Water Disposal Guidelines (MOE, 1976 - see Appendix B) and therefore may contribute to either direct toxicological effects on biota or to bioaccumulation of contaminants through the food chain.

Studies have shown that the benthic invertebrate communities within lakefill embayments are different from the community that existed prior to the lakefill being built. However, there is little evidence to suggest that contaminant levels in biota have

increased in these areas.

Although the materials that are normally trapped in embayments usually create suitable habitat for some aquatic species whose densities would be much higher than the densities of organisms in adjacent areas, such a situation would expose greater numbers of biota to higher levels of contaminants, which in the absence of the embayments would have been dispersed over a wider area and perhaps into deep water basins of a lake.

There is no doubt that fine-grained contaminated sediments accumulate in embayed areas permanently and in semi-protected areas on a temporary basis. The question is -- does this have an adverse impact on biota? This question has not yet been satisfactorily answered. Embayments increase habitat for some aquatic species (although not all species) and tend to have higher densities of organisms than adjacent areas. Hence they bring biota in contact with the contaminants. On the other hand, the contaminants that accumulate in embayments would have entered the water body and been spread over a greater area and still been available to biota. This is clearly evident in areas of the Toronto waterfront where biota in contaminated embayments are no more contaminated than in adjacent areas where sediments are much less contaminated (but suspended sediments are similarly contaminated).

To protect against bioaccumulation as well as other adverse effects, a logical approach would be to require that sediments in embayed and semi-protected areas meet the open-water disposal guidelines. However, the data suggest that this may not result in lower contaminant levels in biota and would probably preclude lakefilling in many urbanized areas.

Fill loss criteria

- Where fine-grained material (<63um) forms part of the core of a lakefill structure, no breaching of the outer armour of the structure resulting in the loss of core fines from the less than 100 year storm shall occur.

-Proponents shall submit damage reports within 48hrs.

Rationale-Fill loss

Some types of lakefills require lengthy periods of stabilization during which fill on the outer face is lost to the lake and additional material is added to replace the lost fill. In addition, storm events may damage structures resulting in the loss of fill during the storm event and subsequently during the repairs.

Some loss of fill during construction is unavoidable and if the material lost is of a quality suitable for open-water disposal, the environmental effects should be minimal. To minimize all

long-term losses of fill, the lakefill structure should be designed to protect clean fill material within the outer armour to at least the 100 year storm.

Habitat Loss Criteria

Since the effects of the elimination of aquatic habitat are primarily site-specific, the decisions on the acceptability of the habitat loss will be made on a case by case basis by MNR staff, using baseline biological information provided by the proponent. Specific information requirements, such as the presence and abundance of fish population and fish habitat in the area, will be determined by MNR. In addition, every applicant will be required to meet the requirements of the Lakes and Rivers Improvement Act and the Canada Fisheries Act. The Fish Habitat Management Policy under the Fisheries Act will be applied to achieve no net loss of fish habitat. For example, the design and location should ensure that the no net loss of productive fish habitat occurs and, wherever possible, fish habitat should be improved through such means as enhancing the littoral zone in sheltered embayments and creation of spawning areas, among others.

Rationale - Habitat Protection

The impacts on the aquatic community from the loss of habitat are site-specific. If the area to be filled represents habitat that is critical to the survival of one or more species (eg. migration route, spawning or nursery rearing area) the consequences of the loss of a small area may be significant. Further, the cumulative effects of many lakefills in an area will eventually have an adverse effect on some components of the aquatic community and the effects may be significant to the aquatic ecosystem.

NON-AQUATIC ISSUES

The primary environmental concerns with the creation of noise and dust during the construction phase of lakefilling activities are aesthetic deterioration and public nuisance to persons living or utilizing the adjacent areas.

Noise guidelines

The Ministry of the Environment's Noise Assessment Branch has developed a MODEL MUNICIPAL NOISE CONTROL BY-LAW (August, 1978), which regulates or prohibits the emission of sound or vibrations and prescribes maximum permissable levels of sounds or vibrations called Quantitative Sound and Vibration Criteria. The by-law classifies noise level according to place, time and source of sound and/or vibration.

The proponent would have to undertake an assessment of possible noise levels and the distance to the nearest sensitive receptor. The probable noise levels can then be calculated and if they exceed the guidelines, mitigative measures would have to be implemented prior to approval.

The Quantitative Sound and Vibration Criteria are applicable but cannot be enforced by the Ministry if the Municipality in question has not passed the by-law. However, if the by-law was referred to in a certificate of Approval for controlling sound emission, then it would be enforceable.

Dust Guidelines

The proponent would undertake an assessment of whc and at what distance the nearest sensitive receptors were and possible levels of just based on the location of the lakefilleng activity in terms of windspeed and soil/fill quality. The proponent would then have to describe the appropriate mitigative measures they will implement to minimize the emissions.

The Certificate of Approval could prescribe control strategies that are possible with reference to Reg. 308 Section 8 (1b) and 11.

IV IMPLEMENTATION PROCEDURES

Subject to acceptance of this report by the Ministry, work will commence on the implementation of the policies outlined in the report.

However, three tasks associated with implementation will have to begin immediately. These are:

1. An analysis of the resource implications to the Ministry.
2. Drafting of a Regulation to be promulgated under Part V of the E.P. Act to provide a legislative basis for the lakefill program.
3. Preparation and implementation of a series of communications plans.

Resource Implications

By extending its operational mandate to include all lakefilling activities in the Province of Ontario, the Ministry of the Environment will be taking on the evaluation, and control of a large number of existing and future projects (EAG, 1988).

In the future, staff will be required to review and comment on such diverse matters as nearshore hydrology, coastal engineering and contaminated soils management. The tiered approach to control suggested in the report also lends itself to the management of human resources.

Small projects, which will eventually be exempt from the requirements of a Certificate of Approval could likely be assessed at the regional offices. Since it is anticipated that most of the projects undertaken in the Province will fall into this category, it is likely that there will be a requirement for a number of technical staff to deal with these assessments.

Medium sized projects, which will require the issuance of a certificate, but will not be subject to an Environmental Assessment hearing, would be reviewed by specialists within the Ministry located at either the regional offices or in the Branches.

It is unlikely that the Ministry could afford to maintain the staff required for the assessment of the large scale lakefill projects like the Leslie Street Spit. By their nature, these projects would also be subject to lengthy Environmental Assessments. It would be more appropriate for the Ministry to retain a professional consultant to act on its behalf to review these large scale projects.

Draft Regulation

Currently, the Ministry of the Environment does not possess the legislative controls necessary to implement a proactive program on lakefill controls. Existing legislation allows the Ministry to act only in an advisory capacity during the planning and construction phases. The nature of existing legislative mandate

is such that the ministry is required to prove damage to the environment in order to address impacts, and with structures as permanent and as large as lakefills , this after-the-fact mechanism is entirely unsatisfactory.

