HAZARDOUS WASTE MANAGEMENT: A REGIONAL PERSPECTIVE OF OTTAWA-CARLETON

by

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ABSTRACT

Public sector management responses directed at controlling the generation and disposal of hazardous wastes in Ontario are identified. These management responses are in the form of laws, policies and programs implemented by the Federal Department of Environment, Provincial Ministry of Environment (Ontario) and local municipalities. The role of technology in these responses is identified. An environmental management framework is utilized to evaluate whether established public sector responses are achieving the proper management of hazardous wastes. The specific case of the Regional Municipality of Ottawa-Carleton is used to exemplify this. Evaluation is carried out through interviews and surveys with government, generators and environmental groups within the region. It is established that the existing management responses are not accomplishing stated goals. Specific recommendations are made for new management responses to be implemented by the regional level of the public sector hierarchy.

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I wish also to acknowledge my thesis advisor Professor Duncan Anderson for his guidance in composing this thesis and for the time spent in instructive discussion. I owe a great deal to Dr. Michael Smith as well for the countless hours he has spent over the last two years assisting me to gain an understanding of environmental issues, and for listening, with interest, to hazardous waste facts and figures.

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CHAPTER 1

INTRODUCTION

1.1 The Problem

It is estimated that there are more than 7 million chemicals known to man. Of this total, some 50,000 are produced commercially and find their way into the environment usually as manufacturing wastes (MacKay 1986). This translates into the generation of some 3.2 million tonnes of hazardous wastes annually in Canada (Gore and Storrie Ltd. 1982). "Most man-made chemicals cannot remain neutral in a living process. They are either a nutrient or a drug (poison). In the absence of precise evidence, it must be assumed that all man-made chemicals are poisons with power to modify, often irreversibly, the growth and life of all organisms" (Chant and Hall 1979:3).

The release of hazardous wastes into the environment is now a major societal concern. In the view of many scientists, industrial waste materials pose a variety of hazards and their uncontrolled disposal poses a threat to both human health and the environment (Chant 1979, Hall 1979, 1983, Morell 1984, MacKay 1986). Clearly, means must be developed to manage and control the treatment and disposal of hazardous wastes since many, such as PCB's and Dioxins, are becoming widely dispersed into the environment.

In Canada, Ontario produces significantly more hazardous waste

than any other province (Jackson and Weller 1982). In 1982, four separate studies of waste quantities placed Ontario's total hazardous waste production at 1.5 million tonnes annually (Proctor and Redfern Ltd. 1982). It is estimated that 25% of this total entered the sewer systems, 15% was mixed with municipal garbage, and 5% disappeared in ways not accounted for. Only 55% of the total received any form of treatment and only 10% of that was reclaimed or recycled (Environmental Non-Governmental Organizations Source Book 1982; Proctor and Redfern Ltd. 1982). No further waste quantities studies have been reported in Ontario since 1982.

1.2 The Management Process

The "proper management" of non-recyclable hazardous wastes involves two basic steps:

1) Appropriate containment of the waste as it is generated, in order to prevent its uncontrolled release into the environment.

2) Appropriate treatment and/or secure disposal of the waste, such that threats to human health and the environment are minimized for an indefinite period of time (Reid, Crowther and Partners Ltd. 1984:12).

Attempts to achieve the proper management of hazardous wastes have, thus far, involved the public sector. The Federal, Provincial and in certain cases the Municipal levels of government in Canada have implemented laws, policies and programs attempting hazardous waste management. This has not occurred without controversy. The generators of hazardous wastes have, in many cases, felt left out of the waste management planning process thus far (Sinclair 1984, 1985).

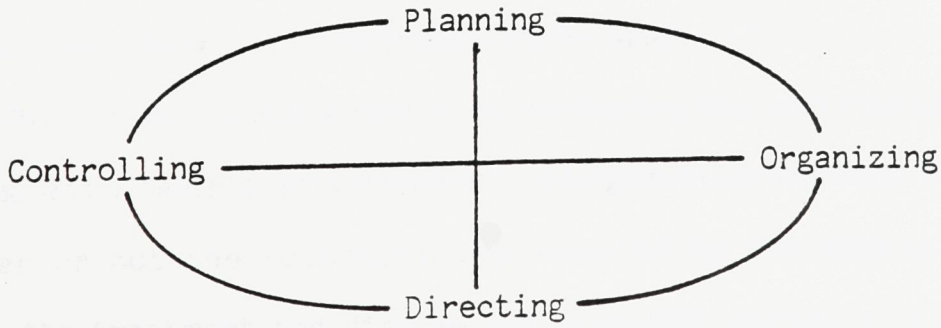
This has resulted in the implementation of management responses that are not seen to fulfill the needs of the generators. Hence, any attempts at new hazardous waste management programs should aim to involve all of the main players including generators, government agencies and environmental groups.

When evaluating public sector responses to environmental issues, such as those that have been implemented in the realm of hazardous waste management, it is useful to consider an overall framework for environmental management. Management in this context implies giving "direction and control to human affairs" (Lang and Armour 1980).

Lang and Armour (1980), state that the framework for environmental management is cyclical and consists of four main functions; Planning, Organizing, Directing and Controlling. Each of these functions is interrelated with the other (Figure 1.1); planning involves the formulation of objectives and goals; organizing requires the coordination of activities to achieve stated goals; directing

Figure 1.1

The Environmental Management Framework



provides the guidance and leadership necessary for the continued functioning of the activities implemented; and controlling allows for the evaluation of accomplishments against stated goals.

1.3 Purpose And Objectives

The Regional Municipality of Ottawa-Carleton (RMOC) is typically viewed as a relatively hazardous waste-free area. However, within the region there are a number of generators that produce a variety of hazardous wastes. Most of these wastes are produced by the high tech, printing and metal fabricating industries, as well as by research laboratories in the region (Sinclair 1985).

The proper management of hazardous wastes in the RMOC is hampered by the lack of a readily available treatment facility in the region. At present, wastes must be shipped to Toronto or Montreal for ultimate disposal, which adds the complex variable of transportation to the waste management system. The lack of a proper management system for hazardous wastes in the RMOC is recognized to have caused a number of serious problems in the region, such as generator dependence on sanitary and storm sewer disposal and even direct disposal into regional waterways and landfills (Gietz Interview 1985; Ottawa Citizen, March 17, 1986:A-2; March 19, 1986:A-1). For these reasons, as well as accessibility to the researcher, the RMOC was chosen as a suitable study area.

This study is concerned with employing the controlling function of Lang and Armour's environmental management framework to evaluate whether or not the responses implemented by the public sector to manage the treatment and disposal of hazardous wastes within the RMOC

are achieving the initial goal established. For the purpose of this study it will be assumed that the goal is to achieve the "proper management" of hazardous wastes as defined on page two. Public sector responses, in relation to the generation of hazardous wastes, include any law, policy, or program aimed at achieving the proper management of hazardous wastes.

The central objectives of this study are:

1) to review the hazardous waste management framework in place in Ontario, including policies and technologies,

2) to evaluate the current hazardous waste management system functioning in the RMOC,

3) to identify any problems in the system hindering the proper management of hazardous wastes,

4) to develop appropriate management response options to any existing problems, and

5) to incorporate the views of the main players throughout this process.

1.4 Methodology

In order to evaluate established public sector responses managing the transportation, treatment and disposal of hazardous wastes in the RMOC, and to develop new management response options if necessary, there are a number of players whose views must be obtained. As stated, these players include: government agencies at the Federal, Provincial and Municipal levels, who set the laws, policies and programs managing hazardous wastes; environmental groups

such as Pollution Probe, Friends of the Earth, Ontario Public Interest Research Group and others, who act as the public's voice on many environmental issues and; the generators of hazardous waste in the RMOC.

It is very difficult to obtain information on hazardous waste management practices. The handling and disposal of hazardous wastes have characteristically been a rather secretive process frequented by irregularities. With this in mind, it was necessary to utilize a number of research techniques to obtain the views and positions of the main players in the process to fulfill the purpose and objectives of this thesis. The review of existing literature, non-scheduled structured interviews, and a survey were among the techniques used.

Information was obtained from government agencies using two techniques: a review of documents and non-scheduled structured interviews. Various acts, regulations and programs at the federal, provincial and municipal levels concerning hazardous wastes were consulted. Non-scheduled stuctured interviews were carried out in order to establish the specific legislative and jurisdictional positions of the various government agencies. Interviews were utilized further to evaluate the new management response options that might be implemented by the RMOC.

The views of environmental groups were also considered through both their literature and non-scheduled structured interviews. A review of literature offered insights into the current legislation and how it operates. The literature also painted a clear picture of the hazardous waste management situation in Ontario. Interviews were

carried out to obtain opinions on the hazardous waste situation in the RMOC, and to develop possible alternative management response options to any identified problems.

Due to the controversial nature of hazardous waste management, careful steps had to be taken to ensure the participation of the generators of hazardous waste in the RMOC throughout the evaluation process. Non-scheduled structured interviews and a survey were used to accomplish this.

Since it would not be possible to interview every potential generator of hazardous waste in the RMOC, due to numbers, a scoping exercise was carried out. Eight hazardous waste generating operations, with at least one representative from each of the generating sectors, were contacted. Their concerns about the hazardous waste situation in Ottawa-Carleton were recorded. Along with this, interviewees were asked to indicate what questions they would be interested in seeing included in a survey to other generators of hazardous waste in the region. These steps were taken in part to facilitate the inclusion of the "appropriate" questions on the survey.

The result of this exercise was the development of a "Survey of Views on Hazardous Waste Management in the Ottawa-Carleton Region", referred to as "the survey" (see Appendix A). The purpose of the survey was to determine who was generating hazardous wastes in the Ottawa-Carleton region and where those wastes were going. Beyond this, the survey attempted to identify the concerns of the generators

and their views on how proper management might be achieved through regional action.

The survey was sent to 200 firms throughout the region. The 200 firms were chosen with the assistance of the Canadian National Inventory of Hazardous Wastes, Scotts Manufacturing Directory, Commercial and Industrial Development Corporation of Ottawa-Carleton Business Directory and Ministry of the Environment Waybill data. The Canadian National Inventory of Hazardous Wastes identifies manufacturing sectors that typically generate hazardous wastes. High tech manufacturing is an example of one such sector. With this information the name of every high tech manufacturing firm operating in the RMOC was obtained, utilizing the Ottawa-Carleton Business Directory, Scotts Manufacturing Directory and Waybill data for the region. Each high tech manufacturing firm was then sent a survey regardless of the size of the business. Similarly, this procedure was carried out for other typical producers of hazardous wastes.

By utilizing literature review, non-scheduled structured interviews and survey research techniques, information, views, opinions and suggestions of the main players identified were collected. The synthesis of this information fulfilled the purpose and five objectives outlined for the paper.

1.5 Policy Research

Many academic disciplines, Law, Political Science, Biology and others have participated in policy research in the realm of environmental management. Clearly, the geographer also has a role to play in this field. Geographers such as Smith, Hare, Williams, Roots

and others, have been called upon to assist in establishing and/or evaluating policies and programs attempting environmental management. A major challenge being faced today is to ensure the proper management of hazardous wastes. This challenge is shared by government, industry and the public.

Dr. F. Roots (Interview 1986) and K. Fraser (Interview 1986) feel that the geographer has a clear role to play in meeting this challenge. According to Roots, much of the environmental degradation that has occurred due to the mismanagement of hazardous wastes may have been avoided if the geographer had played a more active role. There is an inescapable connection between the natural environment and human industrial action. Clearly, the geographer is in a position to comment on the interrelationship between these. On a simplistic level, the geographer can tell us the dispersional effects of hazardous wastes that are discharged directly onto the soil, or into river and lake ecosystems.

The role of the geographer in decision making related to public sector laws, policies and programs is gaining recognition. Hare (1973) has been a firm advocate of the participation of geographers in public policy decision making. Hare put forward that the "fundamental objectives of geography remain the same and that those are closer to policy making than those of most other disciplines. Some of the best policy makers are geographers" (Hare 1973:5).

A more recent article by Smit and Johnston (1983:72) notes that a "well established geographic interest in public policy has expanded

as governments and public agencies are increasingly being called upon to justify their policy decisions". Smit and Johnston see the role of the geographer greatly expanded in the area of evaluation of performance of a public policy. They feel this is particularly true in the field of policy related to resource management and the environment.

Personal interviews with a number of geographers, D. Anderson (1986), M. Smith (1986), P. Nicholson (1986), K. Fraser (1986), F. Roots (1986) and K. Hare (1986) confirm that the geographer has a role in public policy decision making concerning the environment and that this role is entirely appropriate. It is against this backdrop that this geographer sets out to identify and evaluate public sector responses attempting the proper management of hazardous wastes.

1.6 Hazardous Wastes Defined

The term hazardous wastes is not an easy one to define. There have been a number of attempts by policy makers to establish a comprehensive definition, but to this point all have ended in conflict. For the purpose of this study, hazardous wastes will be defined as "waste that requires special precaution in its storage, collection, transportation, treatment or disposal to prevent damage to persons or property and includes explosives, flammables, volatiles, toxic, radioactive and pathological wastes" (Ministry of the Environment O.R. 309:399). This definition has been chosen since many of the ensuing management responses in Ontario have been made with it in mind.

This definition indicates that wastes are usually defined as

hazardous if they have one of the following characteristics: ignitability at a relatively low temperature; corrosivity, highly acidic or alkaline; reactivity, explodes or generates gases or fumes; toxicity, produces acute or chronic health effects on people or animals or affects the growth of plants; radioactivity; infectiousness; carcinogenicity, causes cancer; mutagenicity, damages the genes thus affecting future generations of humans, animals or plants; or teratogenicity, causes birth defects (Jackson & Weller 1982:21).

There are two types of hazardous waste. Organic, being, containing or relating to carbon compounds whether derived from living organisms or not; and inorganic, derived from chemical substances of mineral origin not containing carbon bonding. Both forms of hazardous waste can be found in any of the three natural states of solid, liquid or gas.

Other terms that may require definition can be found in Appendix B.

CHAPTER 2

THE CHALLENGE OF HAZARDOUS WASTE MANAGEMENT

2.1 Human Health and Environmental Risks

Hazardous industrial wastes pose a number of serious environmental and human health risks if they are not managed and treated in an appropriate fashion. The effects of exposure to industrial wastes can be either acute and/or chronic, acute being an immediate effect of a poisoning episode, chronic being the long term effect of a poisoning episode. Figure 2.1 illustrates six possible points where man may be exposed to hazardous industrial wastes.

The effects of such exposure on humans can manifest itself in many ways. In a chronic fashion hazardous wastes can affect the messenger cells in our body that signal various other cells, such as sex cells, to function.

> Thousands of identified environmental pollutants are known to enter the body and they interfere with its signalling system by: A) mimicking a chemical messenger; switching on or off cell activity at the wrong time or, B) preventing specific messengers from acting (Hall 1983:2).

Eventually, as a direct result of this contamination, there may be breakdown which manifests itself as cancer, heart disease, birth defects, arthritis, diabetes or behavioral abnormalities (Hall 1983).

Exposure Points

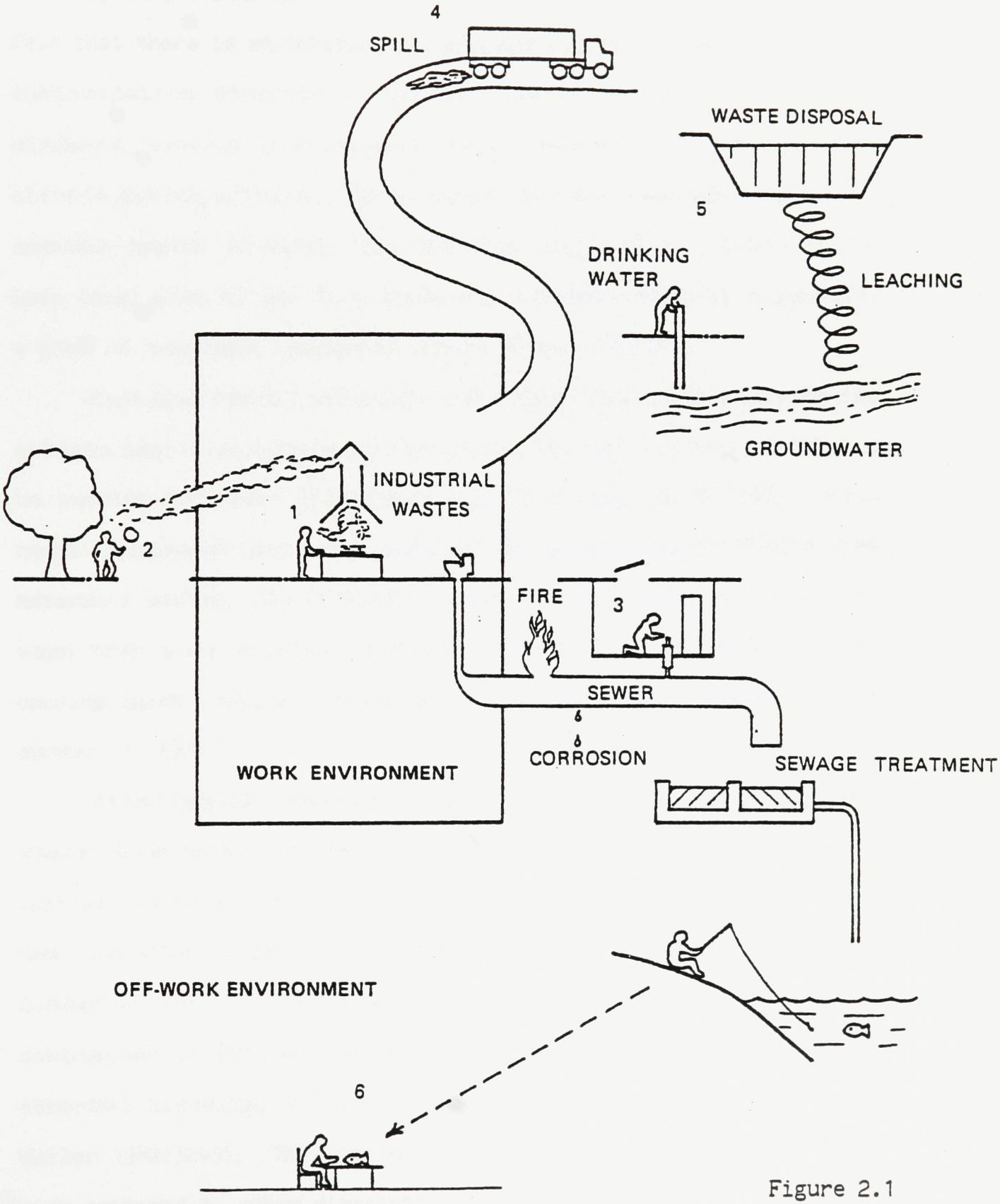


Figure 2.1

(Adapted from Khandelluai 1983)

It has always been very difficult to attribute chronic health effects directly to one source. This is true of hazardous wastes, due to the fact that there is no substantial evidence linking hazardous waste contamination directly to chronic health disorders. This has hindered reaction to hazardous waste contamination that may have chronic health effects. For example, it took a number of years to convince health officials that the high incidence of cancers in the Love Canal area of New York State was a direct result of exposure to a brew of hazardous industrial wastes (Brown 1981:29).

Canadian health officials were also slow in attributing the chronic health disorders in the Grassy Narrows Indians of Ontario to mercury effluent from paper manufacturing (Good 1986). With recent heightened public awareness of the chronic health effects from hazardous wastes, the Enjolfson family received immediate attention when they were exposed to PCB's, considered a potential cancer causing agent, during a spill along the Trans Canada Highway in the summer of 1985.

Other health problems resulting from contact with hazardous wastes may become evident in an acute fashion from the time of initial exposure. The Upper Ottawa Street landfill site, located in Hamilton Ontario, received large quantities of hazardous wastes for a number of years. The people living in the vicinity of the site complained of frequent sore throats, frequent colds, ear aches, abnormal bleeding, kidney problems and skin rashes (Jackson and Weller 1982:32-3). The frequency of the abnormalities was extremely high compared to other districts in Hamilton.

Hazardous industrial wastes can be as devastating to the natural environment as they are to humans. Scientists often refer to abnormalities in the natural environment as early warnings to man that something is wrong. Many Canadian lakes and rivers have been seriously contaminated through pollution by industrial wastes.

For example, Lake Ontario has so many chemicals in it that scientists find it hard to keep track of the possible impacts that they might have if and when they come in contact and react with each other. Recently the Royal Society of Canada and the U.S. National Research Council released a report that identified Great Lakes toxicity as being the continent's worst. Thirty-seven million people living around the Great Lakes ingest a wide variety of toxic chemicals including dioxins, PCB's and pesticides (Globe and Mail, Dec. 12, 1985:A1). Hare (1984) notes further that industrial point sources of pollution are numerous on the Great Lakes.

The Niagara river for example, provides 83% of the tributary flow to Lake Ontario. It provides municipal and industrial water supplies, drinking water, power generation, commerce, and recreation opportunities for more than one million people, in the United States and Canada. Millions more depend on Lake Ontario and the St. Lawrence River for these same purposes. But the leaching of chemicals from hazardous waste dumps has virtually destroyed the Niagara River for aquatic life. There were two-hundred and sixty-one different chemicals identified in a inventory by the Niagara River Toxics Committee in October of 1984. Fifty-seven of these were identified as needing immediate regulatory action, seventy-six

others were of concern, and two-hundred and fifty-one of the total were felt to have the potential to adversely affect the Niagara River ecosystem (Niagara River Toxics Committee 1984). The Committee estimates that 2,650 lbs. of these chemicals enter the river on a daily basis.

The summer of 1985 saw the St. Clair river system jeopardized by hazardous industrial wastes. Divers used a vacuum to suck up a deadly concentration of dioxins and seventeen other chemicals. Nicknamed "the blob", the chemicals threaten the aquatic life and drinking water of the St. Clair River. The source is still unknown but there are worries that a salt cavern used by Dow Chemical Ltd. to store eight billion litres of liquid industrial wastes, many of them highly toxic, may be leaking (Maclean's Nov. 18, 1985:53; Ottawa Citizen Nov 8., 1985:A1-24; Nov. 10, 1985:A5; Nov. 15, 1985:A5; Nov. 20, 1985:A2-5). Investigation, since "the blob" was discovered, has also shown that at least 12 chemical company sewers and ditches run directly into the river (Globe and Mail, Feb. 15, 1986:A18).

Since the 1970's, scientists at McMaster University have been studying the high incidences of cancer in aquatic life in these water bodies. It was discovered that every species of bottom feeder was affected with tumors, many of them malignant. "Tumors swelled on the gonads of Carp; skin lesions and tumorous growths festered on Suckers, and tumors covered the mouths and heads of Bullheads" (Morell 1984:40). These scientists feel that there is reason to worry when lower level animals, such as fish, snakes, frogs and lizards, get cancer since the incidence of this disease in these

animals is usually very low.

The Quebec government fears that the area of one of its largest reserves of fresh underground water near Mercier P.Q. is being permanently poisoned. The cause of the pollution is an open gravel pit which was used for the disposal of millions of gallons of industrial wastes between 1968 and 1973. The dump is leaching into a water reservoir which is located in Quebec's "VegetableGarden", used to irrigate the rich black soils of the area (Jackson & Weller 1982).

The examples presented of the potential environmental and human health risk, through contact with hazardous industrial wastes, number few in the many that could be drawn upon, in the Canadian context. There are hundreds of examples that could have been given to fulfill this same purpose (Jackson & Weller, Alternatives 1982; Brown 1981; MacLean's April 29, 1985; National Geographic, March 1985; Time, October 14, 1985). It is estimated that Canadian industry produces 3.2 million tonnes of hazardous waste annually, with each tonne posing a threat to the environment and human health.