The new regulation would be promulgated under Part V of the Environmental Protection Act. Since this Part deals with the management of waste, it will be necessary to designate lakefill materials as a special type of waste and lakefills as a special type of waste management system. There are several points which will need to be addressed. These include:

- designation of lakefills as waste disposal sites.
- designation of lakefill material as a waste for the purposes of this regulation.
- establishment of minimum standards for fill quality and operational procedures.
- requirement for a proponent to submit to a formal approval process under Section 32 of the Act.
- exemption of both lakefills and lakefill materials from the other provisions of Part V (ie. Section 45 etc.) when constructed in compliance with a Certificate of Approval.
- establishment of a small quantity exemption from the requirement of a formal approval (certificate), however, fill quality and construction practices would have to meet the prescribed minimum standards.
- requirement for financial assurance either at the Regulation level or under the authorities elsewhere in the E.P. Act, at the

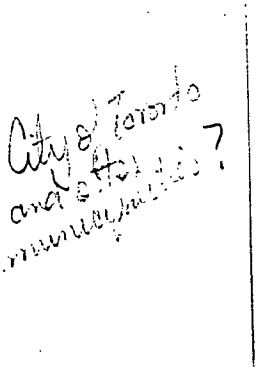
time the certificate is issued.

Communications Plans

Whenever a new piece of legislation is enacted that will have a substantial effect on current practices, it is important that a communications plan be put into effect early in the process. By announcing its intention, to legislate controls, to affected parties, the Ministry has the opportunity to benefit from comments received during the development of the regulation.

In this case, there are several audiences to be targeted. It is suggested that the communications plan address at least the following:

Ministry of Natural Resources
Environment Canada
Conservation Authorities
Shoreline Municipalities
Trucking and Hauling Associations
Consulting and Engineering firms
General Public
Staff of the Ministry of the Environment



Initially, the communications plan would advise interested parties of the Ministry's intent to establish controls on lakefilling and to solicit input from technical groups to aid in the development of the regulation.

is successful, it could provide a model for administering other large-scale lakefill projects. Early consultation with the C.A.s would help to make this more likely and also allow the Ministry to avoid those situations where a conflict of interest might arise (i.e. when the C.A. is the lakefill proponent).

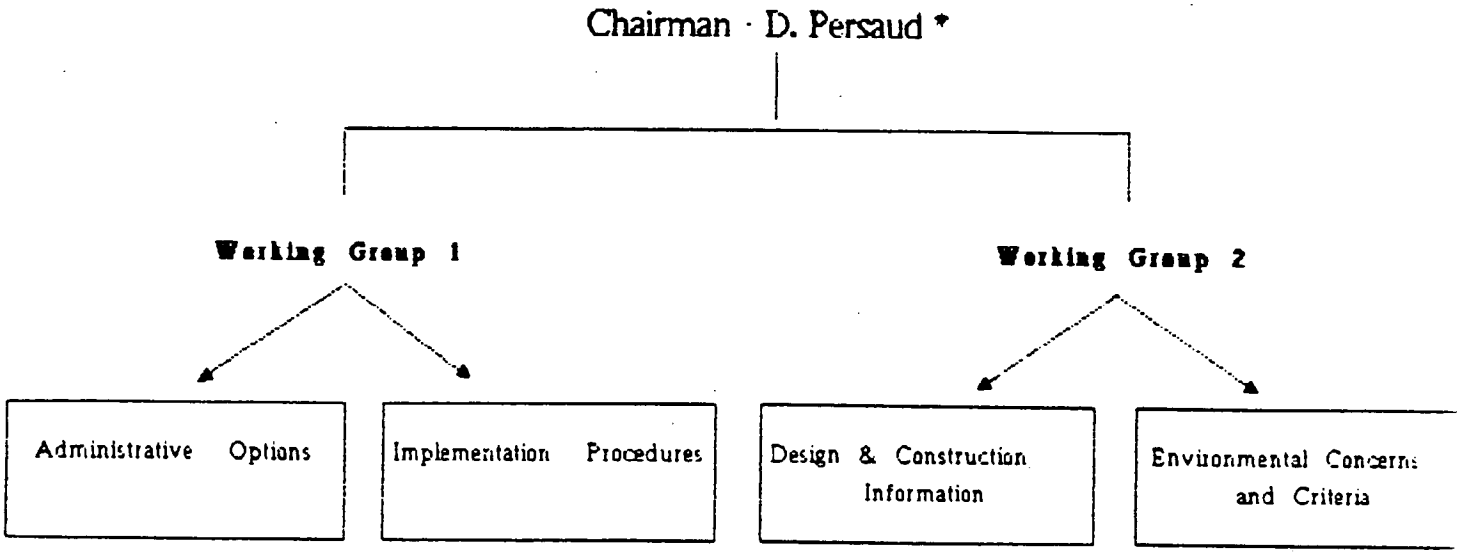
REFERENCES

ENVIRONMENTAL ASSESSMENT BOARD, (EAB) 1980. Environmental Assesment Act Hearing. COLONEL SAMUEL BOIS SMITH WATERFRONT AREA MASTER PLAN DECISION and REASONS, December 1980. Ontario Ministry of the Environment, Toronto, Ontario.

MOE, 1984, Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment, OMOE. Toronto, Ontario.

MOE, 1988, Daphnia Magna Acute Lethality Toxicity Test Protocol- by D.G. Poirier, G.F. Westlake and S.G. Abernethy - OMOE, Water Resources Branch, Toronto, Ontario.

Appendix A — LAKEFILL POLICY COMMITTEE



L. Feldman (Chairperson)*	J. Richardson MOE*	D. Boyd MOE*	A. Hayton (Chairperson)*
A. McLarty MOE*			L. Eastcott MOE*
D. Huber MOE*			J. Weninger City of Toron
D. Hollinger MOE*			R. Biette MNR
L. Sarazin Env. Canada			J. Pimenta MOE
B. Brownlee MOE			T. Lomas MOE

* Steering Committee Members

APPENDIX B : PROPOSAL CONTENT REQUIREMENTS FOR DESIGN AND CONSTRUCTION RELATED MATERIAL

Design principles and construction practices are linked to "Operational Phase" and "Construction Phase" environmental impacts respectively. Appropriate project design will ensure that the long-term alteration of environmental conditions caused by the completed structure does not adversely affect aquatic life or adjacent water uses such as intakes, outfalls, navigational channels, or beaches. Similarly, appropriate project construction must ensure that the short-term environmental effects associated with fill placement do not adversely affect aquatic life or adjacent uses.

The fundamental principle underlying all design and construction criteria is the ultimate responsibility of the lakefill proponent for an adequate supply and quality of fill material, and the technical performance of the lakefill structure. In all cases, lakefill proponents should be responsible for mitigating impacts, or compensating affected users, in situations where project construction or operation has adversely affected aquatic life or water uses.

There are no legally enforceable national or provincial engineering criteria for coastal engineering projects such as those encompassed by lakefilling. However, it is possible to outline general information requirements and proponent commitments associated with project design and construction. These can then be applied as minimum, "generic" conditions of approval for lakefill projects with allowance for imposition of more stringent conditions based on case-by-case evaluation.

Inherent in the following list of information requirements is the concept of establishing "Performance Criteria" for the proposed undertaking and ensuring compliance with them. This approach acknowledges that it it is not possible, or appropriate, for the Ontario Ministry of the Environment to provide detailed engineering specifications for all types of lakefill projects throughout the province (a more complete technical discussion on engineering design and construction practices appears in E.A.G.(1988)). Instead, it will be the responsibility of the proponent to identify, and explain in detail, the intended function(s) of the proposed project, and the corresponding criteria for evaluating its technical performance and environmental impact during and following construction.

In keeping with this general approach, we recommend that all project proposals include a description of:

- comprehensive, project-specific performance criteria for the structure both during, and following, construction (subject to the minimum design criteria contained in Section III of this report)

- study area wave climate, water level, bathymetry, surficial sediment composition and chemistry, and littoral transport conditions,

- adjacent shoreline uses potentially affected (minimum radius of 1 km)

- proximity to water supply intakes, municipal and industrial discharges, sewer outfalls, and tributaries,

- proximity to sensitive or unique habitat (e.g. spawning areas, marshes, etc.)

- the lakefilling methods associated with the construction phase,

- project life span,

- the "risk level" used to establish the design criteria,

- the acceptable damage level inherent in the project design,

- the type and scope of the monitoring program necessary to ensure compliance with project-specific performance criteria,

- the type and scope of maintenance work required to ensure compliance with the project-specific performance criteria,

- the routine inspection and maintenance schedule,

- contingency procedures for structural damage or failure,

- the mitigative/abatement procedures to be employed in the case of unsatisfactory engineering/environmental performance (e.g. unacceptable volume of fill loss, unacceptable water quality impacts),

- fill availability forecasts,

- fill schedule scenarios and construction/maintenance contingency plans associated with various fill availability forecasts (including a "no supply" scenario),

- contingency procedures for structural and environmental protection associated with various fill availability forecasts (including the "no supply" scenario),

APPENDIX C — EVALUATION OF LEGISLATIVE PROCESSES

ENVIRONMENTAL ASSESSMENT ACT

- Lakefilling is covered under Environmental Assessment (EA), if it is part of either a Municipal undertaking, costing $3.5 million or more, or a Conservation Authority project greater than or equal to $1.0 million (Regulation 205). When/if it is covered by these projects it is because it is part of a Municipal or Conservation Authority undertaking, not because it is lakefilling per se.

- Environmental Assessment policy does not provide guidelines as to the specific MOE "green hat" criteria required for any project. This information is available from guidelines and policy developed in the Water Resources or Approvals Branches.

  - For example, at present, a municipal park development involving lakefill with a total cost in excess of $3.5 million would require an individual EA. However, the specific criteria on acceptable quality or type of fill would not be available from the above sources.

- To make smaller (in terms of dollar values) Municipal and Conservation Authority undertakings automatically subject to EA, it would be necessary to amend Regulation 205 to allow flexibility in the dollar value cut-off.

- Smaller public sector projects and private sector undertakings can be subject to EA, if specifically designated by the Minister.

- The majority of the larger scale lakefilling projects (in terms of dollar value and size) that do occur, are generally, public undertakings.

- The Environmental Assessment Act has no effective enforcement mechanisms and would still require the Environmental Protection Act to provide specific controls via a Certificate of Approval.

BEDS OF NAVIGABLE WATERS ACT

- Unless expressly granted, the Bed of Navigable Waters remains Crown land. In these situations only, it may be possible to use this Act, but it would not apply if the lake bed were deeded to a private individual or corporation or in the hands of a federal agency.

PUBLIC LANDS ACT

- A number of sections, including 12, 13, 14, 17, 18, 19, 22, 23, 25 and 35, offer some usefulness in controlling lakefilling situations.

- Section 12

  The Minister of Natural Resources may establish zones which shall be administered only for the purposes defined for the designated class of zone.

- Section 13

  Restricted areas in regions with no municipal organization (which does not apply anywhere within southern Ontario, but perhaps in parts of northern Ontario) must get a permit to build, alter, etc. on any public land and the penalty is $500 maximum.

° Section 14

Provides that the Lieutenant Governor in Council may make regulations prohibiting, regulating and/or controlling the sale or lease and fixing prices and/or conditions of sale.

° Section 14(2)

The Minister may fix such terms and conditions as he considers proper in addition to those required in Section 14(1).

° Section 17

Deals with Letters Patent for land sold or leased and, under subsection 1, these may contain conditions regarding the use of land, and under subsection 2, if conditions are violated, the Minister may order the lands returned to the Crown.

° Section 18

The Minister may alter conditions listed in Section 17.

° Section 19

The Minister may issue Licences of Occupation with appropriate conditions on use within that area.

° Section 22

The Minister may revoke Letters Patent or Licences of Occupation if conditions have been violated, in which case the land reverts to the Crown.

° Section 23(1)

"Lands" means public lands and includes public lands covered with water.

° Section 23(2)

The Minister may originate a "Notice of Motion" via a local judge to obtain and "Order for Possession" requiring the occupant, lessee or purchaser deliver the lands back to the Minister. Under subsection 3, the Minister apparently may give notice "to remove therefrom, any building structure or thing".

° Section (8)

If the person ignores the order, he may be fined $20-$100.

° Section 25

The person who throws or deposits any substance, material or thing on public lands, whether or not covered with water, without written consent of the Minister is guilty and may be fined up to $5,000.

° Section 35

The Minister, during the month of February, will provide to each Assessment Commissioner in the local municipalities a list of all public lands sold, leased or patented during the previous year.

SUMMARY

The Public Lands Act offers control over use of Crown lands via water lots and may have some potential where the site is provincially Crown controlled. Obviously it would not hold true on private or federal lands.

LAKES AND RIVERS IMPROVEMENT ACT

° Section 3

The Lieutenant Governor in Council may make regulations respecting generally the use under this Act of lakes and rivers and waters therein with fines up to $5,000.

° Section 14

Requires that no person shall construct a dam:

(a) until the location is approved in writing by the Minister; and

(b) plans and specifications have been approved in writing by the Minister.

° Section 17(4)

The Minister may order repairs, improvements or removal within the specified period of time.

° Section 17(5)

Upon non-compliance with an Order under Section 17(4), the Minister may do any necessary work and charge back to the owner, lessee, etc.

° Section 15(1)

"The Minister may appoint an officer or officers with such powers and duties as are considered expedient to be in charge of the lake or river or any works or improvements thereon, and to regulate the use of the lake or river in such a manner as seems best

calculated to afford persons having conflicting interest on the lake or river, a fair and reasonable use of the waters...".

° Section 15(2)

The Minister may order the owner of a dam to which 15(1) applies to repair, reconstruct or remove the dam in a specified time period, or if not so done, the Minister can undertake the work and recover costs from the owners through the courts.

° Section 16

Once a dam is in place, the owner must re-apply as under Section 14 before making any alterations to the dam. This gives long term control over modifications to any dam.

° Section 19(1)

The Minister may authorize an engineer's inspection and report on the condition of any dam.

° Section 19(2)

Based on this report, the Minister may order repairs, reconstruction or removal of the dam within a specified time period.

° Section 19(3)

If not complying with subsection 2, the Minister may expropriate the dam and site, in which case it reverts to the Crown.

° Section 20

The owner of the dam must co-operate with officers inspecting the dam, and there is a fine of up to $500.

° Section 22(1)

The Minister may appoint an officer to oversee a project and its operations to ensure ongoing compatibility among users. At the recommendation of the officer, the Minister may order changes. A fine for violation of such orders of up to $50 per day of contravention of the Order is possible.

° Section 29

The Minister and his designates may enter land or premises, except private dwellings, stores, storehouses, offices or farm buildings to perform their duties under this Act.

° Section 36

If any "...refuse, substance or matter has been thrown or deposited..." in or on the shores of a lake or river, which in the Minister's opinion "impairs the natural beauty", the Minister may order removal in a specified time period and the penalty is $50 per day.