2.2 Dealing With The Risks

The primary reaction to the hazardous waste problem has been a set of management responses implemented by public sector agencies, aimed at mitigating the contamination. More often than not these management responses are initially induced through public sector planning in the realm of environmental management.

The seriousness of the environmental degradation caused by the numerous releases of hazardous waste prompted the public to pressure governments for environmental management planning that would ensure

the total containment of hazardous wastes. The highly publicized Love Canal disaster of the mid-seventies hit home with many Canadians, especially those living in highly industrialized south-central Ontario. Many felt it was time for public sector action to ensure that such environmental degradation did not occur in Canada.

In 1867, when the Constitution of Canada was enacted, authority over the environment in general, and hazardous wastes specifically was not explicitly allocated to either the federal or provincial levels of government. The provinces, however, have since that time assumed the bulk of the responsibility through the general provisions of the Constitution Act 1867, such as section 92(16) "generally all matters of a merely local or private nature in the province."

With regards to hazardous wastes, the government of Ontario initially felt that the best way to achieve the proper management goal was to allow the generators to establish responses to the problems posed by their wastes. In the early 1970's, when it appeared that industrial waste management could become a serious issue, the Ontario Ministy of Environment stated that "it was the industries' responsibility to clean up its wastes; the polluter pay concept" (Dwivedi 1983:48).

With continued environmental contamination by hazardous wastes, through the late 1970's and into the 1980's, came the realization that a more active government role in hazardous waste management was necessary if total containment was to be achieved (Dwivedi 1983). Political decisions needed to be made in order to initiate and encourage private sector management responses that addressed the

problems created by hazardous waste generation.

It was not until the latter 1970's that the governments of Ontario and Canada began to initiate the political decisions necessary to try to deal with the issues posed by hazardous wastes. In 1976, Ontario passed the first regulation that dealt exclusively with hazardous wastes, controlling their transportation. At this time the federal government also embarked upon a number of non-regulatory programs dealing with hazardous wastes, such as the Canadian Waste Materials Exchange.

Government planning in the realm of hazardous waste management has not occurred without controversy. Ensuring that hazardous wastes are properly managed by every producing industry has proven to be a regulatory nightmare. The laws, policies and programs, aimed at inducing management responses by generators, at all levels of government in Canada, "offer only a patchwork of approaches to the different issues presented by hazardous wastes" (Castrilli 1982:13). Hazardous waste presents a problem that is of national concern yet the regulatory and legal system at all levels is still evolving.

This evolution has been slow, perhaps partly due to the fact that questions often arise when various levels of government attempt environmental management. The problems that stand out are: (Lang and Armour 1980:234)

1) Limitations of knowledge and data needed for effective management,
2) Lack of clear definition of objectives justifying new environmental management measures,
3) Generating in the community, the necessary demand for and support of environmentally oriented action, and
4) Concern, in environmental management, for both

environmental quality and environmental equality.

2.3 The Provincial Response

The government of Ontario has been very active in the management of hazardous wastes, especially since 1980. A number of laws, policies and programs have been initiated by the Ministry of the Environment (M.O.E.) in the province. The main statutes that deal with hazardous wastes at this time are the Environmental Protection Act R.S.O. 1980 (E.P.A.), the Environmental Assessment Act R.S.O. 1981 (E.A.A.), and the Planning Act. S.O. 1983.

2.3.1 The Environmental Protection Act R.S.O. 1980

The purpose of the Act, originally assented in 1971, "is to provide for the protection and conservation of the natural environment" (E.P.A. Sec. 2). Part five of the act, entitled "Waste Management", deals with industrial waste issues. This legislation gives the Minister of Environment the right to control the storage, handling, treatment, collection, processing and disposal of liquid industrial wastes.

The E.P.A. regulates the establishment of waste management systems and provides for the review of any proposed system or disposal site. Section 27 of the act states that "no person shall use, operate, establish, alter, enlarge, or extend, a waste management system unless a certificate of approval has been issued by the Director."

In order to gain a certificate of approval, application must be made to the Director of Approvals, Ministry of the Environment. The ministry staff will then review the application and the director

shall hold public hearings, when the application proposes to establish, alter, enlarge, or extend a site (EPA Sec. 32(1)). The public hearings will take place before an Environmental Assessment Board. After the hearings, the board will make recommendations as to whether the proposal should be accepted. The Director of the Appeals branch will then decide whether or not to issue a certificate of approval.

Specific regulations have also been established under the act in an attempt to improve the management of hazardous wastes:

1) Ontario Regulation 313, entitled "Transfers of Liquid Industrial Waste" was proclaimed in 1976. The purpose of the regulation is to control the transportation of hazardous wastes throughout the province. The regulation, often referred to as the "waybill system", outlines the responsibilities of the generators, carriers and receivers of liquid industrial wastes and as such currently represents (until Sept 1986) the Ontario government's only control mechanism over industrial wastes.

After July 1, 1985 the Federal Transportation of Dangerous Goods Act required that all inter-provincial shipments of liquid industrial or hazardous waste be accompanied by a six-part federal manifest. As Ontario's five-part "waybill system" was not equivalent to this, it was revised in September of 1985 and replaced by Regulation 322, the "Manifest System".

Ontario's new "manifest" regulation (O. Reg. 322:85) formally stipulates that the generators of liquid industrial wastes must not let those wastes off their property without proper documentation.

The certified carrier of the waste is required to provide the generator with a manifest which must be filled out before the wastes leave the generator's site. The manifest makes the generator and receiver of the waste responsible for indicating what kind of waste is being carried, how much, who generated it, the time the transfer took place, and where the waste is to be disposed of (see figure 2.2). The regulation also stipulates that the generator can only employ a carrier who has been certified by the Ministry of the Environment, and the carrier can only dispose of the wastes at sites certified by the Ministry to receive liquid industrial wastes.

The manifest is made up of six separate pages. Two of the six pages go to the ministry. One is sent to them by the generator and the other by the receiver of the wastes within three days of the transfer. The generator, carrier and receiver of the waste all get a copy of the manifest which must be kept for two years. The new sixth copy must be sent by the receiver of the waste to the generator within three working days. If either the ministry or the generator does not receive their copy of the manifest from the receiver, an investigation must be launched by the M.O.E. and generator.

The "waybill system" contained an exemption for recyclable wastes which was modified by the new manifest regulation. Only those transactions which involve the shipment of recyclable materials to a receiver whose primary business is not the handling of the wastes, will be exempt from the manifest submission.

The penalty for noncompliance with the regulation is an offence rendering the individual subject to a fine of 2,000.00 dollars per

Ministry of the Environment / *Ministère de l'Environnement*

Ontario

MANIFEST / *MANIFESTE*

"Regulation 309, R.R.O. 1980, Form 1." / *"Règlement 309, R.R.O. de 1980, formule 1."*

CONFORMS TO TRANSPORTATION OF DANGEROUS GOODS REGULATIONS UNDER TDG ACT CHAPTER 36 SC 1980

CONFORME AU REGLEMENT SUR LE TRANSPORT DES MARCHANDISES DANGEREUSES EN APPLICATION DE LA LOI SUR TMD CHAPITRE 36 SC 1980

(Instructions on Reverse) / *(Instructions au verso)*

A Generator (Consigner) / *Producteur (Expéditeur)*

Generator Registration No. / *Nº d'inscription du producteur* (Provincial No.) / *(Nº provincial)*

Company Name / *Nom de la compagnie*

Head Office Address / *Adresse du siège social* — City / *Ville* — Prov. — Postal Code / *Code postal*

Shipping Site Address / *Adresse du lieu d'expédition*

City / *Ville* — Prov. — Postal Code / *Code postal*

Intended Receiver (Consignee) / *Réceptionnaire (Destinataire) prévu* — Receiver No. / *Nº du réceptionnaire* (Provincial No.) / *(Nº provincial)*

Receiving Site Address / *Adresse du lieu de réception*

City / *Ville* — Prov. — Postal Code / *Code postal*

B Carrier / *Transporteur*

Certificate of Approval No. / *Nº de certificat d'approbation* (Provincial No.) / *(Nº provincial)*

Company Name / *Nom de la compagnie*

Address / *Adresse*

City / *Ville* — Prov. — Postal Code / *Code postal*

Registration / *Enregistrement*	License Plate No. / *Nº de plaque d'immatriculation*	Prov. / *Prov.*
Vehicle / *Véhicule*		
Trailer # 1 / *1re remorque*		
Trailer # 2 / *2e remorque*		

Point of entry / *Point d'entrée* — Point of exit / *Point de sortie*

Carrier Certification: I declare that the information contained in Section B is correct and complete
Déclaration du transporteur: J'atteste que les renseignements inscrits à la partie B sont exacts et complets

Name of Driver (print) / *Nom du conducteur (lettres moulées)* — Tel. No. (Area Code) / *Nº de tél. (ind. rég.)* ( )

Signature — Day / *Jour* Mon / *Mois* Yr / *An*

Physical State (Solid, Liquid, Gas) / *État physique (Solide, liquide, gaz)*	Shipping Name of Waste / *Appellation réglementaire des déchets transportés*	Waste Identification No. / *Nº d'identification des déchets* — Provincial	TDGA / LTMD	Quantity Shipped / *Quantité expédiée*	Units L / kg / *Unités*	Classification	Packing Group / *Groupe d'emballage*	Concentration	Packaging Containers	

Special Handling / Emergency Instructions
Instructions spéciales de manutention ou en cas d'urgence

Attached / *Annexées* ☐ Below / *Ci-dessous* ☐

Date Shipped / *Date d'expédition* Day / *Jour* Mon / *Mois* Yr / *An*

Time / *Heure* ☐ AM ☐ PM

Scheduled Arrival Date / *Date d'arrivée prévue* Day / *Jour* Mon / *Mois* Yr / *An*

Generator (Consigner) Certification: I declare that the information contained in Section A is correct and complete
Déclaration du producteur (expéditeur): J'atteste que les renseignements inscrits à la partie A sont exacts et complets

Name of Authorized Person (print) / *Nom de la personne autorisée (lettres moulées)* — Signature — Tel. No. (Area Code) / *Nº de tél. (ind. rég.)* ( )

1270 (5 85)

Circulation No. (Quebec only) / *Nº de circulation (réservé au Québec)*

Other Manifest Number(s) / *Autre(s) numéro(s) de manifeste(s)*

C Receiver (Consignee) / *Réceptionnaire (Destinataire)*

Receiver No. / *Nº du réceptionnaire* (Provincial No.) / *(Nº provincial)*

Company Name / *Nom de la compagnie*

Address / *Adresse*

City / *Ville* — Prov. — Postal Code / *Code postal*

Receiving Site Address / *Adresse du lieu de réception*

City / *Ville* — Prov. — Postal Code / *Code postal*

Date Received / *Date de réception* Day / *Jour* Mon / *Mois* Yr / *An* — Time / *Heure* ☐ AM ☐ PM

Quantity Received / *Quantité reçue*	Units L / kg / *Unités*	Identify Any Shipments Discrepancy Problems. Attach addendum if necessary / *Indiquer toute différence relative à l'expédition. Annexer une feuille au besoin*	Handling Code / *Code de manutention*	Decontamination / *Décontamination* — Packaging / *Contenants* Yes / *Oui*	Packaging / *Contenants* No / *Non*	Vehicle / *Véhicule* Yes / *Oui*	Vehicle / *Véhicule* No / *Non*

If handling code "other" specify
Si le code de manutention est "autre", préciser

If waste to be transferred specify intended company name
Si les déchets doivent être transférés, préciser le nom du destinataire

Receiver No. (Provincial No.)
Nº du réceptionnaire (Nº provincial)

Address / *Adresse* — City / *Ville* — Prov.

Receiver (Consignee) Certification: I declare that the information contained in Section C is correct and complete
Déclaration du réceptionnaire (destinataire): J'atteste que les renseignements inscrits à la partie C sont exacts et complets

Name of Authorized Person (print) / *Nom de la personne autorisée (lettres moulées)*

Signature — Tel. No. (Area Code) / *Nº de tél. (ind. rég.)* ( )

Figure 2.2

day unless otherwise excluded from the act. There have been a number of charges but very few convictions under the "waybill regulation", due to some of its inadequacies such as its generality (see Olchowski, 1981, Sinclair 1984). It is hard to say if the new manifest regulations 322 will improve this situation since it will not be fully enforceable until September 1986.

2) Ontario Regulation 309, entitled "General Waste Management" was established in 1978. The purpose of the regulation is to develop standards for landfill sites, incineration sites and waste collection vehicles. The original regulation was amended as of June 17, 1985 to more adequately cope with the problems of industrial waste management. Standards for the location, maintenance and operation of landfill and incineration sites are included in sections 9-12 of the regulation, along with standards for the operation of the waste management systems in section 13.

Recognizing the inability of the waybill system to adequately identify all of the generators of hazardous waste, section 15 of the amended Regulation 309 requires generators of hazardous waste to register with the M.O.E. (see Figure 2.3). The generator registration report requires generators to identify the type and amount of hazardous waste that they are currently producing, who the principal intended receivers of the wastes are, along with the identification of the principal intended carrier (see page 2 of Figure 2.3).

It is hoped that the amended regulation will clear up a very cloudy picture as to who is generating hazardous wastes and where the

Generator Registration Report

Ontario

Ministry of the Environment | Ministère de l'Environnement

Generator Registration Report

"Regulation 309, R.R.O. 1980, Form 2"

Rapport d'inscription du producteur

"Règlement 309, R.R.O. de 1980, formule 2"

NOTE: Regulation 309 requires generators of hazardous or liquid industrial wastes to submit a Generator Registration Report using this form respecting each waste generation facility and each hazardous or liquid industrial waste.

REMARQUE: *Le règlement 309 exige que les producteurs de déchets industriels liquides ou dangereux présentent un Rapport d'inscription du producteur en se servant de la présente formule pour chaque lieu de production de déchets et chaque déchet industriel liquide ou dangereux.*

Part I – Generator Identification / *Partie I – Identification du producteur*

This report is / *Le présent rapport constitue:*

Generator Registration Number / *N° d'inscription du producteur*

1. ☐ an initial generator registration report / *un premier rapport d'inscription du producteur*

or / *ou*

2. ☐ a revision – enter Ontario Generator Registration No. / *une révision – veuillez inscrire le numéro d'inscription du producteur de l'Ontario*

3. For generators located outside of Ontario, enter Registration/Notification number assigned by your local environmental authority. / *Si vous êtes un producteur de l'extérieur de l'Ontario, veuillez inscrire le numéro d'inscription/d'identification attribué par les autorités locales en matière d'environnement.*

Name of Generator (Enter the corporate name or, if a partnership or proprietorship, the name of the principal(s). If the generator intends to carry on business under a separate name or style, this should also be entered.) / ***Nom du producteur*** *(Veuillez inscrire la dénomination sociale ou, s'il s'agit d'une société en nom collectif ou d'une société à propriétaire unique, le nom du (des) principal (principaux) propriétaire(s). Si le producteur envisage d'exploiter une entreprise sous une dénomination ou un nom distinct, veuillez également le noter.)*

4. Name / *Nom*

5. Address / *Adresse*

6. Municipality / *Municipalité* — Province/State / *Province/État* — Postal Code / *Code postal*

7. Site location / *Lieu des installations*

8. Municipality / *Municipalité* — Province/State / *Province/État* — Postal Code / *Code postal*

9. Name of contact / *Nom de la personne à contacter* — Tel No. / *N° de tél.*

10. Standard Industrial Classification Codes (SIC) for Site noted in Section 7. / *Codes de la classification des activités économiques pour les installations décrites au n° 7*

11. Total number of wastes to be registered with this report / *Nombre total de déchets à inscrire au moyen de ce rapport*

12. Name of Company Official / *Nom du représentant autorisé de la compagnie*

13. Position / *Poste*

14. Signature / *Signature*

15. Date / *Date*

PENALTY

Contraventions may be punished by fines of up to $2,000 (higher if environmental damage may result). (Environmental Protection Act, sections 47 and 147)

PÉNALITÉ

Toute infraction peut être sanctionnée par une amende maximale de 2 000 $ (ou plus s'il peut en résulter une détérioration de l'environnement) (Articles 47 et 147 de la Loi sur la protection de l'environnement)

16. **Ministry Use Only / *Réservé au ministère***

County Code / *Code de comté*	
Regional/District Code / *Code de région/district*	
Municipal Code / *Code de municipalité*	
Inter City Tie Line / *Ligne privée interurbaine*	

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Figure 2.3a

Generator Registration Report
(Continued)

Part 2 – Waste Identification / *Partie 2 – Identification des déchets*

1. Description of Waste / *Description des déchets*

2. Description of generating process / *Description du procédé de production*

3. Waste quantity generated or accumulated / *Quantité des déchets produite ou accumulée*

Continuous process / *Procédé continu*

kg/mo. / *kg/mois*

or / *ou*

Batch process / *par lots*

batches/mo. *lots/mois*

kg/batch / *kg/lot*

4. Primary characteristic / *Caractéristique principale*

Analytical data (if applicable). If the data has been estimated, attach separate sheet outlining the basis for the estimate. / *Données analytiques (le cas échéant). Si les données sont estimatives, veuillez annexer une feuille à part pour décrire sur quoi reposent les estimations.*

Name of Laboratory (if applicable). / *Laboratoire (le cas échéant)*

Waste Class / *Catégorie des déchets*

Hazardous Waste Number / *Numéro des déchets dangereux*

Specific Gravity / *Gravité spécifique*

Physical State (Solid - S, Liquid - L, Gas - G) / *État physique (solide - S, liquide - L, gaz - G)*

For Ministry Use Only / *Réservé au ministère*

5. Secondary Characteristic / *Caractéristique secondaire*

Analytical data (if applicable) / *Données analytiques (le cas échéant)*

Part 3 – Waste Management / *Partie 3 – Gestion des déchets*

1. **Principal Intended Receiver / *Réceptionnaire principal prévu***

Company name and address / *Nom et adresse de la compagnie*

Receiver No. / *Nº du réceptionnaire*

Municipality / *Municipalité*

Province/State / *Province/État*

Postal Code / *Code postal*

2. **Principal Intended Carrier / *Transporteur principal prévu***

Company name and address / *Nom et adresse de la compagnie*

MOE Carrier No. / *Nº du M. de l'E. du transporteur*

A

Municipality / *Municipalité*

Province/State / *Province/État*

Postal Code / *Code postal*

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Figure 2.3b

wastes are going. In 1979, 800 hazardous waste mystery dumps were identified in Ontario, and it was estimated that there could actually be as many as 3,000 (Dwivedi 1983:6). The Ontario Ministry of Environment feels that generator regulation will clear up many of these problems by making it easier to enforce existing regulations. Further comment on how this regulation will operate in practice is difficult since its one year implementation period does not end until September 17, 1986.

3) Part IX of the Ontario Environmental Protection Act, commonly referred to as the "Spills Bill", was passed in December of 1979. The bill establishes a code of procedures to be followed in the event of a spill, and is designed to ensure the cleanup of industrial waste spills, particularly hazardous wastes. The major provisions of the bill are:

a) Persons in control of the spilled pollutant must report it to the M.O.E., the municipality and the owner of the pollutant.

b) The owner and person in control of the spilled pollutant must immediately do everything practicable to prevent and ameliorate adverse environmental effects and to restore the environment.

c) The Minister may order that remedial measures be taken by others, including property owners, the municipality where the spill occurred, and any other municipality likely to be affected.

d) Any person, including the provincial and federal governments, is entitled to compensation from the owner and persons in control of the pollutant spilled for personal injuries, financial loss, loss of income, damage to property etc. as a result of the spill, and for

expenses incurred in taking any measures ordered by the Ministry.

Part IX of the E.P.A. finally came into effect on Nov. 29, 1985 amidst much controversy. The law places the blame squarely on the owner of the substance spilled, leaving them with absolute liability. The law was never implemented when established in 1979 because of industry complaints that the absolute liability provision would make it impossible to get insurance. The legislation fills the gap in the area of responsibility for cleaning up, and compensation for the damages of a spill (See also Toronto Star, Aug. 14, 1985:A7; Toronto Star Nov. 2, 1985; Ottawa Citizen, Nov. 29, 1985:C23).

2.3.2 The Environmental Assessment Act R.S.O. 1981

Until the present, it has been very difficult for both government and industry to gain a certificate of approval under the Environmental Protection Act (R.S.O. 1980) in order to establish a hazardous waste treatment facility. Government and industry both feel this is a result of the "not-in-my-backyard" syndrome prevalent at public hearings. However, a review of some of the major industrial and governmental hazardous waste siting proposals, such as South Cayuga, Ontario, "indicates that they have been rejected on technical not emotional grounds" (Castrilli 1982:52).

The Canadian Environmental Law Association feels that the "lack of technical adequacy in such proposals is in part a function of the limited requirements for environmental investigation of proposals under general environmental protection legislation" (Castrilli 1982:52). The Environmental Protection Act only requires the applicant to submit "plans and specifications of the work to be

undertaken together with such other information as the director may require" (Sec. 37 E.P.A.).

It is possible that the void in technical information could be filled by the application of more comprehensive environmental assessment laws. The purpose of the Environmental Assessment Act (1981) is for "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment" (E.A.A. Sec. 2).

Section 5 of the Environmental Assessment Act (1981) requires that the proponent of a hazardous waste treatment facility submit a full environmental assessment that must consist of:

1) A description of the purpose of the undertaking;
2) A description of and a statement of the rationale for;
   a) The undertaking,
   b) The alternative methods for carrying out the undertaking, and
   c) The alternatives to the undertaking
3) A description of;
   a) The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly;
   b) The effect that will be caused or that might reasonably be expected to be caused to the environment, and
   c) The actions necessary or that may reasonably be expected to be necessary to prevent change, mitigate or remedy the effects that might reasonably be expected upon the environment by the undertaking, and
   d) An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods for carrying out the undertaking and the alternatives to the undertaking (R.S.O. 1980, C.I40, S.5)

Once the report is submitted to the Minister of the Environment and is accepted as being satisfactory, it becomes a public document. For a thirty day period after this, any member of the public may

request the Minister to hold a public hearing on the proposed undertaking. A hearing board will then be established by the Minister with any or all of the following mandates; "1) determine the adequacy of the Environmental Assessment report; 2) determine whether approval to proceed with the undertaking should be given, and 3) determine whether the approval should be given subject to terms and conditions" (R.S.O 1980, C. 140, S.12). After the Environmental Assessment Board's hearings, the Director of Approvals will take into account the board's recommendations and other relevant information and will either refuse, suspend or impose conditions on a certificate of approval.

The Environmental Assessment Act (1981) requires the proponents to carry out a more thorough evaluation of their proposal before the public hearings than does the E.P.A. In this way it may be less likely that the proposal will be rejected since the proponent is required to study the aspects of the project more carefully. Ontario has not, as yet, employed its environmental assessment law to the siting of hazardous waste facilities.

2.3.3 The Ontario Planning Act S.O. 1983

The Ontario Planning Act outlines limitations in regards to the locating of waste disposal sites. Municipalities (see Section 2.4) can pass zoning by-laws permitting the use of any land within the municipality for the disposal of wastes if it conforms to the Official Plan.

2.3.4 Bill 90 an Act to Establish the Ontario Waste Management Corporation (1980)

Largely due to the inability of the private sector, and joint private sector/public sector proposals to gain a certificate of approval for the establishment of a hazardous waste treatment facility, during the mid and late 1970's, the province of Ontario developed a new management response. To meet these ends, the Ontario Waste Management Corporation (O.W.M.C.) was established in 1980. The objectives of the corporation are:

> 1) to research, develop, establish, operate and maintain facilities for the transmission, reception, collection, examination, storage, treatment and disposal of waste including sewage, and
> 2) to perform such other duties as may be assigned to it under this or any other Act. (Bill 90)

When the Conservative government of Ontario, under Premier William Davis, implemented the Act, it was decided that a provision for public hearings not be included. Section 15(1) of Bill 90 states that the Environmental Assessment Act, and the Environmental Protection Act do not apply to any activity, enterprise, or facility of the Corporation. This precluded public hearings and an assessment by the Environmental Assessment Board. When the Ontario Liberal Government came to power in 1985, this section of the Act was removed and all future proposals of the O.W.M.C. will now come under the Environmental Assessment Act.