SUMMARY

The Lakes and Rivers Improvement Act was originally intended to control and facilitate the movement of timber through lakes and rivers. Its penalties are outdated and small (maximum $5,000, often less than

$500). The intention of the Act is the control of dams and other works on inland rivers and lakes. It requires that location and design, or improvement or removal of a "dam" be approved by the Minister of Natural Resources. It could possibly be appropriate to use provided that:

1) MOE could be delegated jurisdiction, e.g. under Section 15, 16, 19, 20, 22 and 36. However, the Minister of Natural Resources has delegated "location" approval to MNR Districts and "design" approval to Regional Engineers.

2) "Dam" could be interpreted to include lakefill. Some MNR Districts/Regions do require approvals under this Act for shore protection works considering them to be "dams" under the Act. However, this interpretation has not been confirmed in a court of law. A "dam" is defined as "a dam or other work forwarding, holding back or diverting water".

CONSERVATION AUTHORITIES ACT

Section 28(f) provides that Conservation Authorities may make regulations regarding the placement or dumping of fill of any kind in any place where it may affect the control of flooding, pollution or conservation of land. In most cases, Conservation Authority boundaries on the Great Lakes are at the high water line.

SUMMARY

Pros

1. Some Conservation Authorities already have fill regulations in place along shorelines.

2. Some of the Conservation Authorities have an infrastructure in place to administer fill regulations.

Cons

1. Regulations made under the Conservation Authorities Act are for Conservation Authorities to regulate the placing or dumping of fill in defined areas, the construction of buildings or structures in ponds, swamps or flood plains and the modification or alteration of the existing channels of watercourses. While pollution is part of the Act, this portion is normally not utilized and was included during the original writing of the Act. At that time, many items including the taking of water were also included which is presently an MOE responsibility under the Ontario Water Resources Act.

2. Conservation Authorities do not cover the entire Great Lakes shoreline.

3. The initiation of Regulations by Conservation Authorities is voluntary. Conservation Authorities are not bound to pass any or all types of Regulations and many may choose not to do so along the Great Lakes Shoreline.

4. Not all Conservation Authorities have the expertise to administer all the concerns of MOE.

5. Conservation Authorities, in many cases, do not have the staff or funds to administer the regulations concerning pollution, even if the Conservation Authorities Act gives them the mandate to do so.

ENVIRONMENTAL PROTECTION ACT

° Section 5

Pros

- would allow the promulgation of a regulation that would set province wide standards for lakefilling.

- after the promulgation of the regulation, there would be little impact on Ministry staff since the proponents would be responsible for insuring that they complied with the regulation. The Ministry's involvement would be reduced to one of monitoring compliance.

Cons

- No such standards currently exists.

- Doesn't allow for site specific standards.

- No approval mechanism requires the proponent to come forth and identify the project.

- Would require the promulgtion of a Regulation to give the standards a legal basis.

° Section 8

Cons

- Specifically excludes discharges to water.

° Section 16

Pros

- allows specific actions to be initiated at the order of this Ministry.

Cons

- requires that the Minister must be aware of an existing situation where damage has been demonstrated (an a priori control).

- no approval mechanism requires the proponent to come forth and identify the project.

° Section 17

Pros

- administered at the Regional level

- allows preventative measures to be ordered on a site specific basis.

Cons

- no approval mechanism requires the proponent to come forth and identify the project.

- the Director must have reasonable and probable grounds that an impairment of the environment has occurred (a priori) and that the mitigative measures ordered are directly related to that impairment.

° Section 27

Pros

- Has a formal approval mechanism requiring the proponent to come forth and identify future projects and receive written approval from this Ministry before the project can commence.

- Allows for the establishment of site specific conditions as warranted.

Cons

- Significant staff requirements for the approval process. It is likely that the expertise required does not reside within the Ministry.

- Would require the promulgation of a Regulation to designate lakefills as waste sites in order for the provisions of Part V to apply.

ONTARIO WATER RESOURCES ACT

° Section 23 - Approval of water works

° Section 24 - Approval of sewage works

This Act would not be suitable for controlling lakefilling activities since lakefilling activities

do not involve approval of either sewage or water works.

THE PLANNING ACT

- The major objective of the planning process in Ontario is to minimize the potential for land use conflict through the effective planning and design of new land uses.

- Within the planning process all new development or redevelopment of lands in Ontario is strictly regulated through the provisions of the Planning Act (1983). This Act prescribes general rules for land use planning, establishes how land uses may be controlled and who may control them.

- The Ministry of the Environment is concerned with all aspects of land use planning which may affect or be affected by the environment. The Ministry receives its authority to provide input into the planning process through provisions contained in the Planning Act. The Ministry of the Environment makes comments and recommendations on land use planning matters related to its mandate, which covers sound, air quality, water quality and quantity, servicing (including water, sewage, and waste management), and significant land use conflicts.

- This mandate is derived from the Environmental Protection Act (EPA), the Ontario Water Resources Act (OWRA), the Environmental Assessment Act (EAA), and the Pesticides Act. It is further clarified through MOE policies contained in the Manual of Environmental Policies and Guidelines.

- The Ministry of the Environment's involvement in Land Use Plan Review is part of the Ministry's preventative approach to protecting the environment. By ensuring that environmental problems are minimized at the earliest possible stage in a development proposal, the need for expensive abatement controls later on is avoided.

- The Ontario Planning Act is administered by the Minister of Municipal Affairs. It sets out the ground rules for land use planning in Ontario, and establishes how land uses may be controlled, and who may control them. Among other matters, the Act provides the basis for consideration of provincial interests related to municipal land use planning, such as the management of natural resources and protection of the natural environment.

- Section 4 of the Planning Act allows the Minister of Municipal Affairs to delegate any of his authority, except the authority to approve its own official plan and amendments, to a municipal council. Once delegation occurs, the municipality is responsible for all matters normally dealt with by the Minister, including the referral of any matter to the Ontario Municipal Board (OMB).

- Section 3 of the Planning Act enables the province to clarify provincial policies in matters affecting land use planning through the issuance of policy statements.

- Section 3 of the Planning Act requires that municipalities, in carrying out their own planning functions, "have regard to" these statements. At the same time the O.M.B., provincial ministries and

agencies are also required by the legislation to "have regard to" such statements in carrying out their varied responsibilities.

- Depending on the nature of the particular provincial concern, policy statements may be initiated by the Minister of Municipal Affairs alone, or jointly with other ministers whose responsibilities affect local planning. The Planning Act requires that before a policy statement is approved, the Minister confer with those who are considered to have an interest in the matter.

SUMMARY

- Through the planning process set up under the Planning Act, MOE is able to comment on environmental issues (including soil quality which ultimately has an impact on lakefill). However, under the Planning Act, MOE is simply a commenting agency - not an approval agency. The Minister of Municipal Affairs or its delegated authority is not required to ensure that MOE's concerns are met. MOE can request that a planning application be ultimately referred to the Ontario Municipal Board and then back to Cabinet, if it is declared a matter of provincial significance. But again, it is not the Minister of Environment who has the approval authority under this process.

- Since municipalities, in general, do not approve lakefilling activities as a land use, per se, a lakefilling project (i.e. its actual construction) would not be subject to an official plan amendment or rezoning under the Planning Act. Therefore, MOE would not have an opportunity to comment on this

through the planning process. The ultimate land use for the lakefilled site, may be subject to the planning process but that would be after the lakefilling activity has taken place. (However, it should be noted that some municipalities, such as the City of Toronto and City of Hamilton, are challenging this interpretation and the City of Toronto is currently examining ways to control lakefilling activities on its waterfront from a land use point of view through its official plan.)

APPENDIX D. OPEN WATER DISPOSAL GUIDELINES

The guidelines listed below are used to evaluate the suitability of material for unrestricted fill. For the parameters in Group 1A, i.e. PCBs, Pb. Cd and Hg exceedance of any of these guidelines will be sufficient basis for denial of permission for use of a material as unrestricted fill. Averaging of analytical results will not be allowed. Group 1B parameters will be used to assist with the interpretation of the Group 1A parameters.

Where group 2 parameters are exceeded the materials may be re-evaluated for use as unrestricted fill using the modified leach ate procedure. The results from the modified leachate analysis will be compared to concentrations equal to ten times the Provincial Water Quality Guidelines for the parameters of concern identified by the Ministry. Any exceedance of the 10 x PWQO will result in denial of permission for use of a material as unrestricted lakefill.

PARAMETER	OPEN WATER DISPOSAL GUIDELINES All units in ug/g, dry weight, unless otherwise specified.
1A	
CADIUM	1.0
LEAD	50.0
MERCURY	0.3
PCB	0.05
1B	
LOSS ON IGNITION	6.0%
OIL & GREASE	1500.0
TOTAL PHOSPHORUS	1000.0
TOTAL KJELDAHL NITROGEN	2000.0
AMMONIA	100.0
GRAIN SIZE	
VISUAL DESCRIPTION	
2	
ARSENIC	8.0
COPPER	25.0
ZINC	100.0
CHROMIUM	25.0
IRON	10,000.0
NICKEL	25.0

COBALT	50.0
SILVER	0.5
CYANIDE	0.1

NOTE: a) These guidelines are currently being updated and a new set of Sediment Quality Guidelines are expected by Spring 1989.

b) For information on Analytaical Methods - please refer to -: Handbook of Analytical Methods for Environmental Samples Vols. I and II, Ontario Ministry of the Environment, 1983.

DISTILLED WATER LEACH TEST

APPENDIX E -

THE DETERMINATION OF LEACHATE CHARACTERISTICS OF LAKEFILL MATERIAL

(1) SAMPLING

1.1 Collect approximately 500 g of the sample using techniques which ensure that the sample is representative of the material to be tested. (Ref. 1)

(2) EQUIPMENT

2.1 Sieve, 200 mesh, stainless steel or plastic material.

2.2 Stainless steel filtration unit, 142 mm diameter, minimum 1L capacity, capable of sustaining a pressure of 5 kg/cm^2, applied to the solution to be filtered.

2.3 Membrane filter, 142 mm diameter, 0.45 µm diameter pore size, made of synthetic organic material such as cellulose acetate, cellulose nitrate, nylon or polycarbonate and which is compatible with the leachate to be filtered.

2.4 Glass fibre prefilter, 124 mm diameter, 3 µm to 12 µm pore size range

2.5 Vacuum filtration unit, 90 mm diameter.

2.6 Membrane filter 90 mm diameter as per Step 2.3.

2.7 Glass fibre filter 70 mm diameter as per Step 2.4.

2.8 Solid waste rotary extractor - a device that rotates the bottles end overend about a central axis through 360 °, with a speed of 10 rpm. The dimensions of the box will depend on the needs of each laboratory. (Figure 1).

2.9 pH meter, with a readability of 0.01 pH unit and accuracy of ± 0.1 pH units.

2.10 Cylindrical bottles, wide mouth, 1250 mL capacity, polyethylene.

(3) REAGENTS

3.1 Buffer Solutions, pH 4 and pH 7.

3.2 Reagent water, Type IV (ASTM Specification D 1193).

3.3 Nitrogen gas, prepurified.

(4) EXTRACTION PROCEDURE

4.1 Dry a suitable aliquot of the sample at 60 °C in an oven for 18 ± 2 hrs.

4.2 Crush the sample, with a mortar and pestle, to a 200 mesh particle size.

4.3 Place 50 g of the dry material into a 250 mL wide mouth cylindrical bottle. Use additional bottles, if a larger volume of leachate is required for the analysis.

4.4 Add 1000 mL of the reagent water.

4.5 Cap the bottle and agitate it in the rotary extractor for 15 minutes before pH measurement.

4.6 Measure and record the pH of the solution in the bottle using a pH meter, calibrated with buffers at pH 7.00 and pH 4.00. The solution should be stirred during the pH measurement.

4.7 Cap the bottle and place it in the tumbling apparatus. Rotate the bottle and its contents at 10 $\pm$ 2 rpm for 24 hours at room temperature (20 °C to 25 °C).

4.8 Assemble the filtration unit with a filter bed consisting of a 0.45 μm pore size membrane filter and a coarse glass fibre pre-filter upstream of the membrane filter (per manufacturer's instructions).

4.9 Wash each filter used in the leach procedure with 200 mL of distilled water. Filter under pressure until no water flows through the filtrate outlet.

4.10 Allow the material to settle and decant the liquid phase into the opening of the filtration unit.

4.11 Pressurize the reservoir very slowly with nitrogen gas by means of the regulating valve on the nitrogen gas cylinder, until liquid begins to flow freely from the filtrate outlet.

4.12 Increase the pressure step-wise in increments of 0.5 kg/sq. cm to a maximum of 5 kg/sq. cm, as the flow diminishes. Continue filtration until the liquid flow ceases or the pressurizing gas begins to exit from the filtrate outlet of the filter unit. Discontinue filtration if no more than 1 mL of leachate filters in a 2 minute period.

4.13 De-pressurize the filtration unit slowly, using the release valve on the filtration unit.

Note: *Where separation can be performed without imposing a five kg/sq. cm differential pressure, a vacuum filtration unit with a filter bed as per Step 4.2 may be used.*

4.14 Measure and record the pH of the liquid phase. Discard the solid portion.

Note: *If the analysis is not performed immediately, store separate aliquots of the leachate at 4°C, after adding appropriate preservatives for the analytical parameters of interest (See "A Guide to the Collection and Submission of Samples for Laboratory Analysis", Ontario Ministry of the Environment, July 1979).*

4.15 Analyze the leachate solutions from Step 4.14 for contaminants listed in the lakefill guidelines using recognized Ontario Ministry of the Environment procedures.

4.16 Carry a distilled water blank through the procedure.

(5) CALCULATIONS

mg/L leachable = mg/L in leachate minus (-) mg/L in the blank.
target parameter

Report results to two decimal places.
Also report initial pH (Step 4.6) and final pH (Step 4.14)

(6) QUALITY CONTROL

(a) Instrumentation: Analyse an EPA reference solution along with the samples

(b) Procedure: None currently available. Composite reference material being prepared

(7) LITERATURE

Ref 1: Representative Sampling Methods

Physical Form of Waste	Applicable Sampling Method
Crushed or powdered material	ASTM Std. D346-75

Soil or rock-like material	ASTM Std. D420-69
Soil-like material	ASTM Std. D1452-65
Fly ash-like material	ASTM Std. D2234-76

Note: *1) ASTM Standards are availble from ASTM, 1916 Race St., Philadelphia, PA 19103*

2) U.S. EPA SW 846 is available from Solid Waste Information, U.S. Environmental Protection Agency, 26W. St. Clair St., Cincinnati, Ohio 45269

Ref. 2: J. McKeague Manual on soil sampling and methods of Analysis. Canadian Society of Soil Science, 1978

Ref. 3: J. Pimenta Test methods for waste characterization and classification, Ontario Ministry of the Environment, March 1986.