In September of 1985, the Corporation indicated that it had selected a site for the establishment of a hazardous waste treatment facility in West Lincoln township, in south-central Ontario. To this date, August 1986, the corporation has not submitted an Environmental

Assessment report to the Minister.

2.4 The Municipal Government Role

Municipal governments are often the first level of government to be affected by hazardous waste issues, and often find themselves the first in attempting to address the problems posed by such wastes. In their governmental role, Ontario's municipalities can enact far reaching environmental management policy aimed at controlling the production and disposal of hazardous wastes within their jurisdiction.

Municipal governments are creatures of the provincial legislature and gain the authority to address the problems posed by hazardous wastes from three types of enabling legislation. "First, local governments can enact by-laws controlling nuisances, waste disposal, industrial use of sewers and related matters under the general legislation, establishing municipal institutions in the province. Second, protection of public health and abatement of nuisances has traditionally been delegated to local boards of health under provincial law" (Castrilli 1981:68). Thirdly, the Ontario Planning Act (S.O. 1983) allows municipalities to develop an Official Plan along with passing zoning by-laws. The municipality can pass a by-law under 5.34 of the Planning Act, permitting the use of any land in the municipality for the disposal of waste if it conforms to the official plan. Such power can be used to determine if a hazardous waste facility can be established in the area.

Many municipalities in Ontario have sought to improve the waste management situation in their regions using their own regulatory

instruments. According to Castrilli (1982:69), three mechanisms have been used in general by municipal governments to deal with this interest:

1) improved municipal by-laws controlling hazardous waste transport, packaging and disposal within urban boundaries;
2) authority to require disclosure of information respecting types and quantities of chemicals and wastes manufactured, used or stored in the municipality and;
3) by-laws restricting or prohibiting establishment of facilities or activities deemed to be harmful to the local population.

Many municipalities in Ontario have sewer effluent by-laws. The Regional Municipality of Peel for example has enacted sewer concentration by-laws. Certain chemicals can only be put in the sewers in specified concentrations. Many of the region's industries have their sewer outflow monitored and if chemical outputs rise above specified limits, the company involved must pay a surcharge to the region. In the City of Toronto, counsellors would like to see sewer services cut off to industries that do not adhere to these by-laws (Byers 1986). The City of Calgary, Alberta, has passed a by-law requiring the issuance of a permit before hazardous wastes can be disposed of in the city's landfill. The by-law requires disclosure of the volume of waste, trade name of the chemicals involved, special disposal precautions and hazards that might cause problems in handling.

Other municipalities, such as the City of Waterloo, have sought to determine the type and whereabouts of chemicals being used in the region. In many areas the public has coined this the "right to know"

legislation. It has also become common for municipalities to try to block the establishment of waste management facilities through the use of zoning by-laws. The Ontario courts overturned two such by-laws that restricted the actions of the provincial government limiting the use of by-laws for blocking the establishment of waste management facilities. (see Re Ridge Landfill Corp. Ltd. and The Corporation of the Township of Harwich (1980), 31 O.R. 2d 366, A.G. Ontario V. Mississauga (1981), 10 C.E.L.R. 91).

The potential for municipal governments to become actors in the industrial waste management system seems great although not a lot of action has taken place at this level to date. This level of government is very close to the issues and has to react directly to the needs of both the public and industry within its boundaries. The enabling legislation is available for local governments to take action in controlling hazardous wastes. If clear policy objectives are developed, municipal governments could become a more effective part of the total waste management system. Further support for local government participation in industrial waste management was presented by the Minister of the Environment, The Honourable Tom McMillian, P.C., M.P in a recent speech (Niagara Falls, Oct. 31, 1985).

2.5 The Federal Government Role

Legislation enacted by the federal government has been directed primarily towards setting standards that control pollution emissions into the air and water. This legislation has not required the testing of new or existing chemicals to determine their effects on the environment; it does not foster reuse, recovery or reduction of

industrial or hazardous wastes; nor does it seek solutions to the problems posed by the disposal of such wastes (Castrilli 1982:13).

As Castrilli summarizes (1982:14), "the role Environment Canada, the nation's federal environmental agency, has carved out for itself in the hazardous waste area, is principally an advisory one, not a regulatory one". As expressed in a 1981 Environment Canada policy paper, "the jurisdiction for hazardous wastes is primarily a provincial prerogative. Aside from the broad departmental mandate for the protection of the Canadian environment, Environment Canada does not have comprehensive legislation or regulations specific to the management of hazardous wastes" (Environment Canada 1981:1). Hence the department has taken a number of initiatives to set up non-regulatory programs.

2.5.1 Federal Non-Regulatory Programs

1) Abandoned Sites Inventory

With the help of the various provinces, Environment Canada is currently attempting to compile a national survey of abandoned waste disposal sites with potential for toxic chemical problems. The investigations are broken down into three phases: a) identification and verification of site location together with information on the nature and quantity of wastes deposited; b) preliminary assessment of high priority sites, and; c) detailed assessments of high priority sites and identification of remedial action where necessary (Environment Canada 1985). Due to the contracting out of the various phases of the study to the provinces, some portions are more complete than others. For example, Ontario has completed phase one of its own

report.

2) Recycling of Hazardous Wastes

The federal government has long been an advocate of the view that recycling and reduction should form part of any waste management system (Castrilli 1983). Three non-regulatory programs have been set up in order to promote reduction, recovery and reuse of hazardous wastes in Canada; a) The Canadian Waste Materials Exchange; b) The Development and Demonstration of Resource and Energy Conservation Technology Program (DIRECT), and; c) The Industry Energy Research and Development Program (IERD). DIRECT and IERD tend to be focused towards encouraging the development of energy conservation technology (Adamson 1984).

The Canadian Waste Materials Exchange operates on the premise that "one man's garbage is another man's gold." The exchange is operated nationally by the Ontario Research Foundation and was successful in recording 476 waste transfers totalling 269,288.8 tons per year to November 1985 (Ontario Research Foundation Interview Duncan 1986). The exchange acts as a clearing house of information that brings together waste owners and prospective buyers or users of such by-products through the use of a monthly bulletin, an example of which is provided in Appendix C.

3) National Inventory of Hazardous Waste Quantities

The federal government has attempted to compile a number of hazardous waste inventories since the mid 1970's, but the results have varied due to the use of different definitions for hazardous waste. The most recent inventory compiled by Environment Canada, the

Environmental Protection Service and Gore and Storrie Ltd., was released in January of 1982. This inventory identifies the major industrial generators of hazardous waste, along with the types and volumes of waste produced on a geographical basis across Canada (Gore and Storrie Ltd. 1982).

4) Control of Hazardous Wastes at Federal Facilities

The federal government has encouraged and assisted departments and agencies in developing waste management programs at federal facilities. In 1977 the Environmental Protection Service published a "Code of Good Practice" for the management of hazardous and toxic wastes at federal establishments. The purpose of the code was to provide "guidelines for personnel who are engaged in the handling and disposal of hazardous wastes ... in order to fulfill the government's wishes to provide a consistent and exemplary environmental pollution control program .... thus offering leadership in the nation wide effort to protect and enhance the quality of our environment" (Environmental Protection Service 1977:1). In 1986, a new updated code will be published by the Environmental Protection Service.

The federal government also developed the Environmental Assessment and Review Process in the 1970's in order to promote development of environmentally sound federal establishments. The Environmental Assessment and Review process is intended to apply to projects initiated by federal departments; projects funded by the federal government and projects constructed on federal lands. By following through the review process a project should have a minimum impact on the environment. This would include impacts that may be

caused by the by-products of such a facility.

2.5.2 Regulatory Programs

1) The Transportation of Dangerous Goods Act

To date the only federal legislation that applies directly to hazardous and toxic wastes was developed and published in the Canada Gazette Part II, dated February 6, 1985, entitled "Regulations respecting the handling, offering for Transport and Transportation of Dangerous Goods". The regulations, established for the Dangerous Goods Act (Appendix to the Canada Gazette of June 19/82:1985) control the inter-provincial transportation of hazardous wastes through a manifest system.

The purpose of the act is to promote public safety in the transportation of dangerous goods (Transportation of Dangerous Goods Act 1980). Similar to the waybill system in Ontario, the act provides for the tracking of wastes through the completion of a manifest by the carrier, generator and receiver of the waste. The act also sets out a number of packaging safety requirements and markings and makes it an offence not to comply with them.

2) Other Regulations

While the Transportation of Dangerous Goods Act (1980) is the only federal legislation that specifically addresses hazardous wastes there are other federal acts that may be utilized when dealing with these wastes. For example, The Fisheries Act (R.S.C. 1970); The Environmental Contaminants Act (S.C. 1974); The Clean Air Act (S.C. 1971) and; the Canadian Water Act (R.S.C. 1970) may all have some limited application to the transportation, treatment and/or disposal

of hazardous wastes, depending on specific situations.

The Fisheries Act (R.S.C. 1970) for example could come into play in the event of a spill of hazardous wastes. The act makes it an offense for owners and carriers of hazardous wastes not to notify Environment Canada in the event of a spill of such wastes that may be deleterious to fish. The Environment Contaminants Act (SC 1984) makes it an offense to release certain chemicals, such as PCB's in concentrations greater than those specified by the act.

2.6 Conclusions

Like other environmental management problems, e.g. phosphates in detergents and fertilizers, lead in gasoline, and mercury from pulp and paper production, the severity of the human health and environmental risks caused by the unmanaged deposition of hazardous wastes during the late 1970's and into the 1980's has forced the public sector into the realm of environmental management in order to encourage private sector management responses. As is so often the case in issues of environmental management, the initial step in the process was the implementation of laws, policies and programs by the public sector.

The process of developing legislation that ensures proper hazardous waste treatment and disposal has been slow at all levels of government in Canada. As has been noted, the government response to hazardous waste management is still evolving. Many of the established responses in this field have been reactionary. The public responds to a single catastrophic event, such as a spill, or leaching disposal site and demands immediate public sector responses.

Unfortunately, reactionary responses do not often fill the necessary environmental management voids. It is important to remember that the Federal, Provincial, and in certain cases, Municipal levels of government in Canada have all responded, in one way or another, to controlling hazardous wastes, but only the Provincial level has the primary mandate and responsibility to take such action.

The purpose of this chapter has not been to critically evaluate each of the established laws, policies and programs; many other authors have done this (see Castrilli 1980-81-82; Olchowski 1981; Jackson and Weller 1982, Niemela 1982; Torrie 1982; Sinclair 1984; Scheluer 1985; Keyserlingk 1985; Swaigen and Bunt 1985). Rather, this chapter is meant to clearly identify the public sector management responses to hazardous wastes in order that the performance of those responses, as a unit, may be evaluated in relation to the Regional Municipality of Ottawa-Carleton.

CHAPTER 3

TREATMENT TECHNOLOGIES

3.1 Overview

The availability of treatment technologies is central to the implementation of management responses in the realm of hazardous industrial wastes. Policy implementation by the public sector in Ontario has been directly tied to the type and availability of treatment technologies. The Ministry of Environment in Ontario has in fact delayed their environmental management response to hazardous wastes due to the lack of available treatment technologies in the province (Chant 1985). The Ministry feels that the ideal management response cannot be initiated without the appropriate physical infrastructure. Innovative public sector responses to environmental management issues fuel the need for new technologies and often new technologies will beg further public sector responses in the form of regulation of operation. For example, more stringent regulations regarding smoke stack emissions depend on the availability of appropriate stack scrubber technology.

Canada's knowledge of appropriate hazardous waste treatment and disposal technologies has expanded greatly since the 1970's (OWMC 1982). There are now a number of reliable processes available for

the recycling, treatment and ultimate disposal of hazardous industrial wastes. These new technologies serve to decrease the risk of human and environmental contamination by industrial wastes, although few have been actually implemented to this point in the Canadian context. Typically, many industries have viewed expenditures on pollution abatement as "frivolous, inflationary and a waste of money" (Campbell 1982:59).

Due to their importance to management responses, each of the fundamental treatment technologies will be discussed briefly in turn so that they will be understood for further reference in this report.

3.2 Recycling

The loss of significant quantities of raw material resources through the incineration, physical/chemical treatment and ultimate disposal of industrial wastes is a major societal concern. One innovative answer to this is the implementation of a waste management system that involves recycling. This method of handling industrial wastes is of two pronged significance: 1) it recognizes that the traditional regulatory system that supports the notion of an abundance of raw materials is no longer valid, and 2) it recognizes that proper industrial waste collection and treatment is essential if the amount of hazardous waste requiring disposal is to be lowered (Adamson 1984, Taylor 1983:14, Campbell 1982:58-64, Campbell and Glenn 1982).

A clear definition for the term recycle is problematic since it is often interchanged with words such as reduction and reuse. For

the purpose of this paper, recycling will be defined as follows; "Waste recycling involves methods of recovering wastes as resources. It includes the reuse of wastes or the collection and treatment of a waste product for use as a replacement of all or part of the raw materials in the manufacturing process" (Adamson 1984:12).

Following this definition, it can be stated that industrial waste recycling would include; 1) the recovery and reuse of the waste into the same process that generated it, 2) the transfer of wastes from one industry to another for reuse in other industrial processes and 3) waste recovery (The extraction of valuable materials in a waste stream for use in other processes, either within or outside of the industry, with or without some form of treatment) (Sinclair 1985).

Although most industries would agree that waste recycling is an excellent concept, only a fraction would accept that it is an affordable reality in their plant. This is especially true since our society has characteristically provided industries with very cheap ways to externalize the costs of waste treatment. The unmanaged deposition of industrial wastes has been the cheapest disposal method in an era of inexpensive resources, low energy costs, and little regulation.

The traditional management response to industrial waste has only begun to change in the very recent past as industry, government and the public at large "realized the need for waste minimizing strategies and formally recognized recycling and reduction programs" (Adamson 1984:12). The basis for utilizing recycling is that it

recognizes:

i) Resource Conservation - A shift to recycling activities extends the supply of natural resources, improves land use and conserves energy.

ii) Reduces Environmental Degradation - Recycling cannot resolve all waste problems, but the development of policies encouraging waste recycling have been an important component in addressing the problems of hazardous waste generation and disposal.

iii) Minimizes Detrimental Health Effects - Environmental health and safety programs related to conventional industrial waste management practices could decrease with the application of recycling and reduction practices.

iv) Economic Desirabililty - There are three major economic trends that encourage industry to consider recycling technology; a) the cost of many raw materials is rapidly escalating, and the continued availability of some resources is uncertain, b) processing of commodities requires high energy costs, and c) proper waste treatment and disposal has risen significantly in cost (Adamson 1984:5; Proctor and Redfern Group 1982:6). These underlying motivations have stimulated a number of industries to respond by employing recycling technology in their operations. In 1974 the 3M corporation initiated a program known as the "3P program", Pollution Prevention Pays. Results were obtained through process modification, equipment redesign and recovery of waste materials for reuse. The result of this program was an improved working environment, conservation of resources, improved technologies, and reduced costs (Adamson

1984:1). The Toronto Star newspaper installed recycling equipment at a cost of $28,000. According to Campbell (1982) this cut annual disposal costs from $15,000 to zero, and produced enough recycled ink in the first eight months to replace $40,000 worth of new ink.

Ontario has a number of success stories where individual firms have introduced recycling equipment into their processes (see Campbell 1982). Beyond this there is now a fairly well established recycling industry in Ontario; currently there are approximately 22 firms that collect and recycle industrial wastes in the province (Ontario Research Foundation and Proctor and Redfern 1983:6-3). Table 3.1 shows the primary industrial waste recycling activities in the province.

TABLE 3.1

Primary Waste Recycling Activities 1982

Recycled Wastes	Number of Companies	Volume (millions of litres)
Waste Oils	8	112.5
Oily Waters	4	25.2
Solvents	6	33.75
Spent Pickle Acid	2	108.0

(Ontario Research Foundation 1983:6-3)

This appears to paint an encouraging picture of recycling in Ontario, but in fact only a very small portion of the industrial waste produced is recycled. It is roughly estimated that hauled liquid industrial wastes amount to 60 million gallons per year in Ontario, of which 6 to 9 million gallons are hazardous (Campbell

1982). There are no clear estimates on the amounts of industrial wastes currently being recycled, but it is likely in the neighbourhood of 10 percent of all industrial wastes produced.

Environmentalists and the governments see massive potential to increase resource recovery through recycling. Pollution Probe, a major Canadian investigative environment research organization, estimates that the generation of industrial waste in Ontario can be slashed by 80 percent from current levels. "The basis of this contention is three fold: i) the projection of U.S. experts in the field of recycling ii) analysis of Ontario's waste stream and iii) on site evaluation by existing companies using select recovery equipment" (Campbell 1982:60). Pollution Probe sees the potential for 90 percent recovery and reuse of all wastes in sectors such as electroplating, printing and photofinishing. Table 3.2 provides an assessment of potential industrial waste recycling opportunities in Ontario. (See also Proctor and Redfern Group Background Paper - Waste Reduction 1982). The opportunity to increase recycling from the current level of approximately 10% of industrial wastes generated is great.

3.3 Incineration

Unfortunately, not all hazardous wastes are suited to recycling due either to economics or composition. Incineration involves the application of heat in order to convert a waste into a less bulky, less toxic or less noxious material. The chemical, physical or biological composition of the waste is altered through combustion in order to destroy the hazardous components.

TABLE 3.2

Comparison of Recycling Potential with Present Waste Handling Methods for Select Industrial Wastestreams

Industry Sector	Present Practice	Recycling Potential
Electroplating Industry	Most electroplaters precipitate metals from the wastestream and landfill the metal-laden sludge.	Can recycle more than 90 percent of the metals commonly used in electroplating such as copper, nickel and chromium.
Paint Industry	Most applicators use inefficient spray guns that generate large quantities of sludge which are landfilled. On-site paint recycling extremely rare.	Spray gun efficiency can be increased from 30 percent to over 80 percent using electrostatic spray equipment. This significantly reduces the amount of waste paint requiring disposal. On-site recycling permits 90 percent of paint wastes to be recovered. This is economically feasible for companies producing as little as 50 barrels of sludge a month.
Photoprocessing Industry	Recovery of silver from rinsewater is rare. Developer recycling is rare.	99 percent of the total silver found in the process and rinsewaters can be recovered. 90 percent of process chemical such as fixes, bleaches and developers can be recycled for direct re-use.
Textile Industry	Relatively few textile dyers have highly efficient, low-polluting equipment. Indigo recycling is non-existent in Canada. Recycling of any kind is uncommon in the textile industry.	Low liquor dyeing can cut chemical use and waste production by half over conventional dyeing machines. Equipment is available to recycle 90 percent of some dyes such as indigo. More than 90 percent of synthetic sizes such as PVC can be recycled. U.S. experts estimate that 90 percent of water, 80 percent of auxiliary chemicals and 45 percent of process heat discharged by the industry can be recycled.
Tannery Industry	Most chromium wastes are precipitated and landfilled.	Can recycle 90 percent of chromium in the wastewater.
Printing Industry	Most waste inks are landfilled. Many solvents are incinerated, some are recycled.	Can recycle more than 80 percent of the ink from newspaper presses. Solvents used to clean presses can be recycled on-site or by a reclaimer.
Oil	Most companies generating oil/water mixtures do not recycle them. The majority of waste oil is incinerated to sprayed on roads as a dust suppressant.	Oil/water wastestreams may be separated on-site at even small plants using membrane technology. The separated oil can be recycled. The American Association of Petroleum Re-refiners estimate that 80 percent of used lubricating oil is recoverable. It is estimated that only 10 percent of waste lube oils are re-used as lube oils.
Food Processing Industry	Typically, food processing wastes undergo biological treatment instead of recovery.	Conventional food processing yields organic wastes high in BOD. Some industries such as cheese producers, yeast factories, distilleries and food processing plants recover up to 90 percent of their waste proteins, starches, fats, and sugars for re-use by another industry.
Solvents	Solvents are frequently incinerated rather than recovered.	Non-chlorinated solvents can be readily recycled. Usually, 80 to 90 percent of a waste solvent is recycled, and the remaining 10 to 20 percent has been used as a fuel supplement or low grade paint.
Dry cleaning Industry	Most Canadian dry cleaners lack carbon absorption units. Still bottoms and filters rich in solvents are landfilled or incinerated.	Use of carbon absorption equipment can recycle more than 90 percent of the cleaning solvent in the exhausted air. Solvent recovery from still bottoms and filters can reduce solvent content in sludge by 60 to 80 percent.

Campbell 1982:62

Incineration has long been preferred as a "destructive" waste management technology and is often applied. "In a typical incineration system, wastes and air are mixed in a refractory lined furnace where the organics are oxidized to hot gases that are discharged into the environment" (Proctor and Redfern 1982:145). Since a variety of organic chemical wastes can be incinerated, it is necessary to scrub the resulting flue gases to ensure clean stack emissions. The ability of a incineration facility to manage a wide variety of hazardous wastes will depend on the versatility of the air pollution equipment.

According to Brunner and the Proctor and Redfern Group, incineration offers a number of advantages to a waste management system. They are:

1. States - Incineration is capable of treating all three states of hazardous waste, gaseous, liquid and solid ;

a) Gaseous - if a waste gas contains organic material which is combustible, then incineration should be considered as a final method of disposal.

b) Liquids - both combustible and partially combustible liquids can be disposed of through incineration.

c) Solids - solid waste can be incinerated usually after the removal of most of the moisture content. Incineration is not a total disposal method for solids since most have non-combustible components that will result in ash (Sittig 1979:3-9);

2. Volume Reduction - the volume and weight of the waste is reduced immediately to a fraction of the original size; decreasing

the need for long-term landfilling;

3. Detoxification - incineration technology has evolved to a point where many of the most hazardous organic compounds such as pathologically contaminated material and highly toxic organic compounds can be destroyed. There is basically no limit to the type of organic compound that can be destroyed by incineration as long as sufficient auxiliary fuel is provided (Brunner 1984);

4. Efficiency - combustion of waste compounds to elemental gases (CO_2 and H_2O) is almost complete and the small ash residue is usually no longer hazardous in nature;

5. Energy Recovery - many waste products have a high Btu content and heat can be recovered and sold as energy to offset the operation costs; and

6. Materials Recovery - in many cases the ash produced through incineration will have high metal content or other properties suitable for its reuse (Brunner 1984:2, Proctor and Redfern 1982:143).

The advantages outlined are reason enough for the widespread use of incineration technology throughout the industrialized world. However, practice has shown that there are also disadvantages involved with incineration, some of which make policy regulation difficult:

1. Operation - the operating environment is ever changing due to the variable nature of the waste inputs. Supplemental fuels frequently have to be used in order to maintain required destruction efficiencies. This variability in processing requires very high

maintenance;

2. Environmental Impacts - the variable nature of the elemental composition of the waste determines the nature of the flue gases which can include, sulfur dioxide, sulfur trioxide, nitrogen oxides and particulates in the form of fly ash. The ash resulting from processing will also vary in composition and must be disposed of through proper land disposal or reuse.

3. Staffing - the variable nature of the operation requires qualified supervision, and in order to maintain efficiency, highly qualified operating and maintenance staff are needed; and

4. Cost - there are very high capital costs involved in initiating and operating such a facility (Brunner 1984:2, Proctor and Redfern 1982:144).

There are a number of incineration technologies that can be applied to hazardous industrial waste destruction. The Rotary Kiln system is the most nearly universal destruction system, due to its versatility. It can be used to dispose of solid, liquid and gaseous combustible wastes and is particularly efficient when "applied to solids, liquids, sludges and tars because of its ability to attain excellent mixing of unburned waste and oxygen as it revolves" (Sittig 1979:293). The Rotary Kiln is a permanently located treatment facility.