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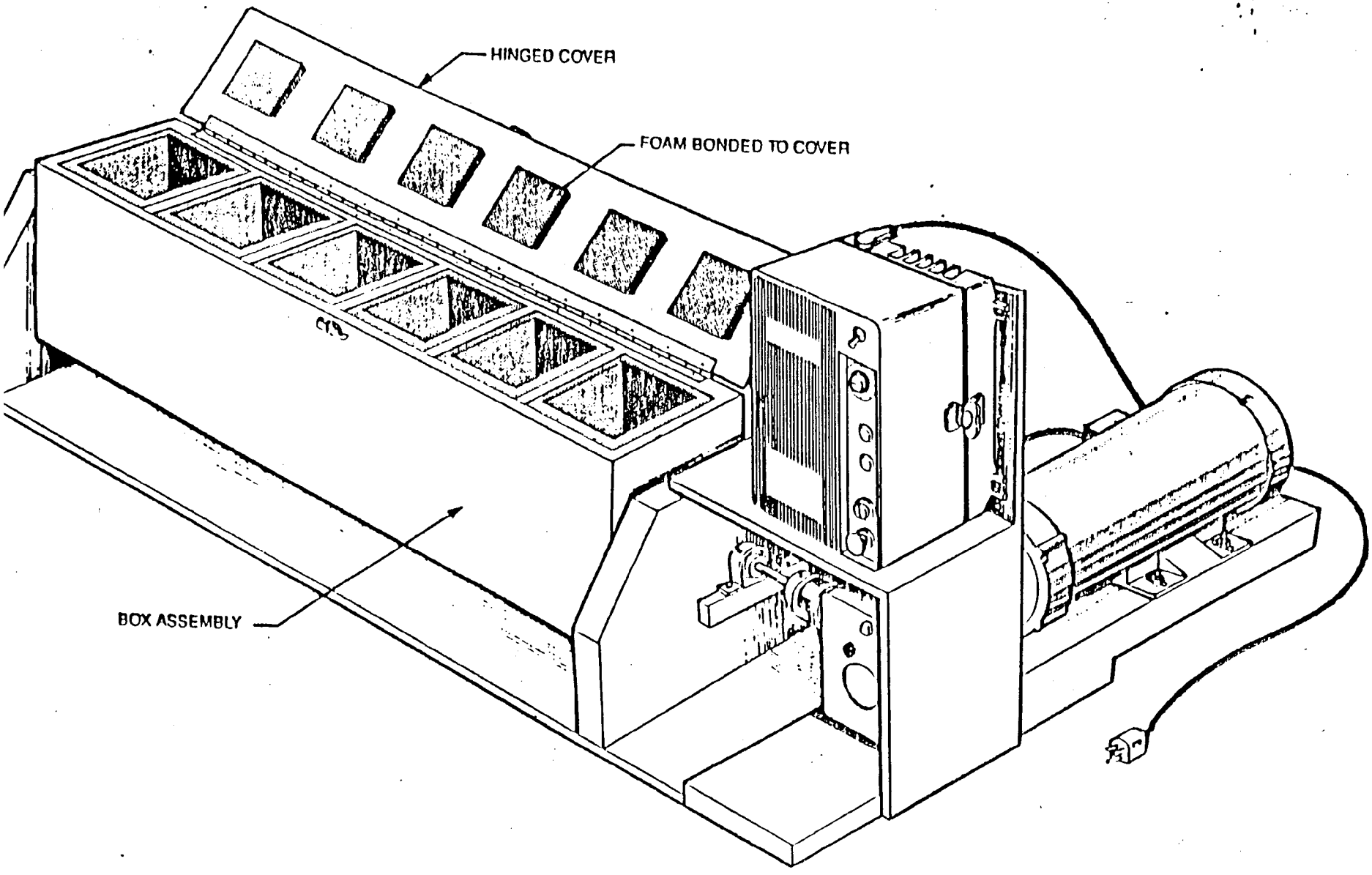

FIGURE 1
SOLID WASTE ROTARY EXTRACTOR

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APPENDIX F- SCHEDULE IV of WASTE REGULATION 309

THE DETERMINATION OF LEACHATE TOXICITY

SCOPE

The Leachate Extraction Procedure is intended primarily as a means for classifying wastes based on the leachability of contaminants in a waste material. A waste sample is treated with a dilute acetic acid solution, using a tumbler extraction technique, for a twenty-four hour period of time. The concentrations of contaminants in the leachate produced are measured and compared to the concentrations specified in the Waste Management Regulation.

Leachate containing concentrations equal to or less than one hundred times those specified in Schedule 4 of the Waste Management Regulation, classifies the waste as non-hazardous. Waste material, with leachate concentrations of contaminants greater than one hundred times those proscribed in Schedule 4, is classified as hazardous waste.

Although not required by the Regulation, this procedure may also be used to determine whether a waste can be used as a fill material on land. Leachate, using distilled water, for a landfill material shall not contain contaminant concentrations higher than those specified by a District Officer of the Ontario Ministry of the Environment. Criteria for fill material intended for disposal in open waters will be determined on an individual basis by the same authorities.

Wastes are normally extracted in their unaltered physical state, or if the aggregate particle size is greater than 9.5 mm, after comminution. Exceptions may be made for hard slag-like wastes or treated solidified wastes, which are likely to remain physically stable in a landfill site. The structural integrity procedure should be followed to determine if a particular waste requires comminution.

THE DETERMINATION OF LEACHATE TOXICITY

METHOD A. Leachate Extraction Procedure

(1) SAMPLING

Collect a sufficient amount of sample to provide approximately 100 g of solid material, using techniques which ensure that the sample is representative of the waste to be tested.

(2) EQUIPMENT

2.1 Sieve, 9.5 mm mesh opening, stainless steel or plastic material.

2.2 Stainless steel filtration unit, 142 mm diameter, minimum 1L capacity, capable of sustaining a pressure of 5 kg/cm^2, applied to the solution to be filtered.

2.3 Membrane filter, 142 mm diameter, 0.45 μm diameter pore size, made of synthetic organic material such as cellulose acetate, cellulose nitrate, nylon or polycarbonate and which is compatible with the leachate to be filtered. Teflon is recommended for organic constituents.

2.4 Glass fibre prefilter, 124 mm diameter, 3 μm to 12 μm pore size range

2.5 Vacuum filtration unit, 90 mm diameter.

2.6 Membrane filter 90 mm diameter as per Step 2.3.

2.7 Glass fibre filter 70 mm diameter as per Step 2.4.

2.8 Solid waste rotary extractor - a device that rotates the bottles end over end about a central axis through 360 °, at a speed of 10 rpm.

The dimensions of the box will depend on the needs of each laboratory. (Figure 1).

2.9 Structural Integrity Tester with a 3.18 cm diameter hammer weighing 0.33 kilogram and having a free fall of 15.24 cm. (Figure 2).

2.10 pH meter, with a readability of 0.01 pH unit and accuracy of ± 0.1 pH unit.

2.11 Cylindrical bottles, wide mouth, 1250 mL capacity, polyethylene or glass with Teflon lined cap for inorganic constituents; glass with Teflon-lined cap or Teflon bottles for organic constituents.

2.12 Cleaning Procedure

All glassware and equipment that comes into contact with the sample should be cleaned in the following way before each use:

2.12.1 Wash with a non-phosphate detergent solution.

2.12.2 Rinse twice with tap water.

2.12.3 Rinse twice with reagent water.

2.12.4 Wash with 10% nitric acid.

2.12.5 Rinse several times with reagent water.

2.12.6 Store bottles filled with 10% nitric acid, until ready to use.

2.12.7 Rinse several times with reagent water before use.

2.12.8 Rinse clean oven dried bottles with methylene chloride. followed by methanol, for organic constituents.

(3) REAGENTS

3.1 Acetic acid, 0.5 N. Dilute 29.4 mL of concentrated acetic acid (ACS grade) to 1000 mL with reagent water.

3.2 Reagent water, Type IV (ASTM Specification D 1193). For organic parameters, the reagent water should be free of any organic substances to be analyzed (ASTM Type 1).

3.3 Nitric acid, 10% (v/v). Add 100 mL of concentrated nitric acid (ACS grade) to 900 mL of reagent water.

3.4 Nitrogen gas, prepurified, scrubbed through a molecular sieve.

(4) SEPARATION PROCEDURE

If the sample contains a distinct liquid and a solid phase, separate it into its component phases using the following procedure:

4.1 Determine the dry weight of the solids in the sample at 60 °C, using a well homogenised sample. Use this weight to determine the amount of material to be filtered in Step 4.8.

4.2 Assemble the filtration unit with a filter bed consisting of a 0.45 µm pore size membrane filter and a coarse glass fibre pre-filter upstream of the membrane filter (per manufacturer's instructions).

4.3 Select one or more blank filters from each batch of filters. Filter 50 mL portions of reagent water through each test filter and analyze the filtrate for the analytical parameters of interest. Note the volume required to reduce the blank values to acceptable levels.

4.4 Wash each filter used in the leach procedure with at least this pre-determined volume of water. Filter under pressure until no water flows through the filtrate outlet.

4.5 Remove the moist filter bed from the filtration unit and determine its weight to the nearest ± 0.01 g.

4.6 Re-assemble the filtration unit, replacing the filter bed, as before.

4.7 Comminute the sample, with a mortar and pestle, to a size that will pass through the opening of the filtration unit (less than 9.5 mm).

4.8 Agitate the sample by hand and pour a representative aliquot of the solid and liquid phases into the opening of the filtration unit. Filter a sufficient amount of the sample to provide at least 60 g of dry solid material.

4.9 Pressurize the reservoir very slowly with nitrogen gas by means of the regulating valve on the nitrogen gas cylinder, until liquid begins to flow freely from the filtrate outlet.

Note: ***Any unfiltrable material remaining in the filtration apparatus is to be considered a solid.***

4.10 Increase the pressure step-wise in increments of 0.5 kg/sq. cm to a maximum of 5 kg/sq. cm, as the flow diminishes. Continue filtration until the liquid flow ceases or the pressurizing gas begins to exit from the filtrate outlet of the filter unit.

4.11 De-pressurize the filtration unit slowly using the release valve on the filtration unit. Remove and weigh the solid material together with the filter bed to ± 0.01 g. Record the weight of the solid material.

4.12 Measure and record the volume and pH of the liquid phase. Store the liquid at 4 °C under nitrogen until required in Step 5.13.

4.13 Discard the solid portion, if the weight is less than 0.5% (w/v) of the aliquot taken. If not, proceed to Step 5.1.

Note: ***For mixtures containing coarse grained solids, where separation can be performed without imposing a 5 kg/sq. cm differential pressure, a vacuum filtration unit with a filter bed as per Step 4.2 may be used. Vacuum filtration must not be used, if volatile organic compounds are to be analysed.***

(5) EXTRACTION PROCEDURE

5.1 Prepare a solid sample for extraction by crushing, cutting or grinding, to pass through a 9.5 mm mesh sieve. If the original sample contains both liquid and solid phases, use the solid material from Step 4.13. The structural integrity procedure, Step 6 should be used for monolithic wastes which are expected to maintain their structural integrity in a landfill, (e.g. some slags and treated solidified wastes).

Note: ***Do not allow the solid waste material to dry prior to the extraction step.***

5.2 Determine the moisture content of the de-watered sample, by drying a suitable aliquot to constant weight at 60 °C in an oven. Discard the dried solid material.

5.3 Place the equivalent of 50 g dry weight of the de-watered undried material into a 1250 mL wide mouth cylindrical bottle. Use additional bottles, if a larger volume of leachate is required for the analysis.

5.4 Add 800 mL (less the moisture content of the sample in mL) of reagent water to the bottle.

5.5 Cap the bottle and agitate it in the rotary extractor for 15 minutes before pH measurement.

5.6 Measure and record the pH of the solution in the bottle using a pH meter, calibrated with buffers at pH 7.00 and pH 4.00. The solution should be stirred during the pH measurement.

5.7 Proceed to Step 5.10.1, if the pH is less than 5.2.

5.8 Add a sufficient volume of 0.5N acetic acid if the pH is greater than 5.2 to bring the pH to 5.0 ± 0.2.

Note: ***Maximum Amount of Acid:*** ***No more than 4 mL of 0.5N acetic acid per gram of dry weight of sample may be added during the entire procedure. If the pH is not lowered to 5.0 ± 0.2 with this amount, proceed with the extraction.***

5.9 Cap the bottle and place it in the tumbling apparatus. Rotate the bottle and its contents at 10 rpm for 24 hours at room temperature (20 °C to 25 °C).

5.10 Monitor, and manually adjust the pH during the course of the extraction, if it is greater than 5.0 ± 0.2. The following procedure should be carefully followed:

5.10.1 Measure the pH of the solution after 1 hour, 3 hours and 6 hours from the starting time. If the pH is above 5.2, reduce it to pH 5.0 ± 0.2 by addition of 0.5N acetic acid. If the pH is below 5.0 ± 0.2, do not make any adjustments.

5.10.2 Adjust the volume of the solution to 1000 mL with reagent water, if the pH is below 5.0 ± 0.2 after 6 hours.

5.10.3 Measure and reduce the pH to 5.0 ± 0.2, if required, after 22 hours and continue the extraction for an additional 2 hours.

5.11 Add enough reagent water at the end of the extraction period so that the total volume of liquid is 1000 mL. Record the amount of acid added and the final pH of the solution.

5.12 Separate the material into its component liquid and solid phases as described under the Separation Procedure Step 4. Discard the solid portion.

Note: ***It may be advisable to centrifuge the suspension at high speed before filtration, for leachates containing very fine grained particles.***

5.13 Calculate the amount of free liquid from Step 4.12 corresponding to 50 g of the dry solid material. Add this amount to the leachate from Step 5.12.

Note: ***If the analysis is not performed immediately, store separate aliquots of the leachate at 4 °C, after adding appropriate preservatives for the analytical parameters of interest (See "A Guide to the Collection and Submission of Samples for Laboratory Analysis", Ontario Ministry of the Environment, July 1979).***

5.14 Analyze the combined solutions from Step 5.13 for contaminants listed in Schedule 4, that are likely to be present.

5.15 Report concentrations of contaminants in the combined leachate and the free liquid solution as mg/L.

5.16 Carry a blank sample through the entire procedure, using dilute acetic acid at pH 5.0 ± 0.2.

6.0 STRUCTURAL INTEGRITY PROCEDURE

This procedure may be required prior to extraction for some samples as indicated in Step 5.1. It may be omitted for wastes with known high structural integrity.