The Rotary Kiln is a horizontal cylinder lined with a refractory shell, which rotates on a slight slope from the horizontal, of usually about 2 to 3 percent. While the speed of rotation is variable, the normal running range is 0.25 to 1.5 r.p.m.

(Brunner 1984:240-41). The main components of the system are the kiln and secondary combustion chamber. Solid wastes, sludges, waste drums and liquid wastes are fed into the rotary kiln, usually through the use of an overhead crane which mixes the refuse and raises it into the charging hopper. "As the waste moves down the kiln, organic matter is destroyed leaving behind inorganic ash" (Sittig 1979:295). The secondary chamber ensures complete combustion of volatile organics. Combustion will occur at high temperatures, usually about 2000°C, and "good mixing is achieved with the oxygen in the air, and the resultant products of combustion generally are carbon dioxide, nitrogen and water vapour" (Sittig 1979:3). Figure 3.1 depicts a typical rotary kiln incinerator.

There are a number of other thermal technologies available, such as the Plasma Arc system. A type of plasma arc was developed by Thomas Barton of the Royal Military College of Canada. This system utilizes an electrode arrangement which creates an electric arc of up to 10,000°C (Barton 1984, Proctor and Redfern 1982). This technology is currently gaining recognition since the high burning temperatures are suitable for destroying highly hazardous organic compounds such as P.C.B.'s that lower temperature processors, such as the Rotary Kiln, cannot. A number of Ontario's environmental groups (Haldimand-Norfolk Organization for a Pure Environment, H.O.P.E., Citizens for Modern Waste Management) are supporting this new technology over Rotary Kiln due to its flexibility. Most of the Plasma Arc systems can be moved from place to place on a tractor trailer negating the need for a large, centralized treatment facility.

Rotary Kiln Incinerator

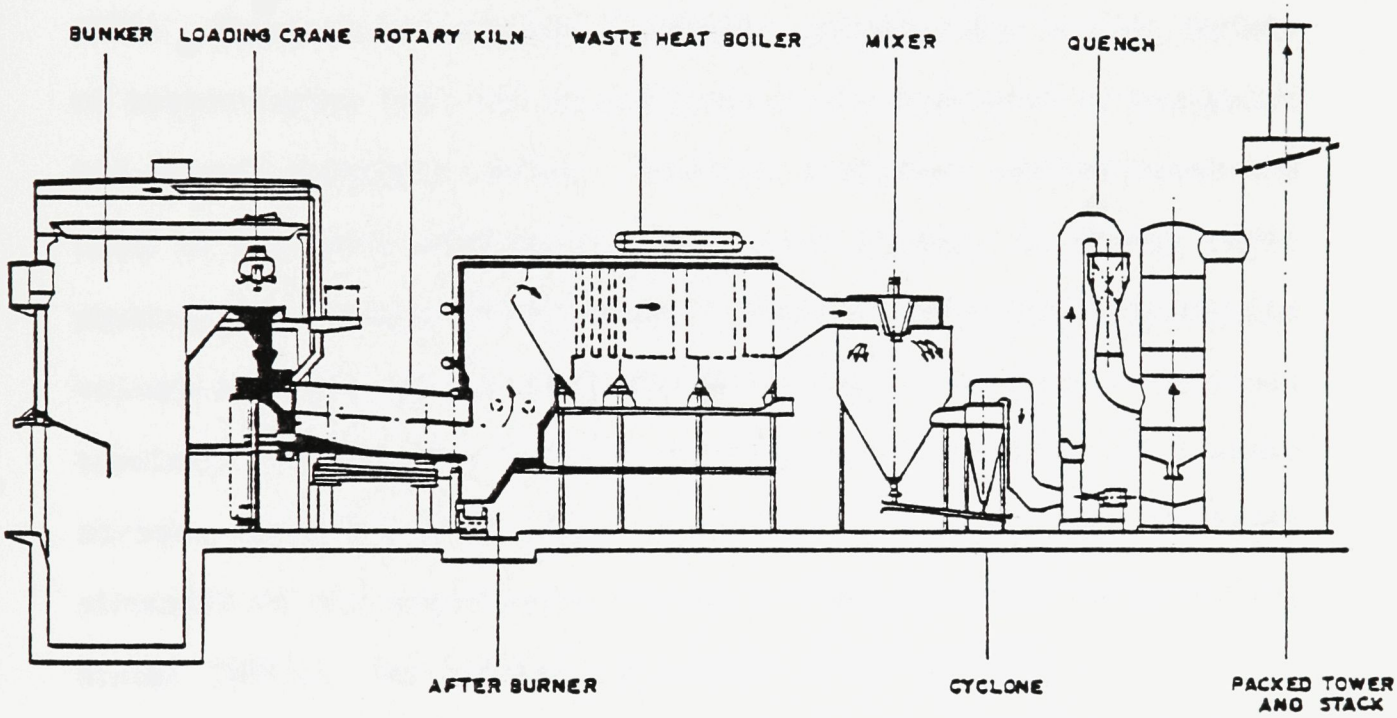


Figure 3.1

(Adapted from Proctor and Redfern Group 1982, Brunner P.E. 1984)

Other thermal processing technologies include Calcenation Kiln, Evaporation, Liquid Incineration, Fluidized Bed Incineration, Multiple Hearth Incineration and Wet Air Oxidation (see Proctor and Redfern 1982 for detail).

3.4 Physical/Chemical Treatment

Many industrial hazardous wastes are inorganic in nature and cannot be incinerated since the resulting ash would be of the same composition as the waste put into the system (Douglas Interview 1986). Physical and chemical treatment systems offer a wide variety of technologies that can be utilized in the treatment of inorganic and organic hazardous wastes. Physical treatment technologies are used to separate components of a waste stream, to change their physical form without altering their chemical structure, reducing the volume of material for further processing or disposal. Chemical treatment technologies destroy the hazardous components of a waste stream, or make them less hazardous by altering the chemical structure of the constituents through a chemical reaction (Mackie and Niesen 1984:57, The Proctor and Redfern Group 1982:83).

There are a wide variety of Physical and Chemical treatment technologies that can be utilized. "The physical treatment technologies are as varied as the topics in a chemical engineering textbook on unit operations" (Mackie and Niesen 1984:56). Since a description of all the treatment technologies is beyond the scope of this report, a brief description of two selected processes, utilized by Stabelex Ltd., will be given to illustrate these systems. Stabelex operates a physical/chemical hazardous waste treatment plant

in Blanville, P.Q, the only one of its kind in Canada. The processing utilized by Stabelex involves filtration, settling, neutralization, precipitation, oxidation and reduction (Douglas Interview 1986).

1. Physical Treatment*

a) Filtration

Filtration is a physical process that involves removing suspended particles in a fluid by forcing it through a porous medium, where the solids are trapped (Proctor and Redfern 1982). In most cases the resulting liquid, which is much lower in suspended solid content, can be released into the sewer system. The sludge or filter cake of resulting solids must either be treated or sent to secure disposal. Filtration in no way treats the waste stream; it simply separates and concentrates the volume of solids.

2. Chemical Treatment

a) Neutralization

One of the most popular chemical treatment processes is neutralization. Neutralization often involves the mixing of two or more waste products that consist of acids and alkalis. Neutralization is a ph control system in which acids are combined with bases in an attempt to adjust the ph level as close to 7 (neutral), as possible. The result of the process is usually the formation of insoluble salts containing the waste components that may require secure landfilling. Neutralization is an established and

* Process descriptions are generic and do not necessarily represent Stablex's operations per se.

proven process that is in full scale use throughout many industries, eg. pulp and paper, petroleum refining and inorganic chemicals industries (Proctor and Redfern Group 1982).

The above provides a thumbnail sketch of a physical process and a chemical process that can be utilized in the treatment of hazardous wastes. Further descriptions of physical and chemical hazardous waste treatment technologies can be found in the Proctor and Redfern Generic Processes Technology Report (1982). Chemical treatment processes are all alike in that they must occur in highly controlled environments in order for the proper chemical reactions to take place.

3.5 Fixation/Solidification

In many cases, fixation or solidification is perceived as being an alternative treatment process for inorganic wastes. The process involves mixing the waste material with some type of fixing agent, such as fly ash or cement, in order to solidify the waste before it goes to ultimate disposal. It differs from the process above in that it does not "treat" the hazardous components of the waste before they are solidified. This process is widely utilized in both the United States and Canada.

Fixation and solidification is much more desirable as a final process after an inorganic or organic waste has been treated. Both Physical/Chemical treatment and Incineration, create a residue by-product that must go to ultimate disposal. These residues will be much less likely to break down and be released into the environment if they are solidified, made into solid blocks, before they are

disposed of. Stabelex Ltd. for example carries out a fixation process, using Portland Cement, on all hazardous wastes that come through the plant before they go to ultimate disposal (Douglas Interview 1986).

3.6 Ultimate Disposal

The technologies utilized in Physical/Chemical treatment, incineration, and in certain cases recycling, create a treatment residue that must be disposed of. The technologies available for the ultimate disposal of the non-recyclable portions of the industrial waste stream do not treat the hazardous components of the waste but generally attempt to ensure that they are contained and controlled for an indefinite period of time. The ultimate disposal technologies currently available for hazardous wastes and hazardous waste treatment residuals include:

1) Secure Landfill
2) Deep Well Injection (Proctor and Redfern Group 1982)

3.6.1 Secure Landfill

The landfilling of solid and liquid hazardous wastes has been popular with industry because of favorable economics. However, as a direct result of the environmental contamination caused by the unmanaged landfilling of industrial wastes across Ontario during the 1970's and continuing today, it has become apparent that regulatory requirements for landfilling are necessary. For example at the Upper Ottawa Street landfill, in Hamilton Ontario, liquid industrial wastes were deposited in a poor hydrogeologic setting with a thin covering of soil overlaying bedrock. Ground water and surface water

contamination problems have resulted (M.M. Dillon 1983:2). Ontario Ministry of Environment studies indicate that in 1976, 65% of all liquid industrial wastes were landfilled. By 1980, it was estimated that only 43% were landfilled (Ontario Ministry of Environment 1980). By 1981 the number had dropped again to between 25% and 40% of all liquid wastes (Jackson and Weller 1982:24). Table 3.3 indicates the most recent estimates of the use of landfill technology in Ontario.

TABLE 3.3

Present Disposal Methods in Ontario of

Liquid Industrial Wastes Based on Waybill System

Method	Percentage of Total
Incineration	31
Public Landfills	22
Private Landfills	13
Sewage Treatment Plants	6
Reclaimers, Reusers	17
Exported	11

(National Research Council of Canada 1983:4-10)

As a direct result of more stringent regulatory requirements, many of Ontario's municipal landfills are now forbidden to receive liquid industrial wastes of any kind. Ontario had 19 landfills licensed to receive liquid industrial wastes including hazardous in 1979 (Ontario Ministry of the Environment 1980). By 1981, the number of licensed landfills had dropped to only eight (Jackson and Weller 1983). Currently, the disposal of liquid industrial wastes in Ontario is restricted to seven sites (Table 3.4).

Table 3.4

Licensed Receivers of Liquid Industrial Wastes in Ontario

Facility	Location	Ownership
Landfill	Barrie	Municipally Owned
Landfill	Brantford	Municipally Owned
Landfill	Guelph	Municipally Owned
Landfill	Lambton County	Tricil Ltd.
Landfill	Mariposa, Victoria County	Municipally Owned
Landfill	Paris, Brant County	Municipally Owned
Landfill	Welland	Municipally Owned

(Ontario Ministry of the Environment 1986)

Engineers and environmentalists now feel that the only suitable landfilling technology for hazardous industrial wastes is the "secure landfill". The secure landfill concept is "based on the recognition that the most significant environmental threat is the migration of liquids containing hazardous constituents into ground water" (M.M. Dillon Limited 1983:20). The secure landfill is meant to be a disposal site for treated and stabilized hazardous wastes only, making it distinct from the concept of co-disposal, which sees the mixing of hazardous industrial wastes and municipal wastes.

A typical secure landfill would comprise the following components:

1) Liner - placed on the base of the landfill to restrict the migration of wastes out of the site and the movement of water into the site, generally composed of clay or synthetic materials.

2) Leachate Collection and Removal System - in order to prevent the accumulation of rain and run-on liquids. Leachate collection devices should be placed above the liner so that such

liquids can be pumped out.

3) Final Cap - once the landfill has reached capacity, a cap or cover should be placed over the top in order to prevent liquids from entering the site. Liners above and below should create the so called "bathtub effect."

4) Drainage Control - a surface drainage control system minimizes the run-on of surface water to the landfill, and controls the run-off of contaminated water.

5) Monitoring System - a system of monitoring both above and below the ground will ensure that the potential for ground water and surface water contamination is minimized (M.M. Dillon Limited 1983:87-112; Shuster 1980:63-67; Johnson 1980:67-75).

Suitable sites for secure landfills should have deep, clay-based soils, since this allows a minimum of liquid migration. A landfill of the design described, located on clay soils, "poses a minimal threat to the environment" (Proctor and Redfern Ltd. 1982:217). It should be noted however, that even with this technology, there are still a number of long term risks and uncertainties. For example, "although the use and construction methods for landfill liners are known, there are uncertainties regarding potential changes in the impermeability of the liner due to chemical interaction and/or physical changes and rates of molecular diffusion through the liner" (National Research Council of Canada 1983:5-11). It is also known that leachate collection or drain systems work well over the short term, but have not proven effective over the long term, which is necessary since leachate

production can continue for decades and longer (National Research Council of Canada 1983).

Currently there is only one secure landfill, such as shown in figure 3.2, operating in Canada, in Sarnia, Ontario. A secure landfill of this type receives only treated industrial wastes that are usually solidified before they enter the site. The key for ensuring that a "chemical waste landfill is a secure landfill, is in choosing and conditioning the wastes properly such that these properties will not change upon disposal" (Shuster and Wagner 1980:64). The secure landfill is seen as an integral and very necessary part of the industrial waste management system.

3.6.2 Deep Well Injection

Deep well injection involves the disposal of liquid wastes below the ground to depths ranging from 300 to 8000 meters. Deep well disposal has been practiced for over thirty years and today is a well developed technology. The technology was developed largely by the oil and gas industry. In the U.S. the largest users of deep well systems are the "chemical, petrochemical, and pharmaceutical companies which operate about half of the active wells. Oil refineries and natural gas plants are second, with the metals industry third" (Smith 1979:108).

The creation and operation of a deep well injection facility is much the same as for an oil or gas well. Liquid industrial wastes, usually of low solid content, are brought to the site and pretreated to prevent the plugging of the disposal zone formation,

Secure Landfill

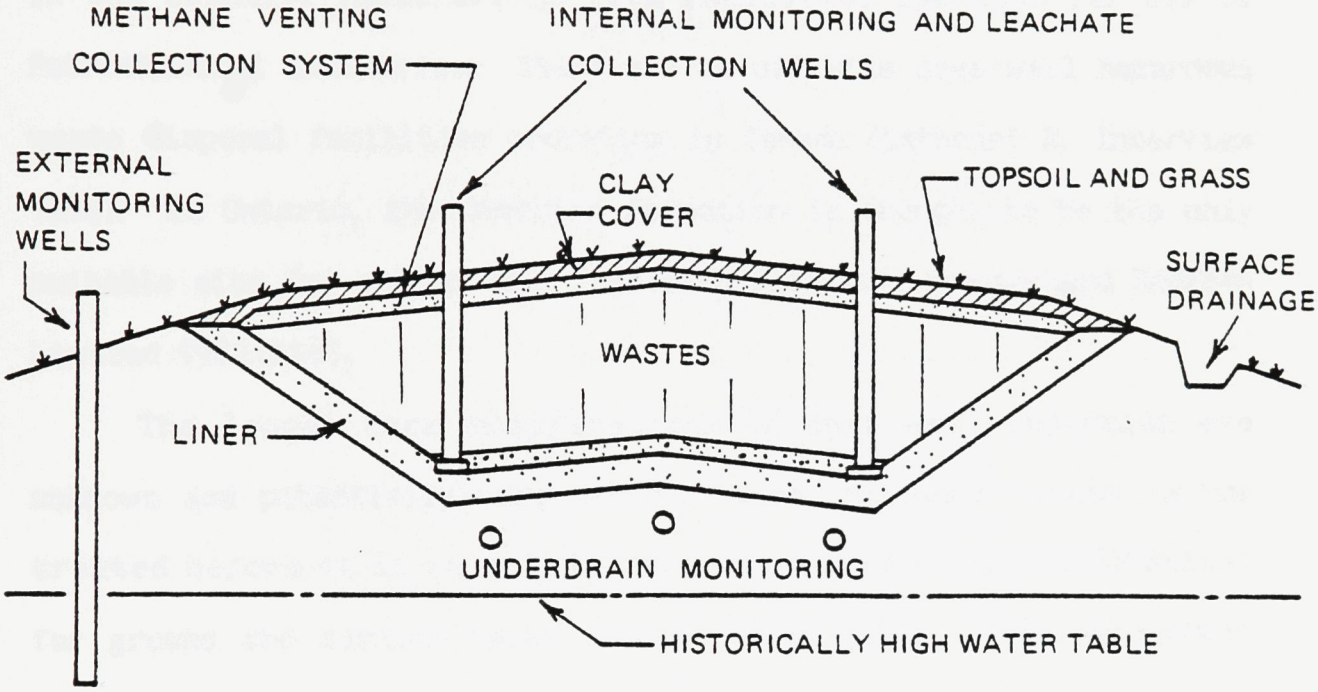


Figure 3.2

(Adapted From National Research Council 1983)

and damage to equipment. It should be made clear that pretreatment does not involve the removal of the toxic or hazardous components of the waste. After the waste is pretreated it is put down into the ground under pressure to the disposal zone which is usually composed of "sandstone, limestone, or dolomite" (Smith 1979:110). Figure 3.3 depicts a typical deep well injection operation.

Western Canada houses the only deep well injection facilities in the country. These are on site facilities operated for use by Petrochemical Industries. There are no off site deep well hazardous waste disposal facilities operating in Canada (Cathcart N. Interview 1986). In Ontario, the Cambrian formation is thought to be the only suitable site for a deep well injection facility (Proctor and Redfern Limited 1982:218).

The longer term ramifications of deep well injection are unknown and potentially very serious since the waste stream is not treated before it is injected into the ground making the potential for ground and surface water contamination great. This management system has been utilized in most part for hazardous wastes that have no appropriate treatment technology. In a recent U.S. study of both Canadian and American industries, many of which produce hazardous wastes, industry respondents felt that "no untreated hazardous waste should be disposed of by any means, particularly deep well injection" (Basta, Hughson, Mascone 1985).

3.7 Transfer Stations

An integral and necessary part of hazardous waste management is the transportation system utilized to get the waste safely from its

Deep Well Injection

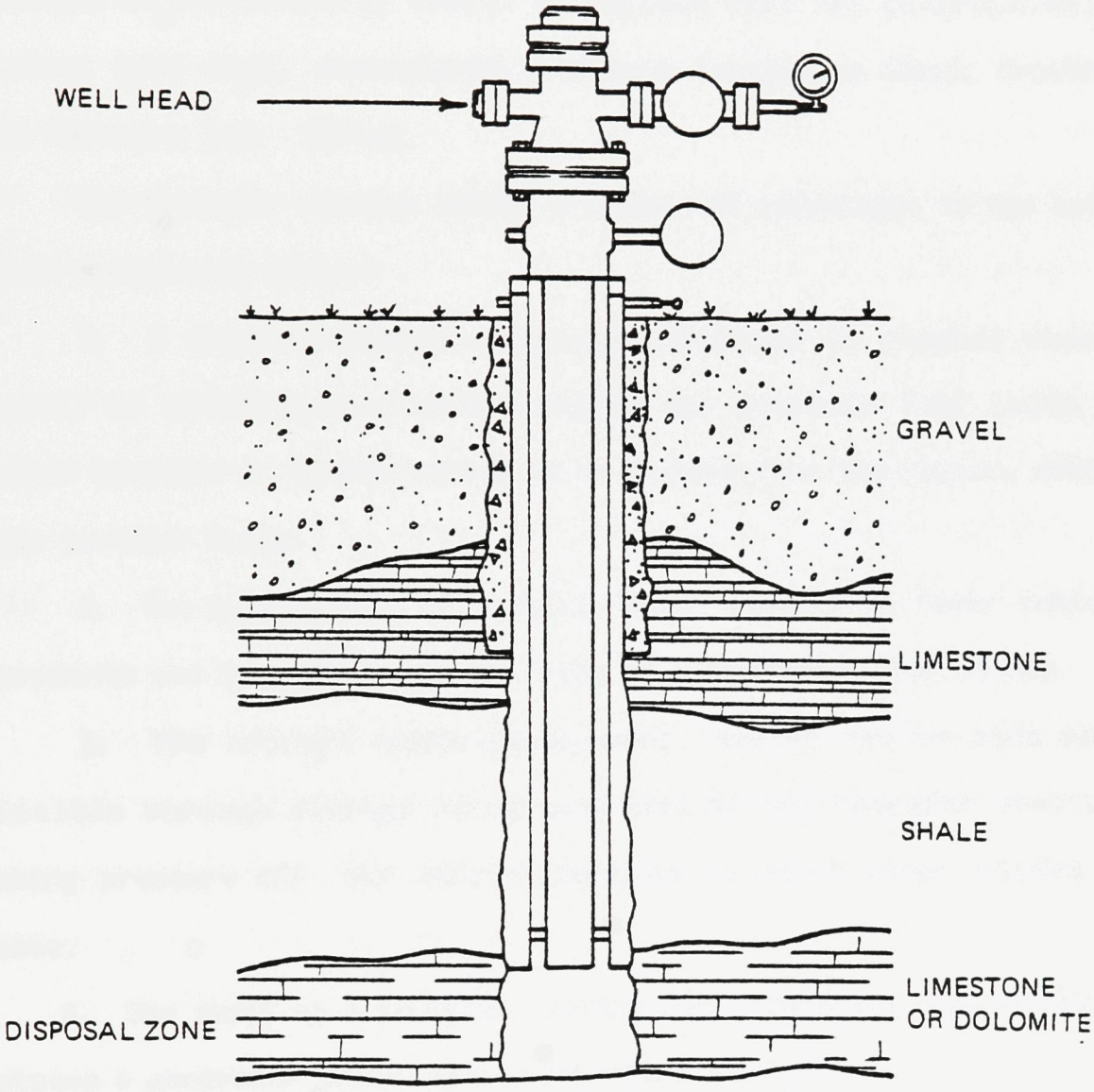


Figure 3.3

(Adapted from Smith 1985)

source to the treatment site. Apart from the transportation equipment utilized, various forms of transfer station technology can be applied. A transfer station normally serves as a regional transshipment depot or gathering point for the assembly and forwarding of hazardous wastes to treatment and disposal sites. The transfer station is particularly useful in regions that are geographically distant from main, centralized treatment facilities (Reid, Crowther and Partners Ltd. 1984:2).

The transfer station offers a number of advantages to the total waste management system:

1. A more favorable economic situation is created when a number of industries within a region can assemble full loads of either drummed or bulked wastes to be shipped from the region, rather than partial loads.

2. The elimination of partial loads results in fewer vehicle movements and thus lower overall risk of a transportation mishap.

3. The overall waste management system can be made more flexible through storage being provided at the transfer station, taking pressure off the central facility to store large volumes of waste.

4. The staff at a transfer station can facilitate communication between a generator and a remote treatment facility.

5. The regional transfer station can act to promote the safe handling of hazardous wastes, and also have equipment and facilities available within the local region in the case of a waste spill or transportation mishap (Reid, Crowther and Partners 1984).

A transfer station can provide for the receiving, off loading, storage, on loading and shipment of a variety of liquid, semi-solid and solid wastes. The station itself can take three basic forms:

1. For handling drummed wastes only. The drummed wastes would be brought to the transfer station and await shipment in large quantities to lower the overall transportation cost to each industry.

2. For handling bulked wastes as well as drummed wastes. This station is capable of consolidating drummed wastes into bulked lots for shipment. This could result in great cost reductions to individual firms who generate small quantities of hazardous waste.

3. For handling both drummed and bulked wastes. This station is capable of pretreating wastes as well as consolidating waste streams. In many cases, upwards to 80% of a hazardous waste is water. If this can be removed through pre-treatment there is a significant volume reduction prior to transportation (Reid, Crowther and Partners 1984:4).

Transfer stations are essential for regions that are distant from the central treatment facilites. Transfer stations can provide industry with a means for handling and possibly pretreating hazardous waste when the treatment facility is many miles away. They can also facilitate communication between industries in the region, as to the chemicals being produced. Regional transfer stations are an incentive to proper waste treatment.

3.8 Conclusions

An extensive review of all hazardous waste treatment technologies is beyond the scope of this thesis. This chapter has

attempted solely to outline the fundamental hazardous waste treatment technologies. It is important to understand that the treatment of hazardous waste is very diverse, complicated by the fact that no one technology is suitable for treating all hazardous wastes. Proper treatment requires the incorporation of technologies as determined by waste inputs.

The Proctor and Redfern Group compiled the Generic Process Technologies Studies (1982) for the OWMC. This is a well respected review of the treatment technologies available for hazardous wastes, and should be utilized if further information is required.

Chapters 2 and 3 have attempted to outline the policy and technological framework of hazardous waste management in Ontario. This background knowledge can be effectively utilized to address the hazardous waste management situation in the Regional Municipality of Ottawa-Carleton, allowing for appropriate recommendations for policy or technological changes to be made if necessary.

CHAPTER 4

Hazardous Industrial Wastes in the Regional Municipality of Ottawa-Carleton

4.1 Overview

The Regional Municipality of Ottawa-Carleton (RMOC), centered on the national capital and comprising 11 municipalities, is typically viewed as a relatively hazardous waste-free area due largely to the region's lack of heavy industry. However, within the RMOC there are a number of organizations that generate a variety of hazardous wastes. Most of these wastes are produced by the high tech, printing and metal fabricating industries, as well as by research laboratories in the region (Sinclair 1985).

Proper hazardous waste management in the RMOC is currently hampered by the fact that there is no readily available treatment facility in the region. At present, hazardous wastes must be shipped to Toronto or Montreal for ultimate disposal, thus adding the complex variable of transportation to the waste management system. The lack of a proper hazardous waste management system within the RMOC has caused a number of serious problems, such as industrial dependence on sanitary and storm sewer disposal, and direct disposal into regional waterways (Gietz Interview 1985, Ottawa Citizen, March 17, 1986:A2; March 19, 1986:A1).

In order to ensure the input of the generators in determining the current hazardous waste situation in the RMOC, and in establishing management response options to any potential problems, the results of the "Survey of Views on Hazardous Waste Management in the Ottawa-Carleton Region", will be utilized in the following chapters. As indicated in Chapter 1, 200 surveys were administered throughout the RMOC. Of the 200 surveys sent out, 105 (53%) were returned and 52 (50%) of the respondents indicated that their firm generated hazardous wastes. The returns fell into the business sectors shown on Table 4.1. Each of the business sectors was adequately represented in responses. Furthermore, the responding business varied greatly in size as displayed on Table 4.2

While the figure of 52 respondents is only 26% of the total sample, it should not be taken lightly. The Ministry of Environment presently has knowledge of just 35 specific generators of hazardous waste in the RMOC through the waybill system, their only collection mechanism (Excluding Generating Government Departments). Survey results, however, indicate that there are at least 48 generators of hazardous waste in the region, excluding the 4 government department responses. This fact strengthens the survey results.

The survey replies were analyzed by simply tallying responses to individual questions on the survey. This provided an indication of the generator's situation and views on specific hazardous waste management issues in the RMOC. The results are expressed in the following discussion as a percentage of the 52 completed surveys (see also Summary Results Appendix "D").

TABLE 4.1

BUSINESS SECTORS OF SURVEYED RESPONDENTS

	# of Respondents	% of Total
Chemicals	3	6
Computing Equipment	3	6
Electronic Components	9	17
Government	4	8
Hospitals	3	6
Metal Plating and Coating	4	8
Oils and Greases	3	6
Plastics	1	2
Printing	11	21
Pulp and Paper	1	2
University or College	2	4
Woven Fabrics and Finishing	1	2
Other	7	12
Total	52	100%

TABLE 4.2

BUSINESS SIZE OF SURVEYED RESPONDENTS

Number of Employees	# of Respondents	% of Total
0-49	19	37
50-99	8	15
100-149	8	15
150-199	3	6
200-499	1	2
500-999	6	11
1000-1499	1	2
1500-1800	2	4
No Response	4	8
Total	52	100%

4.2 Regional Government Action

In addition to the laws, policies and programs described in Chapter 2, that have been initiated by the federal and provincial levels of government, the RMOC has taken some steps recently in order to induce private sector management responses to the industrial waste problems in the region. These actions include:

1. Resolution in Council (1982)

The hazardous industrial waste disposal resolution called for the "RMOC to have a study undertaken to determine the status of hazardous waste disposal in the regional area. The study was to determine the amounts, methods and places of disposal of hazardous wastes, and to make appropriate recommendations to alleviate any problems" (Hazardous Industrial Waste Disposal - Ottawa Resolution 1982).

The resolution recommended that the Ontario Ministry of Environment be requested to undertake the study, and that the Ministry should be urged to proceed with the establishment of a collection depot to bulk liquid industrial wastes and transfer them to a treatment facility. The Ministry of Environment, as of this date, has taken neither of these steps. A study of this sort is currently being carried out for the RMOC by a private consulting firm under the "waste plan" initiative (see point 3).

2. By-Law No. 208 of 1984

> A by-law to govern sewers and sewage treatment works and the discharge of industrial wastes into municipal sewers.

By-law No. 208 was introduced to attempt to deal with some

of the problems of hazardous waste disposal in the region's sewer system. The by-law outlines the concentrations of certain hazardous wastes that can be deposited in the sewers. The hazardous waste compounds covered in the by-law, and "acceptable" disposal concentrations are shown in Table 4.3

Industry in the Regional Municipality must adhere to this by-law or face fines if caught. Every person who contravenes the by-law is guilty of an offence and on conviction is liable to a fine of not more than $2,000.00 for every day or part thereof upon which the offence occurs. The by-law also stipulates that there will be a minimum penalty of $500.00 for a first offence, $750.00 for a second and $1,000.00 for any subsequent contraventions.

3. Waste Plan

In 1985, the RMOC embarked on a two-year program toward the development of a Waste Management Master Plan for the region. Waste Plan's mandate is directed towards domestic or household waste disposal within the region and has been broken down into 3 stages:

i) Public participation to help identify which waste management options and activities should be considered in the subsequent stages of the process.

ii) Stage two is meant to address which of the various options identified should proceed. Public participation will focus on the evaluation and discussion of the various waste management options.

iii) The specified policies, programs, facilities and sites to be developed under the Master Plan.

Table 4.3

Hazardous Waste Sewer Disposal Concentrations
RMOC By-Law No. 208, 1984

1) Sanitary Sewer Content

Matter	Concentrations (Milligrams per litre)
Arsenic	1.0
Cadmium	2.0
Copper	5.0
Cyanide	2.0
Lead	5.0
Mercury	0.1
Sulphide	2.0

2) Storm Sewer Content

Matter	Concentrations (Milligrams per litre)
Arsenic	1.0
Cadmium	0.1
Copper	1.0
Cyanide	0.1
Lead	1.0
Mercury	.001

Source: By-law No. 208

As a preliminary step, MacLaren Consulting Ltd. was hired, in 1985, to do a background study of the current waste management system, including hazardous industrial, existing in the region. MacLaren's initial report was published in May of 1985. In this report MacLarens concentrated solely on documenting the current status of hazardous waste generation in the region and not on recommending or establishing policies for the proper management of these wastes.

4. Toxic Waste Manager

The pollution control division of the RMOC Works Department had a proposal approved by regional council that recommended the creation of a Toxic Waste Manager's position for the region. Once the position is established, sometime in 1986, the Manager's duties for the first two years will be to identify the hazardous waste management problems in the region, and to develop a framework to deal with these problems. It is proposed that the Manager will get three assistants by September 1986, whose job will be to visit industries in the region to discuss waste management practices and to test effluent streams (Ottawa Citizen Mar. 17, 1986:2).

4.3 Waste Quantities

When considering waste management, the determination of quantities produced is always a key issue. However, ascertaining the exact amount of hazardous waste produced by a particular region is virtually an impossible task at this point in time. In Ontario, there are no regulations that compel an industrial plant or business to record the quantities, or even types of hazardous waste they

produce, unless the waste is transported on a public road (see Regulation 309, Chapter 2). The total amount of hazardous waste produced in the RMOC can therefore only be estimated.

In 1982, the Ontario Waste Management Corporation (OWMC), commissioned a study of the quantities of hazardous waste produced throughout the province. Using a waste generation model, the corporation's consultants estimated that Ottawa produced approximately 16,000 tonnes of hazardous waste per annum (Proctor and Redfern Group 1982). The major sectors producing this waste have been mentioned previously; table 4.4 provides a profile of the types of hazardous wastes potentially produced by these industries in the RMOC.

The accuracy of the waste quantities study developed by the OWMC has come under criticism from many sectors. The Ministry of Environment's abatement officers in the region question the total estimates. For example, their experience in the RMOC indicates that the totals for waste oils and solvents should be higher than the totals for heavy metal solutions. If 8,300 tonnes is the correct amount for heavy metals, then solvents should be much higher than the 500 tonnes listed (Stiles and Dunn Interview 1985). Thus, while the OWMC results may be a useful starting point, it should be realized that the totals are probably underestimated for the RMOC.

A further source of information that can be drawn upon to determine waste quantities is the Ministry of Environment's waybill documentation. Each time a hazardous waste is transported via a public road, the generator, carrier, and receiver of the waste must

Table 4.4

Estimated Waste Generated Within The Regional Municipality of Ottawa-Carleton

Waste Category	Amounts (Tonnes x 1,000)
Organic sludges and still bottoms	.5
Solvents and organic solutions	.5
Oils and greases	.2
Oil/water mixtures	1.1
Organic and oily residuals	1.2
Heavy metal solutions and residuals	8.3
Miscellaneous chemicals and products	1.1
Paint and organic residuals	.7
Aqueous solutions with organics	+
Anion complexes	.5
Sludges and inorganic residuals	1.5
Pesticides and herbicide wastes	+
P.C.B. wastes	+
Cleanup residuals	.1
Total	15.700

+ Quantities less than 100 tonnes

From the Proctor and Redfern Group, Waste Quantities Study, 1982, pg. 58 for O.W.M.C.

fill out a waybill that states the type and quantity of hazardous waste being shipped. A summary of the 1984 waybill records shows that 328 transactions took place in the region for a total of 2,995,280 litres transferred. Until June 30, 1985 a further 142 transactions took place for a total of 52,890 litres transferred. On June 30, 1985 the Ministry of Environment began collecting this data in the form of kilograms rather than litres. From June 30, 1985 to December 31, 1985 a further 226 transactions took place for a total of 300,000 kilograms transferred. This total includes B & B Recycling and Disposal Ltd. which brings hazardous waste by-products into the region and ships them out as recycled products for sale. Table 4.5 provides a complete breakdown of the waybill transactions in the region for 1984 and from January 1 to June 30, 1985.

While the totals from the waybill records for hazardous waste generation in the RMOC are not disputable, it must be understood that the totals only include waste that is transported off a site on public roads. The totals do not include hazardous waste that is treated or stored on the generator's premises, nor waste that is disposed of in the sewer system under municipal by-law, or otherwise.

Lastly, respondents to the survey, were asked to identify the amount of hazardous waste generated by their facility per month. The responses indicate that the bulk of the hazardous waste producers in the RMOC fall into the less than 100 kg per month category which likely depicts the Regional situation. Table 4.6 shows that there are a number of hazardous waste producers in the RMOC rather than one or two industries generating large quantities.

Table 4.5

Waybill Transactions by Source Category
Regional Municipality of Ottawa-Carleton

1984 Summary

Source Category	Transactions Number	%	Volume x 1,000 Gallons/Litres	%
Federal Gov.	91	27	22.850/102.3	3.4
Municipal Gov.	7	2	1.792/8.06	0.3
Institutions	28	9	3.478/15.65	0.5
Commercial/ Industrial	110	34	40.472/181.92	6.1
B & B Waste Recycling	92	28	597.072/686.82	89.7
Totals	328	100	665,618/2995.38	100

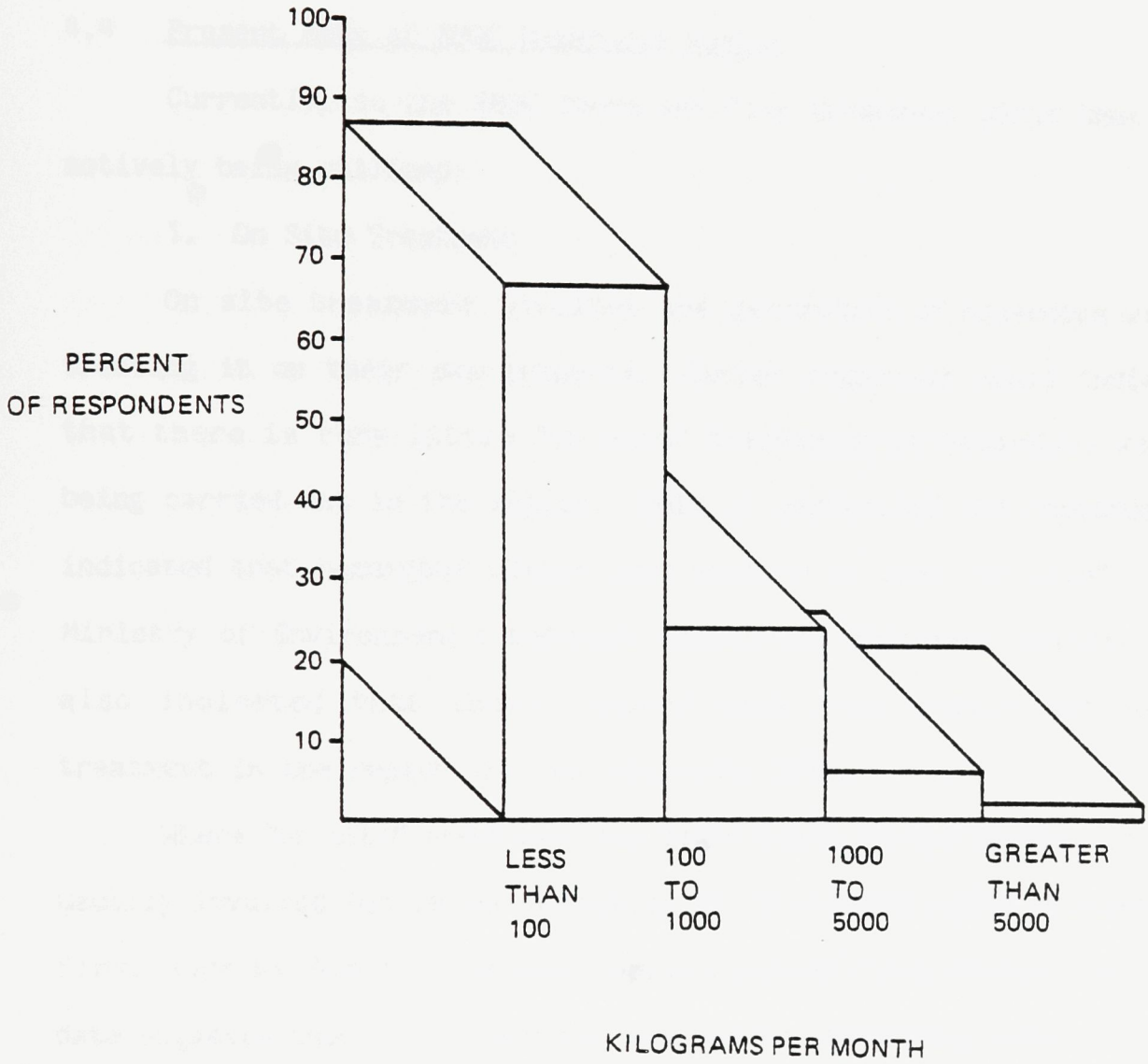
1985 Summary
(Until June 30, 1985)

Federal Gov.	50	35.3	2.95/13.39	25.3
Municipal Gov.	2	1.4	.36/1.67	3.2
Institutions	10	7.0	.08/.36	.7
Commercial/ Industrial	80	56.3	8.26/37.47	70.8
B & B Waste Recycling	Nil	Nil	Nil	Nil
Total	142	100	11.65/52.89	100

Source: MOE Waybill Documentation

Table 4.6

Quantities of Hazardous Waste Generated By Facility In the RMOC



Source: Survey Data

The consensus of this information indicates that there is a significant quantity of hazardous waste generated in the RMOC. There is little doubt that the estimate of 16,000 tonnes per annum by OWMC is low. Hopefully the information presented provides a picture of the types and potential quantity of hazardous waste produced in the RMOC.

4.4 Present Fate of RMOC Hazardous Wastes

Currently, in the RMOC there are five treatment paths that are actively being utilized:

1. On Site Treatment

On site treatment involves the generators of hazardous waste treating it on their own property. Survey responses would indicate that there is very little "on site" treatment of hazardous waste being carried out in the region. Only 13 percent of the respondents indicated that hazardous wastes were treated by them "on site". The Ministry of Environment's Regional Industrial Abatement Officer has also indicated that their figures show very little "on site" treatment in the region (Stiles Interview 1985).

Where "on site" treatment has taken place in the region, it has usually involved set up and operation by an outside waste management firm, such as Mosaic Chemical Corporation of Mississauga. Survey data suggests that it is commonly the larger industrial organizations that utilize "on site" treatment. Beyond this, the Ontario Ministry of Environment states that there are currently 23 active solid waste incinerators operating "on site" in the region. Only one of these, operated by the Department of National Defence, is licensed to

incinerate other than domestic wastes (refer to Table 4.7).

2. Off Site Treatment

Survey results firmly indicate that the bulk of hazardous wastes produced in the RMOC that receive some form of treatment are handled "off site". Seventy-five percent of the respondents indicated that their hazardous wastes were handled by an outside firm off the generator's site.

Most of the hazardous wastes that receive "off site" treatment are handled by one of three waste management companies: Tricil Ltd., of Montreal and Sarnia, Syntath of St. Catharines, and Mosaic Chemical Corporation of Mississauga. All three firms are capable of carrying out some form of waste treatment at these sites. Tricil and Syntath operate incinerators and Mosaic utilizes a stabilization and fixation process. These three processes can only be utilized in the destruction of hazardous organic wastes.

The residues from these treatment processes may end up in an engineered landfill in Ontario or elsewhere. In 1985, Ontario had seven landfills licensed to receive hazardous wastes. One of these seven sites may or may not be utilized by a waste management firm. For example, Mosaic Chemical Corporation has access to 12 government approved disposal facilities in Canada and the United States. Hazardous wastes that are collected from the RMOC, but which cannot be treated by one of the three firms mentioned, are most often sent to approved operations in the United States.

3. Recycling

Some hazardous wastes produced in the RMOC are recycled and

Table 4.7

Active Regional Incinerators

ACTIVITY	INSTITUTION	M.O.E. CERTIFICATION NUMBER	NUMBER OF INCINERATORS	WASTE GENERATED/ INCINERATED*	REMARKS
a) Hospitals	Ottawa Civic Hospital	80 / 5 / 204	1	Type 4 - Biomedical	Accepts Waste from: Ontario Cancer Clinic University of Ottawa Medical Extension
	National Defence Medical Centre (Public Works Canada)		1	Type 2 and 4 - Refuse and Biomedical	Accepts Waste from: Children's Hospital of Eastern Ontario Elizabeth Bruyère Montfort Hospital Ottawa General Hospital
	Queensway - Carleton	84 / 4 / 46 - T	1	Type 2 and 4 - Refuse and Biomedical	
	Riverside Hospital		1	Type 2 and 4 - Refuse and Biomedical	
	Salvation Army Grace Hospital	91 / 5 / 315	1	Type 2 and 4 - Refuse and Biomedical	
	Perley Hospital		1	Type 4 - Biomedical	
b) Public Works Canada	RCMP Headquarters		1	Type 1 - Rubbish	
	Old Bank of Canada Building		1	Type 1 - Rubbish	
	Virus Laboratory	8 - 4032 - 78 - 006 to 8 - 4035 - 78 - 006 incl	1 3	Type 1 and 4 - Rubbish and Biomedical	
	Animal Disease Research Institute	32 / 5 / 56	1	Type 4 - Biomedical	
	Confederation Heights Central Heating Plant		1	Type 1 - Rubbish	
	General Records Building	8 - 4008 - 83 - 006	1	Type 1 and 4 - Rubbish and Biomedical	
	Communications Research Centre Building # 3 - Central Heating Building	8 - 4022 - 76 - 006	1	Type 1 and 4 - Rubbish and Biomedical	
	Animal Breeding Building	82 / 5 / 255	1	Type 1 and 4 - Rubbish and Biomedical	
	Lester B. Pearson Building		1	Type 1 - Rubbish	
	Sir Leonard Tilley Building		1	Type 1 - Rubbish	
	Bio - Hazard Building # 136		1	Type 1 and 4 - Rubbish and Biomedical	
	Canadian Forces Base - Uplands Building # 52		1	Type 1 - Rubbish	
	Bee Diseases Building # 135		1	Type 1 - Rubbish	
	Parliament Buildings East Block		1	Type 1 - Rubbish	
c) Transport Canada	Ottawa Airport		1	Type - 2 Refuse	Accepts Waste from: Overseas flights
d) Bank of Canada	Bank of Canada	32 / 5 / 67	4	Type 1 - Rubbish	
e) Other	Ottawa - Carleton Humane Society		1	Type 4 - Biomedical	
	Abbtec Ltd.	8 - 4010 - 77 - 006	1	Type 1 - Rubbish	Silver Recovery

** See Section 2.5.2 in text on waste types*

Source: MacLaren Engineers, 1986

reused. There are a handful of industries in the region that have installed recycling equipment. For example, Zenith Auto Bumper Chroming of Ottawa recycles and reuses the chromic acid utilized in their operation. By doing this they have greatly reduced their disposal costs, as well as their costs for raw materials. Both the Ottawa Citizen and Le Droit newspapers recycle the ink and solvents utilized in their operations. The Ottawa Citizen indicated that transportation and disposal costs for these wastes were getting out of reach. Now they save costs on both disposal and purchase of raw materials (Tailor Interview 1985).

B & B Recycling and Disposal Ltd. of Gloucester, previously mentioned in this report, collects solvent wastes in the region for recycling. B & B Recycling and Disposal Ltd. did not wish to disclose the quantity of solvents collected in the Ottawa area, but did indicate that the bulk was collected from outside of the region.

4. Sewer System and Landfills

Only 13 percent of the survey respondents indicated that the sewer system was their ultimate disposal point. The research carried out for this report and a previous report (see Sinclair 1985) indicates that a very large quantity of the hazardous wastes produced in the region are put into the sewer system under municipal by-law.

The Trail Road, Rump and Herneault landfills within the RMOC receive 98% of the region's wastes. For a short time prior to 1982, the Herneault site and the Municipal dump in Gloucester received some hazardous wastes. The Ontario Ministry of Environment stopped this practice when the sites were deemed improper for the purpose. The

Gloucester site was found to be hydrogeologically insecure; two plumes of organically-contaminated wastes are now leaching off the site (National Research Council of Canada 1983:5-14). Currently, none of the landfills in the region are licensed to receive hazardous wastes and the bulk of the region's non-hazardous wastes go to the privately owned Rump landfill (see Figure 4.1).