Procedure

6.1 Fill the sample holder with the material to be tested. If the sample of the waste is a large monolithic block, cut a portion from the block measuring 3.3 cm in diameter by 7.1 cm in length. For a treated waste (e.g. solidified waste), samples may be cast in a form with the above dimensions for the purposes of conducting this test. In such cases, the waste should be allowed to cure for 30 days prior to testing.

6.2 Place the sample holder in the structural integrity tester, then raise the hammer to its maximum height and allow it to fall. Repeat this procedure 14 times.

6.3 Remove the material from the sample holder, and proceed to Step 5.2. If the sample has not disintegrated, it may be sectioned; alternatively use the entire sample (after weighing) and a sufficiently large bottle as the extraction vessel. The volume of reagent water to be initially added is 16 mL/g of dry sample weight. The maximum amount of 0.5N acetic acid to be added is 4 mL/g of dry sample weight. The final volume of the leachate should be 20 mL/g of dry sample weight.

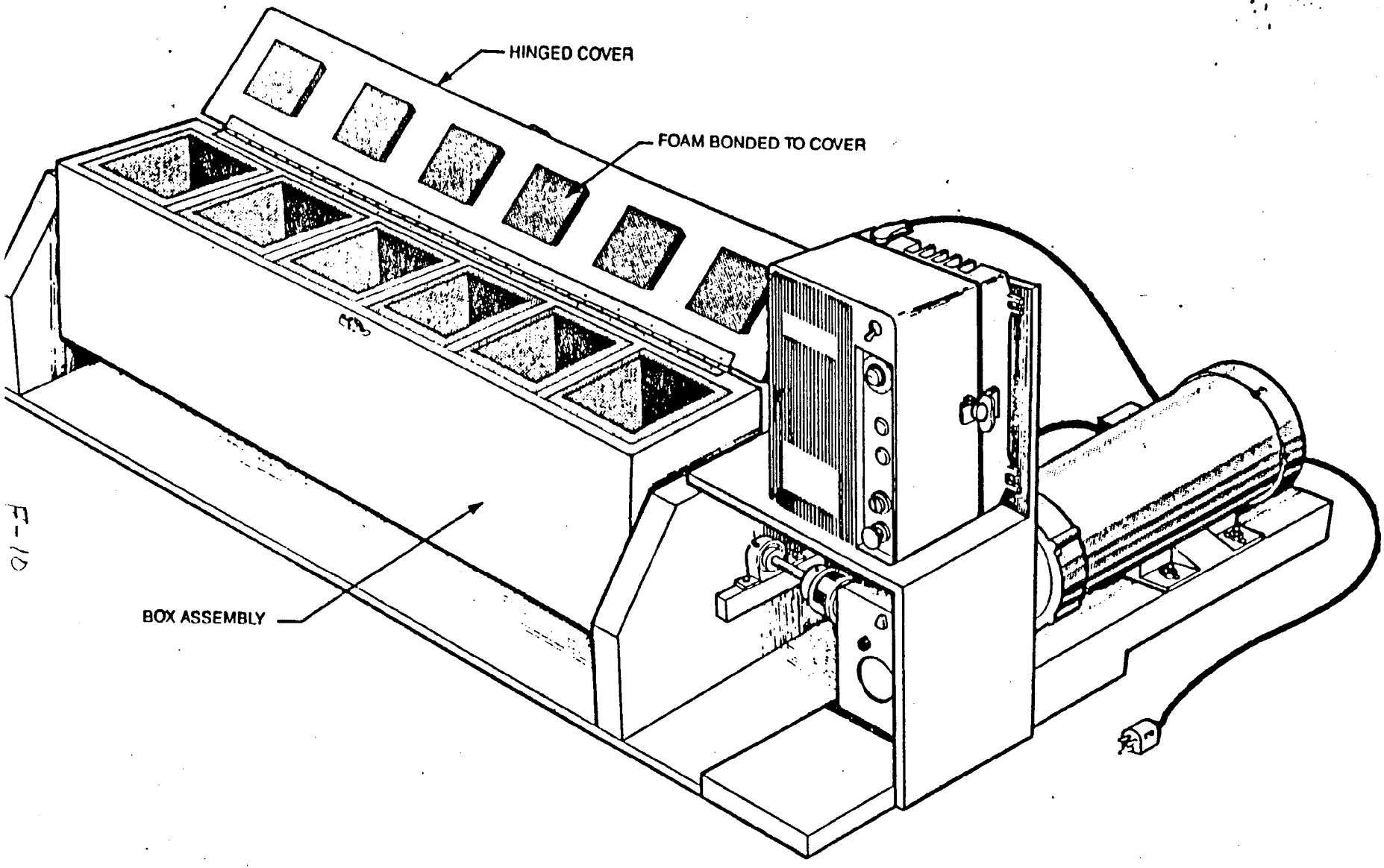

FIGURE 1
SOLID WASTE ROTARY EXTRACTOR

Leachate Quality Criteria

Hazardous Waste Number	Contaminant	Concentration (milligrams per litre)
ON4001	2,4,5-TP / Silvex / 2-(2,4,5-Trichlorophenoxy) propionic acid	0.01
ON4002	2,4-D	0.1
ON4003	Aldrin + Dieldrin	0.0007
ON4004	Arsenic	0.05
ON4005	Barium	1.0
ON4006	Boron	5.0
ON4007	Cadmium	0.005
ON4008	Carbaryl / 1-Naphthyl-N-methyl carbamate / Sevin	0.07
ON4009	Chlordane	0.007
ON4010	Chromium	0.05
ON4011	Cyanide (free)	0.2
ON4012	DDT	0.03
ON4013	Diazinon / Phosphordithioic acid, 0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) ester	0.0002
ON4014	Endrin	0.0002
ON4015	Fluoride	2.4
ON4016	Heptachlor + Heptachlor epoxide	0.003
ON4017	Lead	0.05
ON4018	Lindane	0.004
ON4019	Mercury	0.001
ON4020	Methoxychlor / 1,1,1-Trichloro-2, 2-bis(p-methoxyphenyl)ethane	0.1

ON4021	Methyl Parathion	0.007
ON4022	Nitrate + Nitrite	10.0
ON4023	Nitrilotriacetic acid	0.05
ON4024	Nitrite	1.0
ON4025	PCB's	0.003
ON4026	Parathion	0.035
ON4027	Selenium	0.01
ON4028	Silver	0.05
ON4029	Toxaphene	0.005
ON4030	Trihalomethanes	0.35
ON4031	Uranium	0.02

APPENDIX G - LIST OF BIOACCUMULATIVE SUBSTANCES

PCBs

HCB

Pentachlorobenzene

Pentachlorophenol

Octachlorostyrene

Hexachloroethane

Hexachlorocyclohexane

Benzo(g,h,i)perylene

Dioxins and furans

2, Chloronaphthalene

bis(2-ethylhexyl)phthalate

Fluorene

Dibenzo(a,h)Anathracene

1,2,3,4 tetrachlorobenzene

1,2,3,5 tetrachlorobenzene

1,2,4,5 tetrachlorobenzene

Benzo-a-pyrene

DDT and metabolites

Aldrin/Dieldrin

Chlordane

Mirex