5. Unknown

Lastly, there is some portion of hazardous waste generated in the region that has an unknown disposal point, such as the side of the road, or directly into regional waterways (refer to Unknown Disposal, Section 4.5).

It is very difficult to determine the exact quantities of hazardous waste that fall into each of these five categories. Even if every industry in the RMOC was interviewed, the figures could only be estimated, since many industries would not divulge such information about their operations. Table 4.8 shows the OWMC estimates for the fate of hazardous wastes across the province. While the categories in Table 4.8 are applicable to the RMOC, the percentages are not the same. For example, there is very little "on site" treatment or recycling taking place in the region, while there is a lot of sewer disposal.

4.5 Regional Hazardous Waste Problems

An evaluation of the current hazardous waste management situation in the RMOC would not be complete without identifying any problems in the system. Representatives of the main players including; R. Stiles (M.O.E.), R. Pickard (RMOC), D. Gietz (RMOC), K.

POLLUTION CONTROL SITES

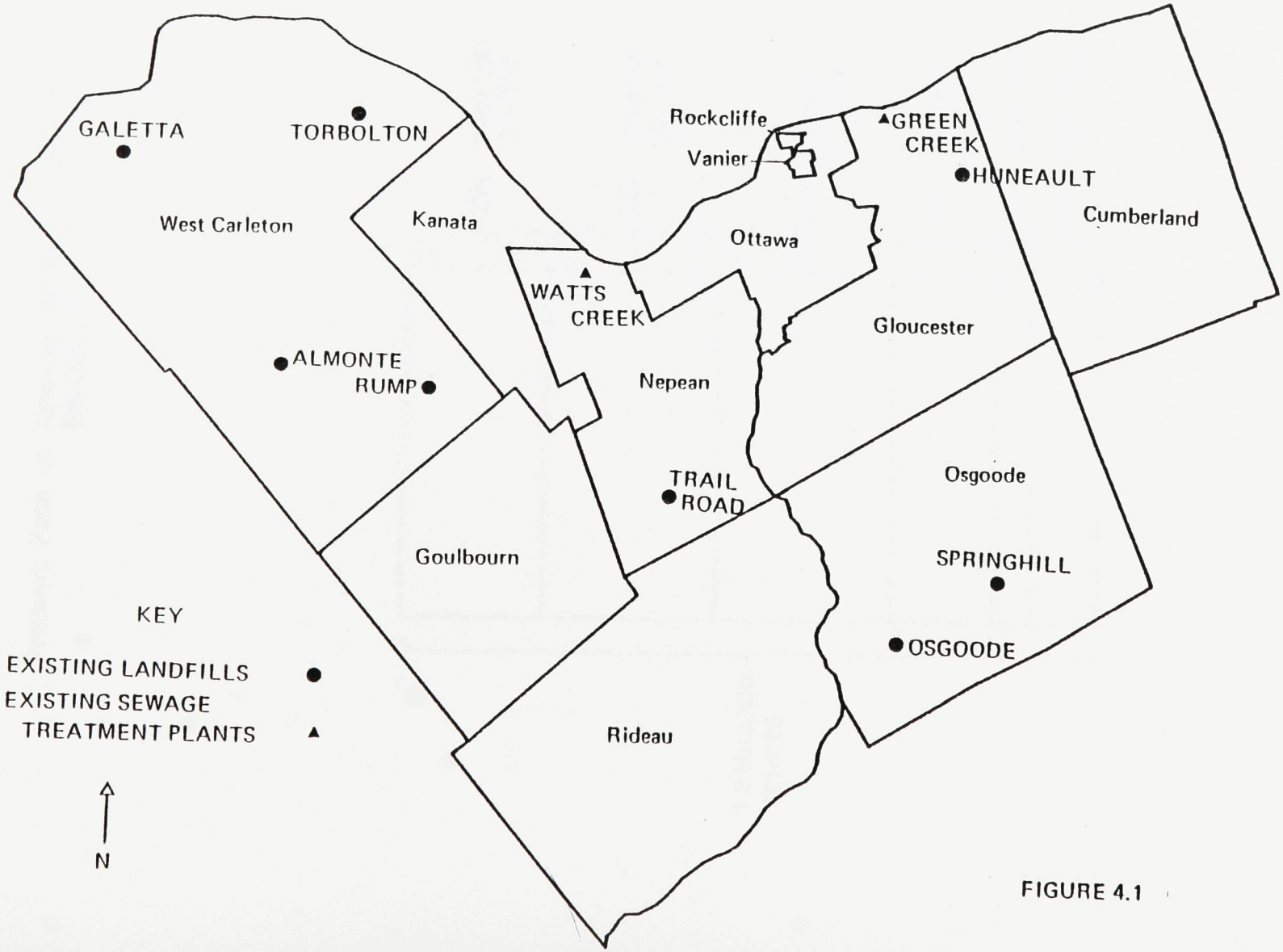
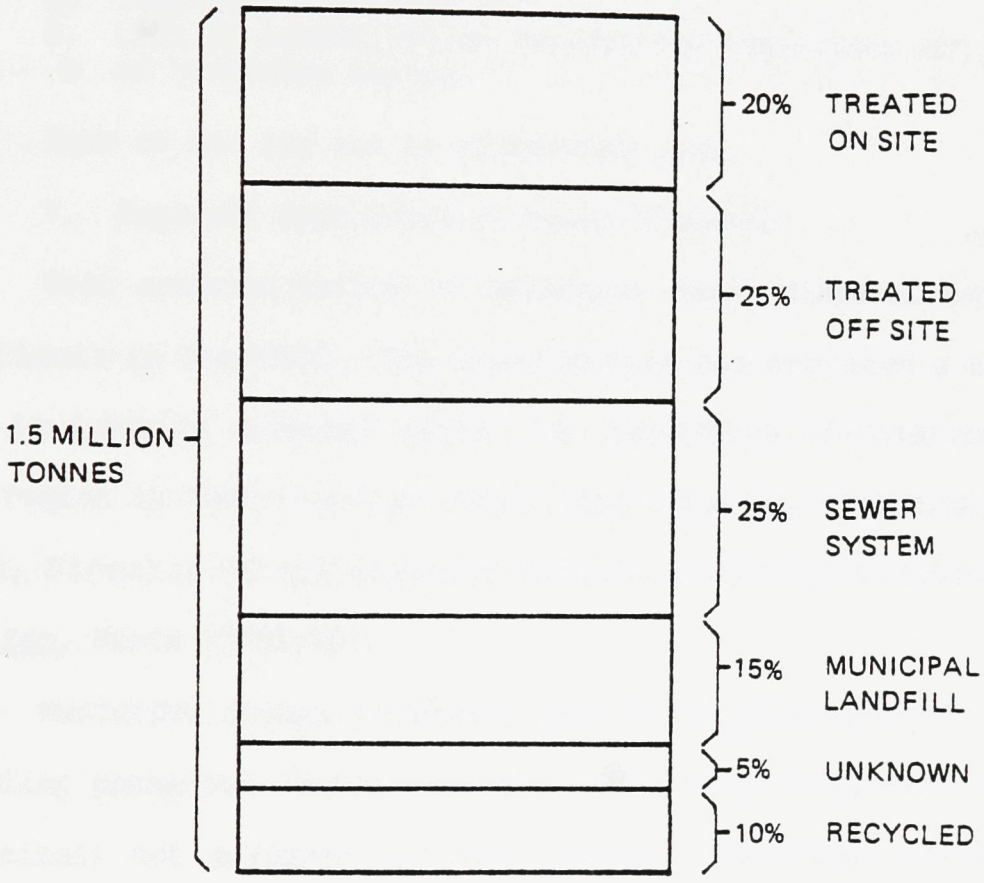


FIGURE 4.1

Table 4.8

Present Fate of Special Wastes in Ontario
(Estimated)



Source OWMC, Facilities Development Process, Phase 1 Report, 1982

Millyard (Pollution Probe), C. Wright (OPIRG) and the 50% response of regional generators to the survey questions asking them to identify "regional hazardous waste problems", tend to perceive many of the same problems. These are also in accordance with the author's perception and include:

1. Regional dependence on sewer disposal,
2. Lack of treatment and transport facilties,
3. Unknown disposal,
4. Lack of awareness,
5. Temporary solutions and
6. Lack of communication between the regulators and generators of hazardous wastes

Each of the six can be elaborated upon.

1. Regional Dependence on Sewer Disposal

Cost externalization of hazardous waste disposal has not been difficult in the RMOC. The sewer system has provided a convenient and inexpensive disposal option for generators of hazardous wastes. The region is "very worried" about this situation according to Andrew Hauk, Director of the Region's Pollution Control Division (Ottawa Citizen, March 17/86:A2).

Municipal sewage treatment plants are generally not suited for handling hazardous wastes, and the RMOC sewage treatment plants are definitely not equipped for this purpose. Hazardous wastes usually pass through the treatment plants undetected and untreated, if they go through fast enough or in small volumes (Gietz Interview 1985). The closure of sewage treatment plants due to hazardous waste contamination has been a common problem across Ontario. This problem is further complicated by the fact that when a hazardous waste is discovered in the sewage treatment facility, there is virtually

no way to detect the source. These wastes are also very hard on the sewer system, shortening its life expectancy.

As a result of this, the RMOC has faced a number of problems at their two main sewage treatment plants, Watts Creek and Green Creek. The presence of hazardous wastes, notably heavy metals, destroys the live bacteria in the digesters that cleanse the sewage. This has occasionally forced both the Watts Creek and Greens Creek plants to shut down, and on occasion, dump sewage that has only been chlorinated, into the Ottawa River, due to facility contamination (Gietz Interview 1985).

2. Lack of Treatment and Transport Facilities

The lack of treatment facilities in the RMOC necessitates the long distance transportation of hazardous wastes. While the closest hazardous waste treatment facility to Ottawa is the Tricil plant near Montreal, the RMOC depends most heavily on the Toronto area for the appropriate disposal of hazardous wastes (Sinclair Survey 1985).

Transportation has proven to be a very complex variable in the waste management system for four reasons: i) it is presently very hard to regulate the movement of hazardous cargoes within a region, ii) there are very high capital costs to an individual firm for purchasing, operating and properly maintaining hazardous waste transportation equipment, iii) when an industry utilizes a cartage firm they must absorb very high transportation costs, in addition to treatment costs, and iv) the potential risk that the general public must accept when hazardous wastes are transported on public roads.

There is at present no co-ordinated system for collecting and

transporting hazardous wastes out of the RMOC to licensed disposal facilities. The lack of a collection system has meant that an individual generator must organize hazardous waste pick up from Montreal or Toronto. This has proved to be very costly due to the small volumes that any individual firm produces. To try to improve this situation, the three waste management firms previously mentioned began, about two years ago, doing circuit routes throughout the region to collect hazardous wastes from a variety of generators.

While this step has improved waste management in the region, there is still no coordinated system for collecting and transporting these wastes. High transportation costs are a significant disincentive to the appropriate disposal of hazardous wastes in the region. It is hard for generators to accept high transportation costs, according to the three collecting waste management firms, when the bulk of the volume being transported is water. The development of a collection system facilitating the bulking and volume reduction of hazardous wastes, along with a system designating the safest transportation routes for hazardous cargoes throughout the region, would greatly improve this situation.

3. Unknown Disposal

In any region there is always a portion of hazardous waste whose ultimate disposal point is unknown. The three waste management firms that do business in the region claim that the Ottawa River is the largest illegal deposition point in the region. Mosaic Chemical Corporation claims that they would likely not prosper if they located a facility in Ottawa until illegal disposal in the Ottawa River is

brought under control (Holland Interview 1985).

A recent Environment Canada study indicates that there are some fifty man-made chemicals in a glass of drinking water from the Ottawa River. These chemicals "include pesticides, solvents, and dozens of suspected carcinogens" (Ottawa Citizen, Saturday, April 13, 1985:A-1, F-1). The Ottawa River is beginning to show the effects of municipal, industrial and agricultural pollution. Illegal sewer hookups from homes and businesses all pour directly into the river from some 130 storm sewers (Sinclair 1985).

At a OWMC public consultation meeting held in Ottawa, February 12, 1985, the plight of the Ottawa River was discussed. It was compared to the much more serious problem in the Niagara River, where 89 industries on the U.S. side and 12 on the Canadian side discharge directly into the river. The OWMC hopes that improved statutory regulations of the Ontario Ministry of Environment will get industrial wastes out of our rivers.

4. Lack of Awareness

The RMOC is typically viewed as a region that has no generators of hazardous wastes because the bulk of the industry located in the region is commonly conceived as being "clean". This lack of awareness has hindered recognition of the hazardous waste situation, and what the needs of hazardous waste generators might be in a regional setting. In particular, small hazardous waste producers lack the ability and infrastructure to handle hazardous wastes and these businesses should be identified and assisted. Lack of awareness has also given generators the opportunity to dispose of

their by-products in any manner they choose.

5. Temporary Solutions

All interest groups in the RMOC should appreciate that the current industrial waste management responses, put in place by the region, are only temporary. By-law No. 208, discussed earlier, outlines the concentrations of hazardous waste that an industry is allowed to deposit in the sewer system. This may appear to be an effective form of hazardous waste management but there are deficiencies in the by-law:

i) Concentration limits allow industry to legally pollute. If an industry's effluent is too concentrated, it can be easily diluted to meet the limitations of the by-law.

ii) There is currently virtually no way to properly monitor the by-law in the region (Gietz Interview 1985). The region does not have the equipment to allow constant monitoring of industrial effluent streams. This makes it virtually impossible to apprehend violators of the by-law.

iii) The by-law was created, in the first instance, to ensure the continued operation of Ottawa's sewage treatment system, not to ensure the proper treatment, containment and disposal of hazardous inndustrial wastes.

iv) Officials in Metropolitan Toronto have found that industry perceives fines for sewer by-law violations as a "routine penalty". Industries continue to pollute through the sewer systems paying fines, when caught, as a cost of business.

These are critical deficiencies that must be recognized. A by-

law such as this may be very necessary in the total waste management system, but on its own it has little effect.

6. Lack of Communication Between the Regulators and Generators of Hazardous Wastes

Many generators view the public sector as antagonists who do not see improved communication as a solution to the hazardous waste management problems. Sixty-five percent of the respondents to the survey felt that there are communication problems between generators and the RMOC. A further 70% feel that hazardous waste generation has been regulated by the RMOC without their consultation.

This communication gap forces regulators to operate in a void. The regulators do not fully appreciate what the needs of generators are, nor do they attempt to solicit the sometimes expert assistance of those generators involved with hazardous waste management. The result is policies and programs that may not meet the specific needs of the generators within the region. Along this same line, generators have not stepped forward to assist the region, nor have they attempted in large part, to assist each other with specific problems.

The shroud of secrecy surrounding hazardous waste management hinders communication which in turn affects the implementation of policies and programs. It is difficult to implement management responses that improve a situation when no one has a clear understanding of the issues they are trying to deal with. More effective communication is one step that could help to solve these problems.

4.6 Conclusions

It is quite evident that the public sector and private sector responses to hazardous waste management, currently in place in the RMOC, do not achieve the containment of these wastes. Amendments to existing responses, in addition to the implementation of new responses, appear to be necessary if the problems discussed in this chapter are to be alleviated and proper management achieved.

The RMOC depends exclusively on other parts of Canada, particularly South-Central Ontario, for the treatment and disposal of wastes generated. Currently there is no coordinated system for managing these wastes within the region to ensure that the proper treatment and disposal takes place. This has been the origin of a number of problems with hazardous wastes in the RMOC that should be constructively dealt with.

CHAPTER 5

IMPROVING HAZARDOUS WASTE MANAGEMENT IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON

5.1 Overview

The RMOC seems to be in a very good position to try to correct some of the problems discussed in Chapter 4. As of March 1986, a $110,000 budget was established by the RMOC to evaluate hazardous industrial waste management in the region (Ottawa Citizen, March 19, 1986). This could go a long way toward implementing management responses if planning of the appropriate steps needed to solve the problems is initiated, rather than simply implementing policies that are an immediate reaction to the problems, with inadequate thought having been put into them.

The RMOC, as a regional government, has jurisdiction within its mandate over the eleven municipalities within its bounds. Most importantly, the RMOC has direct regulatory authority for the operation of the major landfills and sewage treatment plants, thus they are directly affected by poor hazardous waste disposal practices. This was exemplified most recently in early 1986 when the RMOC took responsibility for cleaning up coal tar, containing polynuclear hydrocarbons, leaking from an ancient Ottawa Gas Company disposal site. The coal tar spilled into the region's Lee's Avenue

storm sewer resulting in clean up that has so far cost 1.1 million dollars and could easily reach 3 million dollars (Ottawa Citizen) May 31, 1986:A-8). Serious consideration should be given by the RMOC to initiatives that can be implemented in response to, and targeted towards, the specific waste needs of the region. The RMOC is in a much better position than more senior levels of government to address the explicit needs of the region.

Eighty-five percent of the respondents to the "Survey of Views on Hazardous Waste Management in the Ottawa-Carleton Region" (The Survey) felt that the regional government should play a role in hazardous waste management. The response to what the role should be varied from total responsibility for the collection, treatment and disposal of hazardous wastes, to simply bearing some of industries' disposal costs. More senior levels of government see a clear opportunity for regional municipalities to deal effectively with some of the hazardous waste management issues (McMillan T., P.C., M.P., 1985; Stiles Interview 1986). The City of Ottawa has indicated that they, and some of their counterparts, feel that there is a vital and critical role for the region to play (Bury Interview 1986). Environmental groups such as Friends of the Earth, and the Ontario Public Interest Research Group, also see regional involvement as an extremely positive response in waste management planning (Wright Interview 1986; Castrilli 1983:68; Jackson Interview 1986; Vles Interview 1986).

In order to determine the most appropriate management responses for the RMOC to initiate, the options available should be

established and the reactions of the main players to those options, should be identified. The main players include hazardous waste generating operations within the RMOC, government, including the Federal, Provincial and Municipal levels, both as regulator and generator, and environmental groups such as; Pollution Probe, Friends of the Earth, Ontario Public Interest Research Group, Haldimand-Norfolk for a Pure Environment, Canadian Environmental Law Association, West Lincoln Task Force Against Toxic Wastes, Citizens for Modern Waste Management. Having done this, a consensus can likely be achieved resulting in concrete recommendations for the implementation of positive management responses.

5.2 Management Response Options

5.2.1 Hard Responses

There are at least four hard management responses that could be implemented in the RMOC to improve the management of hazardous wastes in the region. Hard responses require physical infrastructure which may include equipment for the destruction of hazardous wastes such as incineration systems or perhaps landfill disposal facilities. The following hard management responses are theoretically possible options for the RMOC:

1) Regional Hazardous Waste Treatment Site

The availability of a waste treatment site would improve generator accessibility to appropriate treatment technologies, fostering greater use of such facilities and advance hazardous waste management. A number of respondents to the survey felt that the best regional management response would be the establishment of a

regional hazardous waste treatment site. The site could consist of a Rotary Kiln Incinerator, since the bulk of the region's hazardous wastes are organic in nature, and a fixation or stabilization plant in order to solidify the treatment residue before transportation to a secure landfill outside the region.

There is no doubt that a number of the region's hazardous waste generators take exception to the fact that there is no treatment or disposal option for their wastes in Eastern Ontario. This necessitates the long distance transportation of these wastes to south central Ontario and beyond. The respondents to the survey also felt that a facility such as this would promote better hazardous waste management in the region.

The government's position is not quite as positive on this issue. The RMOC does not feel that this type of response would be within its legal mandate. In addition to this, the initial capital costs are seen to be too high for either the region or a private management firm, due to the fact that the waste quantities in the region are not perceived as being large enough to make the operation profitable (Pickard Interview 1986). The provincial government feels that the hazardous waste treatment problems should and will be solved by the projected OWMC mega-treatment facility. Environmental groups tend to back modern waste treatment options within which, they feel, technology of this sort does not apply. (Hallis Interview 1986; Hayes Interview 1986).

2) Mobile Treatment

Mobile treatment offers both flexibility and accessibility.

The mobile treatment option was suggested in 10% of survey replies as being a possible management response for the region. This option would utilize one of the mobile incineration technologies available in Ontario (See Chapter 3). The mobile incineration unit offers flexibility, especially in a region where a larger treatment facility is not viable. The mobile unit would travel from one generator's site to another making it readily available, while at the same time, treating wastes "on site".

The region may be willing to accept private tenders on such an option if it could be proven to be risk free and viable for the region's waste stream (Pickard Interview 1986). The provincial and municipal levels of government are also very positive about such technology, especially for the destruction of P.C.B. wastes in storage (Stiles Interview 1986; Bury Interview 1986). Many environmental groups advocate mobile technology as being a suitable modern "destructive" treatment option (Hallis Interview 1986; Hayes Interview 1986).

3) Transfer Station

Transfer stations are seen as a vital and practical management response in regions geographically distant from central treatment facilities. According to survey results, 83% of the respondents felt that a transfer station within the region would improve the current situation. Only 6% of the respondents felt that a transfer station would not be a positive management response to hazardous waste generation in the region.

A transfer station, such as described in Chapter 3, offers a

number of positive management advantages, according to the responding generators. It can be viewed as a potential solution to cleaning up questionable waste disposal practices within the region. It can reduce the generator's waste disposal costs, along with providing a region wide waste management system. In addition, it is well suited for handling small quantities of hazardous wastes. This is particularly critical in the RMOC since the survey of regional generators indicated that the region has a large number of small volume hazardous waste generators (see Chapter 4).

Beyond this, generators were asked how often they would utilize such a facility if established. It is very positive to note that 77% of the survey respondents indicated that they would make use of a transfer station at various intervals throughout a single month. Table 5.1 displays this information.

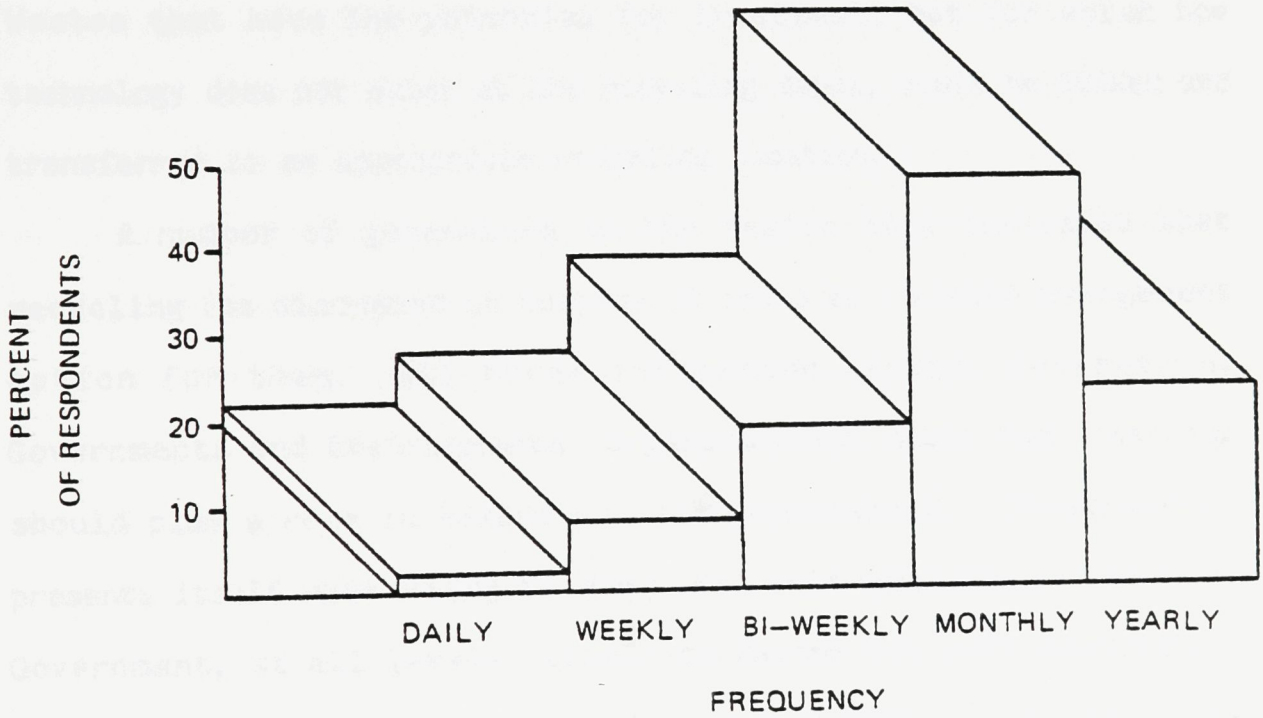
There seems to be a willingness on the part of regional generators to react positively to such a management response. As has been noted, high transportation costs are seen as a significant disincentive to proper hazardous waste treatment in the Ottawa-Carleton region. It is perceived by generators that such a management response would significantly lower their overall waste management costs in real terms.

The RMOC regional works commissioner expressed the view that there is a definite need for a transfer station within the Ottawa-Carleton Region. A transfer station could be established as part of the regional waste management system. The region, while not currently willing to establish such a facility on their own

initiative, may invite private sector tenders on such a project (Pickard Interview 1986). The M.O.E. Ottawa branch also perceives the need for a transfer station in Eastern Ontario but believe that it will come to the region as part of the O.W.M.C. initiative sometime in the future (Stiles Interview 1986). Environmental groups feel that the transfer station is an important management tool in

Table 5.1

Potential Transfer Station Utilization



Source: Survey Data

rectifying the problems of externalization (Wright Interview 1986; Millyard Interview 1986).

4) Recycling Depot

Recycling has become an integral and important part of all waste management systems. Results of the survey of regional generators suggest that a recycling depot for hazardous wastes within the region may be a very useful option. Such a depot would serve as a location where recyclable hazardous wastes could be bulked and treated. This would require a full assessment of the region's hazardous waste stream to determine the best treatment option. Obviously, the facility could not cater to every waste stream. Wastes that have the potential for treatment, but for which the technology does not exist at the recycling depot, could be bulked and transferred to an appropriate recycling location.

A number of generators in the region have indicated that recycling (as discussed in Chapter 3) could be a viable management option for them. All three interested groups, Generators, Governments and Environmental Organizations, state that recycling should play a role in hazardous waste management. Disagreement presents itself when trying to shape what role recycling should play. Government, at all levels, appear to favour the soft management responses to recycling (see Section 5.2.2) while generators and environmental groups tend to favour a harder response, such as a recycling depot.

5.2.2 Soft Responses

There are a diverse number of soft or systems management

responses that could be implemented in the RMOC to improve the management of hazardous wastes in the region. Soft responses do not require the physical infrastructure of hard responses; rather, they are consultative or planning oriented in nature. Soft responses could include anything from public education to the establishment of a regional co-op for recycling. The following soft management responses are seen as possible options for the RMOC:

1) Policy Diversification

Perhaps the most popular soft management response of government is the amendment of existing policies or implementation of new policies. The range of options available to regulatory bodies for new policy is virtually endless. Regulatory policy on its own however, can be self defeating, especially if the physical infrastructure necessary to support the policy is not readily available. Careful planning must first be initiated before a new policy can be implemented.

Survey respondents in the RMOC generally appear to adopt an uncritical attitude towards the existing public sector policy responses. Fifty percent of those questioned felt that hazardous waste generation is properly regulated in the province, while 30% felt that it was underregulated. The most common position taken by the respondents was that the public sector policy responses in place would serve the purpose if they were properly enforced.

Fifty-eight percent of the respondents expressed the opinion that the Provincial hazardous waste management laws, policies and programs were either underenforced or inconsistently enforced. Only

19% felt that the provincial laws, policies, and programs were properly enforced. Much the same scenario was put forward in relation to the enforcement of Federal laws, policies and programs, the single difference being that only 17% felt that federal policy responses were properly enforced.

The regional picture was somewhat different. Forty-eight percent of respondents felt that the policies put in place by municipal levels of government in the region were either inconsistently enforced or underenforced. Surprisingly, 37% of the respondents had no opinion of the enforcement of municipal policy, stating most frequently, that they were not aware of any municipal policies governing hazardous waste management in the region. This is compared to only 15% who had no opinion of the enforcement of federal and provincial laws.

Not surprisingly, survey respondents did not propose sweeping changes to the legislation, nor did they propose that new policy be adopted. In fact, the respondents tended to oppose any management option that may involve increased regulation. Instead, the option of developing new and better ways of enforcing existing policy was favored.

All levels of government appear to see room to improve hazardous waste management through increased policy regulation. The Province of Ontario has established sweeping changes to regulation 309 "General Waste Management" as discussed in Chapter 3. The region perceives the opportunity to improve on existing policy through increased enforcement (Pickard Interview 1986; Hauk, Ottawa Citizen,

March 19, 1986). The environmental groups would like to see movement towards more stringent penalties for not abiding by the existing policies (Wright Interview 1986, Millyard Interview 1986). Environmental groups have generated a broad literature in this area as alluded to in Chapter 3.

2) Cooperative for Recycling and Reuse

Recycling is a cost effective and resource conscious waste management option. Environmental groups in general feel that the implementation of a recycling system for all wastes, including hazardous ones, is the most critical management response option (Millyard Interview 1986; Wright Interview 1986; Vles Interview 1986). All the groups involved felt that some form of system should be established that fosters greater recycling and reuse of the region's hazardous wastes. The cooperative option requires a managing body that would facilitate the transfer of wastes from generators to potential users of those wastes resulting in the recycling and reuse of those materials rather than their disposal. The cooperative could be operated much the same as the Canadian Waste Materials Exchange described in Chapter 3. This would involve the publication of a newsletter advertising wastes wanted and wastes available within the region. These advertisements would be confidential and the managing body would facilitate the exchange of waste between the parties.

The setup of a cooperative that advances recycling and reuse of wastes was not as well received by hazardous waste generators as may have been expected. Fifty-two percent of respondents said they would

be interested in participating in such a plan, but 48% said that they did not feel they would be interested. If the cooperative also addressed issues such as coping with provincial legislation, requiring the establishment of emergency response teams etc. 73% said they would be interested in participating in such a system.

The establishment of a hazardous waste cooperative within the region would offer a number of positive benefits. The publication of a newsletter advertising wastes wanted and available could also act as an information dissemination and collection forum. The system for exchanging wastes could be tied into the Canadian Waste Materials Exchange, fostering greater recycling throughout the province. The Region of Waterloo, for example, operates a successful waste exchange within their region (Resource Integration Systems 1984).

3) Information Directorate

Hazardous waste management has been and continues to be, a field where information collection and exchange is difficult, if not non-existent. The management of hazardous wastes is often shrouded in secrecy, promoting very little exchange of ideas between generators and regulators. Survey results indicate that there is an information gap in the RMOC, as has been found in other regions such as Waterloo (Resource Integration Systems 1984).

In addition to the large percentage of generators who had no knowledge of regional by-laws governing hazardous waste disposal in the region, a further 73% indicated that their waste management operations would benefit through obtaining more information about the disposal practices of other generators in the RMOC. In addition to

this, 58% indicated that their waste operations would benefit further through obtaining more information on the establishment and funding of new hazardous waste management technologies.

An information directorate could distribute information concerning programs and policies within the province and region, establishing vital lines of communication between generators and the RMOC. The directorate should be able to provide consultation on regional industrial waste recycling and disposal options. A further valuable role would be to maintain up-to-date technical literature that could be made available to generators upon request. The information directorate would also be able to provide the names of important contact people outside of their jurisdiction. Public education might also constitute a critical role of the directorate. A number of survey respondents commented that they have found it very difficult to obtain information on hazardous waste management issues from the region's pollution control department and the regional Ministry of Environment office. Many have found themselves making calls to central Ontario and beyond for information. The fostering of information exchange within the region, while being able to answer basic management questions, would help to end the sense of frustration that many generators now have when trying to adhere to legislation.

There are also a number of important publications such as the Technical Manual on Waste Abatement, Reuse, Recycling and Reduction Opportunities in Industry and Profit from Pollution Prevention, which should be made freely available to both generators and the region's

pollution control employees. The technical manual was published as a result of a study of the information gaps in hazardous waste management in the region of Waterloo. Each industry in Waterloo was sent a copy of the manual and told they could purchase it for a mere $25.00. Information directorates are vital in disseminating data such as this.

Environmental groups are very positive about fostering information exchange. Within the region, assuming appropriate backing, OPIRG Carleton was willing to offer their information sources and expertise to develop an information directorate on hazardous wastes within the region (Gloger F. and Scher R. Interview 1986). More senior levels of government are also trying to generate greater information exchange. Environment Canada's motto for this year is "working better together". The RMOC, however, felt that an information directorate could only be established if a cost benefit analysis indicated that such a venture was viable (Pickard Interview 1986).

4) Waste Day

Establishing a hazardous waste day could be an important and beneficial option. A day would be set aside for small waste generators to bring their hazardous wastes to a specific site so that they may be collected and taken for treatment and disposal. This would include the homeowner who often has small quantities of hazardous products around the house. Waste days have been used in the region of Waterloo with great success, and other regional governments such as Metro Toronto and Mississauga are contemplating

the same steps (Resource Integration Systems 1984). Waste days are an important public educational option that could serve to get many household and laboratory hazards out of regional landfills.

The City of Ottawa is actively looking into the waste day option, but feel it could be handled much more economically at the regional level with municipal assistance (Bury D. Interview 1986). The province also perceives that it is within the region's scope to deal with small generators of hazardous wastes, such as the homeowner, and feel that waste days are a viable option (Stiles Interview 1986). Environmental groups have likewise advocated waste days as a hazardous waste management tool (Vles Interview 1986).

The Regional Works Commissioner feels that a waste day may be a suitable response to the problems created by small hazardous waste generators. He does not, however, see it as the region's responsibility nor consider it within their legal mandate. The region does not at present have the people or budget for such an operation. The Commissioner feels that it could only be carried out with the assistance of the municipalities and the province.

5) Coordinator

Establishing and coordinating a viable hazardous waste management system is a critical task. Hazardous waste management in the RMOC lacks any coordinating body at this time. Survey results indicate that, by far, the most popular response, 40%, to the possible management options, was for the region to fulfill the role of hazardous waste management coordinator. Coordination of hazardous waste management activities could involve a number of different

programs to ensure that any system for collecting and treating waste operates properly. As coordinator, the region would have to first establish who the hazardous waste generators are, along with the types of waste they are producing. This would make the task of enforcing existing policies much easier and also allow the region to develop a coherent plan for the wastes being generated.

Beyond this, the coordinator would have to ensure that there is an organized system for the collection, treatment and disposal of the region's hazardous wastes on a regular basis. This should also involve ensuring that the needs of small generators of hazardous wastes are met. Once the non-recyclable portion of the hazardous waste stream is dealt with, the coordinator should organize recycling efforts within the region. This could be done by identifying who is recycling, what wastes have the potential for recycling, and how firms not presently recycling could become involved. Updating changes in legislation to generators would also be an important function of the coordinator.

The RMOC could take on a number of roles as hazardous waste coordinator. In fact, it could take responsibility for implementing any or all of the options outlined as coordinator. The region however does not feel that it is within their mandate to coordinate hazardous waste management activities in Ottawa-Carleton. It is felt that this is clearly a provincial role and mandate. In contrast the provincial government sees the opportunity for better hazardous waste management if the region becomes involved in some manner, since they can reach everybody where the Ministry of Environment cannot.

Environmental groups feel that the region is the one closest to the problems of hazardous waste management, and is also the most directly affected by poor hazardous waste disposal and should therefore assume some role in coordinating efforts (Jackson Interview 1986; Wright Interview 1986).

5.4 Conclusions

There are a number of hats that the RMOC could wear if it chose to implement any of the management response options outlined. The RMOC could find itself in the role of regulator, operator and/or consultant. It is very clear that the solution to the problems identified is not solely increased legislation but rather a more constructive approach that provides generators with an array of treatment options and information sources. The region should recognize that many of these constructive options will serve the purpose of getting hazardous wastes out of the region's sewers and landfills, the RMOC prime concern. At the same time they offer other positive benefits that satisfy the needs of generators within the RMOC, all within the scope of the region's legal mandate.

The RMOC has indicated that it does not want to become the operator of hazardous waste management facilities, such as a transfer station, but it should be recognized that it is possible to take a positive initiative and then pass it over to private concerns after the critical establishment phase. Involvement of this constructive sort can only serve to improve hazardous waste management throughout the region.

CHAPTER 6

SUMMARY

6.1 Conclusions and Recommendations

The objectives of this paper, as stated in Chapter 1, were to: review the hazardous waste management framework in place in Ontario; evaluate the current hazardous waste management system functioning in the Regional Municipality of Ottawa-Carleton (RMOC); identify any problems in this system hindering the proper management of hazardous wastes; develop possible appropriate management response options to any existing problems, and; incorporate the views of the main players throughout this process. These objectives have been achieved in relation to the RMOC.

By employing Lang and Armour's environmental management framework, the purpose of this paper has also been fulfilled. The controlling function of the environmental management framework was utilized to evaluate whether or not the responses implemented by the public sector to manage the treatment and disposal of hazardous wastes within the RMOC, were achieving the goal of "proper management".

The purpose and objectives of this paper were addressed using a number of research techniques including, literature reviews, non-

scheduled structured interviews, and a survey. This brought together the views and opinions of the main players, achieving a broader more comprehensive evaluation of the hazardous waste management situation in the RMOC, thus going beyond the narrow interpretation of a single player's perspective.

The general conclusions resulting from this research are:

1) the public sector responses in place within the RMOC are not currently achieving the goal of proper management of hazardous wastes;

2) this situation is not adequate since hazardous wastes are entering the environment on a daily basis, thereby threatening both human health and the environment;

3) there are a number of management response options, as outlined in Chapter 5, that could be implemented to alleviate these concerns and move the region closer to achieving the proper management goal.

Unfortunately, the management of hazardous wastes tends to be somewhat of an orphan; there appears not to be a single level of government that is anxious to step in and assume the responsibility for implementing responses that would ensure the proper management of hazardous wastes. Some officials of the Municipal, Regional and Provincial levels of government, within the region, feel that the Ontario Waste Management Corporation (OWMC) has the only legal mandate and responsibility for managing hazardous waste treatment and disposal. The O.W.M.C. is no doubt an important player, but it should be recognized that generators have been waiting since 1980 for

action from the OWMC and still have none. A conservative estimate would place the planned OWMC hazardous waste treatment system in operation by 1993, assuming that there are no delays. This is too long to wait since the status quo is not acceptable. Beyond this, 60% of the respondents to the "Survey of Views on Industrial Waste Management in the Ottawa-Carleton region", felt that the OWMC facility would in no way benefit their operation in properly managing hazardous wastes.

Furthermore, provincial and municipal governments and the private sector in the RMOC felt that the OWMC's tardiness, coupled with the need for the proper management of hazardous wastes put the regional level of government in a position to respond to hazardous waste issues. Eighty-five percent of the regional generators who responded to the survey felt the Ottawa-Carleton region has a role to play. Both provincial and municipal levels of government also felt that constructive responses of the nature outlined were within the mandate of the region. They did not however, foresee the region in the role of establishing hazardous waste treatment facilities. Environmental groups felt that the region should become involved and were even willing to assist.

All parties interviewed felt that at the very least, the region should take steps to help small hazardous waste generators, including homeowners. Providing the public with safe means to dispose of household hazardous wastes has been addressed in other regions, such as Waterloo and Mississauga, and should be addressed by the RMOC. There is absolutely no infrastructure for dealing with small

hazardous waste generators. Even the Ontario Ministry of Environment has indicated that one of their biggest problems is trying to cope with small waste generators or homeowners who want to dispose of a minute quantity of hazardous waste (Stiles Interview 1986).

It appears that in order to attempt to achieve the proper management of hazardous wastes throughout the RMOC, at the very least there needs to be: an improved pick-up and transportation system that allows the generator to utilize an array of treatment options; an infrastructure established to deal with the problems of small hazardous waste generators; improved utilization of the recycling systems available; better enforcement of existing by-laws controlling hazardous waste disposal and; coordination of all waste management activities within the region. If these needs are fulfilled, the region will be moving toward having a functional waste management system.

The RMOC should recognize that they are the appropriate level of government to implement the needed management responses. The bases for this contention are:

1) Regional Municipalities are closer to the immediate situation than more senior levels of government, thereby allowing them to respond to the specific needs of the generators within their bounds.

2) Spatially, the RMOC has certain political-administrative responsibilities over the entire Ottawa-centered urban region.

3) Economies of scale would indicate that it is more cost effective for regional municipalities to implement management

responses than local municipalities.

4) Other regional municipalities, such as Waterloo and Toronto, have taken steps to ensure the proper management of hazardous wastes within their bounds.

5) The RMOC's legal jurisdiction over sewers and landfills, (see Sec. 34 and 181 of the Regional Municipality of Ottawa-Carleton Act, RSO 1980 Ch. 439), gives the region authority to implement responses managing hazardous wastes, and also mean that the region is directly affected by poor hazardous waste disposal.

6) Generators within the region agree almost unanimously that the Ottawa-Carleton region has a role to play.

7) The RMOC itself has established a budget to examine the current hazardous waste management system, and

8) The RMOC's Official Plan (1983) outlines that the region has the following specific goals:

i) to control all forms of environmental pollution,

ii) to provide for the efficient disposal and treatment of all domestic and industrial wastes,

iii) to minimize exposure to adverse environmental influences,

iv) to provide adequate protection to plant and animal life,

v) to ensure respect for and harmony with the natural environment. (RMOC Official Plan 1983:1-6)

Clearly, if the region is going to fulfill these goals, hazardous wastes must be properly managed.

It is quite evident that there is a case for regional participation in ensuring the proper management of hazardous wastes. If the RMOC recognizes that they do have a role to play in this

field, it is suggested that the following specific recommendations be implemented.

1) **Affirm the validity of existing regional policies**

By-law 208, outlining the concentrations of hazardous waste compounds that can be disposed of in the region's sewer system, could serve a vital function in the total waste management system if it were enforced. The by-law serves little, if any, purpose if enforcement is not forthcoming.

2) **Perform a coordinating role for all hazardous waste management activities in the region**

The implementation of recommendations three through five depend on proper coordination to ensure that all generators are: aware of the systems, utilizing the systems, and that the systems are operating effectively. The RMOC would be an appropriate body to fulfill this role and many regional generators think that it is suitable for them to do so.

3) **Work actively to determine the viability of establishing a transfer station within the region**

Transfer stations fill an important void in any waste management system that is geographically distant from central treatment facilities. Transfer stations ensure that there is systematic and coordinated pick up of hazardous wastes from generators. Clearly, generators see them as a necessary component for any hazardous waste management system in the RMOC.

4) **Perform a lead role in establishing a hazardous waste cooperative aimed at recycling, reducing and exchanging of wastes generated**

Reduction and recycling of hazardous wastes diminishes the volume requiring treatment and disposal facilities and lowers the risk of environmental contamination by hazardous wastes. A regional waste cooperative could also be tied effectively into the national Industrial Waste Exchange thereby enhancing the exchange system.

5) **Endeavor to establish a hazardous waste day within the RMOC**

With the assistance of other levels of government, this type of response shows a willingness to constructively deal with the problem of small hazardous waste generators and at the same time highlights awareness to hazardous waste issues.

In the course of these recommendations the soft or system oriented responses have been favoured over the hard management responses outlined in Chapter 5. The soft responses were preferred as potential management response options for the RMOC by the main players. The soft responses also appear to be the most practical for regional implementation. In addition to this, most of the hard management responses require physical infrastructure that is highly capital intensive and requires large volumes of waste in order to operate properly and in a cost effective manner. It does not appear, from current estimates, that the RMOC generates enough hazardous wastes to satisfy the requirements of these operations.

6.2 Concluding Remarks

The controlling function is one of the most important steps in the environmental management framework and it is the one most often

overlooked. The evaluation of implemented management responses in the form of laws, policies or programs is critical since they do not operate in a void. Changing situations, or the lack of the initial responses to achieve desired goals, are reason enough to improve old or implement new responses. Evaluation is the only way to determine if the responses implemented are achieving set goals.

During the course of this research, application of the environmental management framework has been made to the specfic case of hazardous waste management in the RMOC. This same process could be applied to other hazardous waste producing regions in Ontario or elsewhere. The application of this framework is not solely limited to hazardous wastes, but could be applied to a multitude of other environmental issues, such as lead in gasoline, acid rain and others. Developing a solid management system and continually evaluating its performance is essential in attempting to solve our environmental problems.

It is often forgotten that we, the public, pay for the effluents of industry. Costs will be incurred to the public either through the increased price of consumer goods, payments by a government agency for the clean up of hazardous waste contamination, or through damage to health and the environment that surrounds us. Ultimately it is up to the public to direct the elected officials as to which of these we prefer to bear.

APPENDIX "A"

SURVEY OF VIEWS ON HAZARDOUS WASTE MANAGEMENT IN THE OTTAWA CARLETON-REGION

Carleton University
Ottawa, Canada K1S 5B6

January 6, 1986

Mr. A. Sinclair
A.B.C. Inc.
68 Somerset Street W.
Ottawa, Ontario
K2P 0H5

Dear Mr. Sinclair:

Increasingly, government regulations controlling the disposal of various wastes are affecting many companies and institutions, and it appears that these policies are often developed with little, or no consultation with the affected firms and institutions. For this reason a study is being conducted to obtain opinions and information, specifically from organizations with waste disposal concerns, before new waste management policies are developed by the Regional Municipality of Ottawa-Carleton.

The study is intended to identify your thoughts on current waste management policies and issues which you feel are critical to improving waste management in the region. The attached questionnaire was developed with the help of several hazardous waste generating firms in the region, in hopes of including the "right questions". Your assistance with this will be most appreciated and will ensure that business views and concerns are identified; the results of the survey will be given to the Regional Municipality of Ottawa-Carleton.

This survey is being conducted as part of the research necessary to complete a graduate thesis for the Department of Geography at Carleton University.

For your convenience, a stamped, self-addressed envelope is enclosed and it would be appreciated if you would return the form whether completed or not. If the survey has not reached the appropriate hands in your organization, please pass it on. Your answers will be held in strict confidence.

If you require further information, please contact either; Professor Duncan Anderson 564-5562, Dr. Michael Smith 564-5566, or Mr. John Sinclair 564-2611.

Thank you for your assistance.

Yours sincerely,

John Sinclair

Faculty of Social Sciences ☐ Department of Geography ☐ Loeb Building ☐ (613) 564-2641

SURVEY OF VIEWS ON HAZARDOUS WASTE MANAGEMENT IN THE OTTAWA-CARLETON REGION

PLEASE NOTE

This questionnaire is meant to solicit your opinions regardless of your experience or level of involvement with hazardous waste issues, so please try to answer all the questions that are applicable. In many cases, space is provided for your comments.

All answers will be held in confidence, and the results will be used in statistical form.

1. Which of the following industries or services best describe your operation?

a) Agricultural Chemicals/Pesticides ____
b) Chemicals ____
c) Computing Equipment ____
d) Drugs ____
e) Electronic Components ____
f) Explosives ____
g) Government ____
h) Leather and Tanning ____
i) Man-made Fibers ____
j) Metal Plating and Coating ____
k) Oil and Greases ____
l) Paints and Allied Products ____
m) Plastics ____
n) Printing ____
o) Pulp and Paper ____
p) Rubber Products ____
q) University or College ____
r) Waste Management Firm ____
s) Woven Fabrics and Finishing ____
t) Other (specify) _____

2. How many employees are there in your organization?

_____

3. Are you personally involved in plant operations?

Yes _____
No _____

4. If hazardous wastes are generated at your facility, what do you estimate the quantity to be?

Less than 100 kg/month ____
100-1000 kg/month ____
1000-5000 kg/month ____
More than 5000 kg/month ____
Cannot Comment ____
Do Not Know ____

5.(i) Where does your operation treat and/or dispose of its wastes?

Onsite ____
Offsite ____
Sanitary Sewer ____
Cannot Comment ____
Do Not Know ____
Other (specify) _____

(ii) If offsite what location(s)? _____

6. Do you feel that hazardous waste management in Ontario is currently:

Overregulated _____
Underregulated _____
Properly Regulated _____
Comments _____

7. Do you feel that provincial and municipal hazardous waste policies/ regulations generally make sense?

Yes _____
No _____
Do Not Know _____
Please Comment _____

8. What is your opinion as to how government agencies are enforcing hazardous waste management law and regulations?

	Federal	Provincial	Municipal
Overenforced	_____	_____	_____
Underenforced	_____	_____	_____
Properly Enforced	_____	_____	_____
Inconsistently Enforced	_____	_____	_____
No Opinion	_____	_____	_____

Comments _____

9. Do you feel that hazardous waste management in the Regional Municipality of Ottawa-Carleton has been regulated by Municipal and Provincial Governments without consultation with your organization?

Yes _____
No _____
Comments _____

10. Do you feel that there are communication problems between hazardous waste generators and the Regional Municipality of Ottawa-Carleton?

Yes _____
No _____
Comments _____

11. Could your operation benefit through obtaining more information about:

i) The disposal practices of other generators in the region?

Yes _____
No _____
Comments _____

ii) Establishing and funding of new in-plant waste management technologies?

Yes _____
No _____
Comments _____

12. Where, at the present, does your greatest cost burden lie in hazardous waste management?

Complying With Regulations _____
Treatment Processes _____
Ultimate Disposal _____
Transportation _____
Storage _____
Other (specify) _____

Comments _____

13.(i) Do you feel that a transfer station within the Regional Municipality of Ottawa-Carleton would improve hazardous waste management?

Yes _____
No _____

Comments

13.(ii) If established, how often would you utilize such a facility?

a) Daily _____
b) Weekly _____
c) Monthly _____
d) Yearly _____
e) Other (specify) _____

Comments _____

14.(i) Would your operation be interested in participating in a regional co-op aimed at recycling and reuse of industrial wastes through exchange within and outside the region?

Yes _____
No _____
Comments _____

(ii) Would a regional co-op also be useful in helping generators comply with provincial regulations? e.g. emergency response teams

Yes _____
No _____
Comments _____

15. Can you identify any current problems with hazardous waste management in the Regional Municipality of Ottawa-Carleton?

Comments _____

16.(i) Do you think the Regional Municipality of Ottawa-Carleton should play a role in hazardous waste management?

Yes _____
No _____
Comments _____

16.(ii) If yes, what do you feel the role should be?

Comments _____

17. If the Ontario Waste Management Corporation's treatment facility is established in southern Ontario, do you feel it will benefit your operation in the management of hazardous wastes?

Yes _____
No _____
Comments _____

18. Further Comments _____

Carleton University
Ottawa, Canada K1S 5B6

January 20, 1986

On January 6, 1986 a questionnaire was mailed to you entitled "Survey of Views on Hazardous Waste Management in the Ottawa-Carleton Region". The response rate to the questionnaire has been very gratifying so far. This letter is to remind you that if you have not yet returned the survey there is still time to do so and your response would be greatly appreciated.

I would also like to take this opportunity to thank all those people that participated in this survey.

Yours sincerely,

John Sinclair

Faculty of Social Sciences ☐ Department of Geography ☐ Loeb Building ☐ (613) 231-2641

APPENDIX "B"

GLOSSARY OF TERMS

Afterburner - An air pollution control device used during incineration that removes undesirable organic gases.

Biodegradable - A substance that decomposes quickly through the action of microorganisms.

Btu - "British Thermal Unit", a measure of heat quantity obtained through burning.

Dewatering - A physical process which removes water from a waste changing its physical form from that of a fluid to a slurry or damp solid.

Dioxin - A group of 75 chemicals of the chlorinated dibenzodioxin family, including 2,3,7,8 tetrachloro-dibenzo-para-dioxin.

Disposal - The discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous waste into or on any land or water so that such wastes or any constituent thereof may enter the environment.

Environment - The sum total of all living things and non-living entities and their reaction with each other.

Environmental Pollution - The unfavorable alteration of our surroundings, wholly or largely as a by-product of man's action, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical condition and abundance of organisms.

Filter - A device that removes solid particles from a fluid stream by passing the stream through a barrier that restrains the larger particles.

Fly Ash - Noncombustible particles carried by flue gas during incineration.

Generator - A person or firm which produces hazardous waste.

Hazardous Waste Management - The systematic control of hazardous wastes through collection, source separation, storage, transportation, processing, treatment, recovery and disposal.

Heavy Metals - Metallic elements having a high density which are toxic for the most part.

Incineration - A controlled process that uses combustion to convert a waste to a less bulky, less noxious or less toxic material.

Leachate - The liquid that has percolated through or drained from hazardous wastes and contains components of the waste.

Liner - A thin structure of clay or manufactured material, plastic, which serves as a barrier to leachate reaching groundwater.

PCBs - Polychlorinated Biphenyls; a family of chemically inert compounds, having the properties of low flammability and volatility and high dielectric constant.

pH - The measure of acidity or alkalinity of a chemical solution from 0 to 14.

Run-off - The portion of precipitation that drains over land as surface flow.

Scrubbing - The removal of impurities from a gas stream by spraying of a liquid.

Secure Landfill - The total containment or vault technique which isolates the waste from the immediate environment by the use of engineered systems including liners, collection tiles, and leachate circulation.

Slurry - A pumpable mixture of solids and fluids.

Toxic - A poisonous substance which has the ability to cause harm after reaching a target organ or organism. Toxic or toxicological effects refer to the adverse biological or health effects which result from either short-term or long-term exposure to a chemical.

APPENDIX "C"

CANADIAN WASTE MATERIALS EXCHANGE

The following is an excerpt from the monthly Canadian Waste Materials Exchange Bulletin, No. 42, Dec. 1984, that brings together waste owners and perspective buyers or users.

canadian waste materials exchange

la bourse canadienne des déchets

BULLETIN NO. 42

DECEMBER
DECEMBRE 1984

The letters of this map are used to identify the geographic region in which waste materials are available or wanted. The letter appears as the last letter in the waste code number.

Wastes are listed in the bulletin under 10 categories:

1. Organic Chemicals and Solvents
2. Oils, Fats and Waxes
3. Acids
4. Alkalis
5. Other Inorganic Chemicals
6. Metals and Metal Containing Sludges
7. Plastics
8. Textiles, Leather and Rubber
9. Wood and Paper Products
10. Miscellaneous

Listings will appear in the language submitted.

Les lettres inscrites sur cette carte indiquent la région géographique dans laquelle des déchets sont disponibles ou demandés. Cette lettre apparait comme dernier caractère du code de déchet.

Les déchets sont inscrits au bulletin sous l'une ou l'autre des 10 catégories suivantes:

1. Produits chimiques organiques et solvants
2. Huiles, graisses et cires
3. Acides
4. Alcalis
5. Autres produits chimiques inorganiques
6. Métaux et boues contenant des métaux
7. Plastiques
8. Textiles, cuir et caoutchouc
9. Produits du papier et du bois
10. Divers

Les inscriptions paraîtront dans la langue de leur soumission.

ONTARIO**RESEARCH** **Sheridan Park Research Community, Mississauga, Ontario, Canada. L5K 1B3 (416) 822-4111**

canadian waste materials exchange

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Dear Participant:

Once again we have to ask you to help us help you in 1985 by sharing the costs of the Canadian Waste Materials Exchange programme. Enclosed is an invoice card and reply envelope. We really need your support in this coming year. Our government sponsors, who funded us completely in the first few years of operation, are saying, "If the programme is useful, as you say it is, to industry, why aren't they paying for it?" We have kept our request down to $25.00 for one more year, in the hopes that many more of you will, indeed, share in the costs of operating the programme in 1985.

We are increasingly getting complaints from people who send in enquiries about wastes which are listed in the bulletin that they are not hearing from the listers. We have always said that it is the lister' prerogative not to contact specific enquirers if they are competitors or for other good reasons. In these specific cases, I would appreciate it if you would please call us at the Exchange so that we can explain to enquirers. I feel this is a matter of courtesy to enquirers who are obviously geniunely interested in what you have listed in the bulletin.

The prevalence of this problem suggests that there are more instances of non-response to enquirers than those for which there are legitimate reasons. If you have a waste listed as being available or wanted, we presume it is because you seriously want to dispose of or obtain that material. We also work on the premise that enquirers are seriously interested in obtaining or supplying these materials.

SO, IF WE DO SEND YOU ENQUIRIES, PLEASE DO ONE OF THE FOLLOWING:

(a) Respond promptly;
(b) Let us know you do not intend to respond;
(c) Ask us to remove the listing if you are no longer interested in disposing or obtaining the material.

We are trying to help both our listers and enquirers to solve their waste reuse problems. If you have any suggestions as to how we can do this even more effectively, we would be delighted to hear from you.

We hope that you will once again support the Canadian Waste Materials Exchange programme in 1985. We look forward to receiving your cheque for $25.00 to continue receiving the bulletins in the upcoming year.

Bob Laughlin

R. G. W. Laughlin
Manager

ONTARIORESEARCH Sheridan Park Research Community, Mississauga, Ontario, Canada L5K 1B3 (416) 822-4111

WASTES AVAILABLE : DECHETS DISPONIBLES

Use Form 3 to enquire about these wastes if you think you could use them.

Veuillez utiliser la formule 3 pour obtenir des renseignements sur les déchets que vous pourriez utiliser.

1. ORGANIC CHEMICALS AND SOLVENTS : PRODUITS CHIMIQUES ORGANIQUES ET SOLVANTS

	Region/Région	Quantity/Quantité	
A006	O	---	Crude naphthenic acid still bottoms (Toronto)
A170	O	5000 lbs/week	Slush from solvent processing
A221	O	2000 gal/week	Light solvents sludge (Toronto)
A298	R	80,000 gal/week	Molasses stillage (Montreal)
A627	N	2 tons/week	1,2 Diamino cyclohexane/hexamethylene diamine mixture (Maitland)
A689	O	11,000 lbs	Calcium acetate powder
A783	G	2000 gals/month	Fusel oil (Calgary)
A852	N	4 drums/year	Thermally degraded polyalkylene oxide H.T. fluid
A1132	I	12 gals	Flytox containing lindane
A1322	O	63 x 45 gal drums	Resin, isocyanate, ethylene chloride and water
A1323	O	15 x 45 gal drums	Plasticol and DOP
A1324	O	113 x 45 gal drums + 215 x 5 gal pails	Paint water and caustic soda
A1332	Q	500 gall par mois	Peintures latex et alkydes
A1349	O	40 packages	Compound Resolin 105 (contains polyurethane) (Toronto)
A1358	I	200-1000 gal/year	Chlorinated hydrocarbon wastes (some asphalt)
A1366	S	180 gals/an	Varsol melange avec huile de coupe (St. Cyprien)
A1368	O	1500 gal/week	Condensate water 5-10% phenol 10-15% formaldehyde
A1400	H	6 drums/year	Flux 25% rosin 75% IPA (Saskatoon)
A1413	O	4556 kg	Hotmelt adhesive Bostic No. 9315
A1416	O	15-20 drums/week	6% acetone solution
A1452	O	2 drums/month	Acetone (Mississauga)
A1453	O	3-4 drums/month	Shellsol (Mississauga)
A1461	G	30 gals/month	Rubber Cement
A1467	O	200 Barrels	Miscellaneous chemicals (resins, diols, triols, isocyanates)
A1468	O	160 gal/month	Perchlorethylene sludge
A1469	O	300 lb/month	White resin glue
A1485	O	15 x 45 gal drums	98% Acetonitrite 1% water
A1486	O	10 x 45 gal drums	92% Acetic Acid 7% water
A1507	R	10,000 gals	Paint
A1515	O	15,000 kg/month	Solvent slop (Toronto)
A1516	R	5,000 kg/month	Solvent slop (Montreal)
A1518	S	2000 litres/month	Alcohol solvent waste (ethanol/propanol) (Cowansville)
A1519	R	1200 lbs	Biphenyl (Montreal)
A1590	O	2 drums/month	Solvent slush
A1599	O	6,000 gals + ongoing supply	50% IPA Solution
A1640	O	6,000 gals	High bild solvent base industrial paint
A1648	O	85,000 lbs	Xylene sulphonic acid (Niagara Falls)
A1649	O	35,000 lbs	Toluene sulphonic acid (Niagara Falls)
A1654	O	800 L/yr	1,1,2-Trichloro-1,2,2-trifluoroethane 98.5%+
A1668	O	---	Hydrazine hydrate N_2H_2
A1670	O	---	Dow Therm A (polyethylene glycol)
A1671	N	3,000 litres at irregular intervals	5% aqueous solution of ethylenediamine contaminated with iron corrosion products

WASTES AVAILABLE : DECHETS DISPONIBLES

Region/Région		Quantity/Quantité	
→ A1677	N	450 lbs	Silicone fluid GE #CS 4152
A1680	O	1500 litres	Denatured industrial alcohol 40% EtOH, 4% MeOH
A1682	O	144 cu ft	Ion exchange resin Rohm and Haas IRA-402 new
A1683	O	470 cu ft	Ion exchange resin Rohm and Haas IRA-93 new
A1684	O	153 cu ft	Ion exchange resin Rohm and Haas IRN-154 new
A1685	O	185 cu ft	Scintillation liquid "bio flour" Ne-961
A1686	O	41 cu ft	Ion exchange resin IRA-402 reclaimed and used material
A1687	O	248 cu ft	Ion exchange resin Rohm and Haas IRA-120 new

2. OILS, FATS AND WAXES : HUILES, GRAISSES ET CIRES

A380	O	15 drums/month	Petroleum acid pitch
A410	O	600,000 gals/year	Oily biox sludge 1.9% organics 2% solids (Oakville)
A912	O	1000 lbs/month	Petroleum based wax
A1017	O	4500 gal/6 months	Sodium base soap lubricant
A1053	O	600 drums	Petroleum acid pitch
A1110	O	1200 lbs	GAFAC GB520 Emulsifier for textiles or wire drawing
A1143	O	2000 gal/month	Polywax/PA/Oil mixture (Sarnia)
A1310	Q	62,000 tons	Used baked carbon mainly anthracite, coke and pitch
A1312	O	32 x 45 gal drums	FDA approved high viscosity carbon wax
A1351	O	100 gal/week	Residual Galena Tramo E.P. gear lubricant
A1373	O	large quantities	Charcoal fines
A1388	O	25 MT/M	99% fine graphite
A1396	O	40 tons/quarter	Fatty material (stearic oleic palmitic acids) (Rexdale)
A1402	N	1100 kg/week	Filler earth containing 25% tallow (Ottawa)
A1464	O	100 pieces	Graphite blocks AGR58 18" x 3" x 60" (Toronto)
A1487	G	3000 litres/month	Oil sludge, non-halogenated C6+
A1610	U	large quantities	Coke breeze
A1641	M	500 tons/year	Charcoal fine granular (South River)
A1642	M	30,000 lbs	Wood tar (South River)
A1646	O	15-20 tons/day	Char 4,300 Btu/lb (60% ash)
A1651	O	900 kg/month	Scrap candle wax, multicolours ($0.56/kg)
A1673	R	15 tons/month	Waxes
A1674	R	large quantities	Waste oils

3. ACIDS : ACIDES

A049	R	1500 ton/year	92% sulphuric acid (Montreal)
A360	O	4-5,000 tons/year	12-15% H_2SO_4 possible lead contamination (Toronto)
A906	O	5000 gal/year	15% H_2SO_4
A980	E	6000 tons/year	93% sulphuric acid + 3% organics (Port Moody)
A1267	E	3000 litres/month	20% (vol) HCl + dissolved Pb, Fe and Zn (Surrey)
A1293	O	5000 gal/week	Ferrous sulphite waste pickle liquor solution (Windsor)
A1307	O	2170 gal/year	Chromic acid solution with impurities
A1362	R	25 tonnes/sem	Acide 35% Acetique et 55% Sulfurique (Valleyfield)
A1363	R	25 tonnes/sem	Acide Acetique 50% (Valleyfield)
A1438	R	100 m^3/jour	Electrolyte use a 250 g/L H_2SO_4; 10 g/L Zn; 10 g/L Mn; 10 g/L Mg
A1524	R	15,000 gal/year	H_2SO_4 Pickle liquor (Zn + Fe contaminated) (Montreal)
A1528	R	---	Dry phosphoric acid in silicium pellets
A1593	O	2000 litres/mth	Reclaimed sulphuric acid (30% H_2SO_4) possible lead contamination
A1656	N	1000 gal/month	Nitric acid (4N) 20 oz per gal copper + nickel

WASTES WANTED : DECHETS DEMANDES

Use Form 3 to enquire about these wastes if you think you can supply them. Return Form 3 to the Waste Exchange.

Veuillez utiliser la formule 3 pour demander renseignements au sujet des déchets que vous pensez pouvoir fournir.

	Region/Région	Quantity/Quantité	
1. ORGANIC CHEMICALS AND SOLVENTS : PRODUITS CHIMIQUES ORGANIQUES ET SOLVANTS			
W185	O	Unlimited	Paint overstock, etc.
W235	O-V	Unlimited	Chlorinated solvents
W262	F	1-2000 gals/month	Benzene/toluene/xylene (Edmonton)
W292	O	10,000 gals/month	Chlorinated solvents
W347	O	Unlimited	Trichloroethylene
W350	O	Unlimited	Methylene chloride
W400	USA	Unlimited 6000 gal minimum	Chlorinated or non-chlorinated solvents + by-product chemicals
W401	O	Unlimited	Chlorinated & Unchlorinated Solvents
W411	U.K.	Unlimited	Tetrahydrofuran
W412	U.K.	Unlimited	Dimethylformamide
W413	U.K.	Unlimited	Dimethylsulphoxide
W414	U.K.	Unlimited	Pyridine
W415	U.K.	Unlimited	Alpha Picoline
2. OILS, FATS AND WAXES : HUILES, GRAISSES ET CIRES			
W248	R	- -	Scrap graphite
W257	All	Large quantities	Scrap graphite and electrodes
W270	L-R	Unlimited	Industrial waste lube oils; best prices offered
W303	O	Unlimited	Saturated filter carbons (granular active and non-active)
W330	O	Unlimited	Waste oils (Toronto)
W346	O	Large quantities	Waxes or oils
W354	O	Unlimited	Scrap graphite or baked carbon
W371	E	Unlimited	Waste oils and solvents
W399	USA	Unlimited 6000 gal minimum	Waste oils, fuels, condensates
W405	USA	Unlimited	Vegetable and animal fat by-products + glycerine clean or contaminated
W408	N	5,000-25,000 ton lots	Carbon based materials and other high Btu wastes
3. ACIDS : ACIDES			
W099	E	15,000 gals/month	HCl pickling waste (Pb 2 gpl, Fe 200 gpl)
W359	O	Unlimited	Contaminated pickle acid
W369	R	60 tonnes/jour	Moins a 50% de produits basiques (Valleyfield)
4. ALKALIS : ALCALIS			
W345	R	15 tonnes/jour	Au moins 80% de produits basiques
W360	O	Large quantities	Sodium hydroxide
W377	O	20,000 gals/week	25-30% spent caustic (no oil, sulphides, heavy metals) (Hamilton)

WASTES WANTED : DECHETS DEMANDES

	Region/Région	Quantity/Quantité	
5. OTHER INORGANIC CHEMICALS : AUTRE PRODUITS CHIMIQUES INORGANIQUES			
W034	O	- -	Solutions containing sodium nitrate (Hamilton)
W242	All	Large quantities	Gypsum and phosphogypsum
W245	O	- -	Spent alumina
W320	All	Large quantities	Gypsum
W321	All	Large quantities	Anhydrite
W322	All	Large quantities	Bauxite
W323	All	Large quantities	Alumina
W329	All	Large quantities	Any product containing high percentage calcium and/or silica
W343	All	Tonnage quantities	Scrap or spent alumina (low Ca, Mg)
W344	All	Tonnage quantities	Scrap or spent zirconium oxide (low Ca, Mg)
W361	O	Bulk quantities	Sodium sulphate, liquid, solid, solution
W372	O	Not specified	Spent urea liquor
W404	O	Unlimited	Ferric chloride
→ W429	All	truckloads	Silicon carbide
6. METALS AND METAL CONTAINING SLUDGES : METAUX ET BOUES CONTENANT DES METAUX			
W016	O	---	Liquid or solid containing tin (Hamilton)
W047	All	Unlimited	All types non-ferrous/precious metals residues, sludges, dusts drosses, grindings, oxides etc.
W130	All	Unlimited	Electrolytic silver recovery
W131	All	Unlimited	Scrap or exposed X-ray film
W132	All	Unlimited	Silver chip and residue
W133	All	Unlimited	Scrap tungsten carbide inserts
W153	O	Unlimited	Insulated copper wire or lead covered copper cable
W154	O	Unlimited	Non ferrous metals
W183	F	10 tons/day	Cobalt salts or residues
W198	O	3 million ft^2/mth	Perforated metal sheet 10-15 mil with 0.5-2" dia holes, 48-52" roll
W246	R	---	Non ferrous metals
W247	R	---	Ferrous metals
W249	R	---	Structural steel
W251	R	---	Steel shot new and used
W280	S	Unlimited	Galvanized angle
W281	S	Unlimited	Bare copper wire
W282	S	Unlimited	Fine bare stainless steel wire
W283	S	Unlimited	Perforated aluminum
W284	S	Unlimited	45 gallon steel drums
W285	S	Unlimited	Non ferrous metals
W286	S	Unlimited	Structural steel
W310	O	Unlimited	5 gallon steel pails with lids
W313	M	1000'	Extra heavy black pipe 1", 1-1/4", 1-1/2" dia, minimum 3" length
W318	All	Large quantities	Iron oxide
W319	All	Large quantities	Mill scale
W335	O	300 tons/month	FeSi
W336	O	100 tons/month	FeMn
W337	O	100 tons/month	FeCr
W338	O	100 tons/month	SiMn
W351	O	Unlimited	Sludges containing nickel, cobalt or other metals
W362	O	Truckload quantities	Aluminum powder
W364	O	Unlimited	Metal hydroxide filter press cake
W373	O	Truckload quantities	Zinc oxide
W378	S	Large quantities	Strip tail steel sheet 13 ga to 1/4"

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FORM 1

Company Name:	Contact:
Address:	Telephone:
	Telex/TWX:
Confidential information will not be disclosed	

To expedite enquiries may we give your name and telephone number to enquirers? yes ☐ no ☐

Please list the following wastes available from our plant in the next bulletin:

Code Number	Quantity/Timing	Description	*Geographic Location
exchange use only			

Please list the following substitute raw materials we could use at our plant in the next bulletin:

Code Number	Quantity/Timing	Description	*Geographic Location
exchange use only			

*Use letter identifiers from the map at the front of the bulletin or if you wish to publish a more specific location, e.g., Toronto, Halifax, etc., please list this here. You are encouraged to be specific unless you feel confidentiality will be jeopardized.

Formule française au verso

canadian waste materials exchange la bourse canadienne des déchets

FORM 2

Services Available

Please use this form if you wish to list waste transportation, reprocessing or consultation services available on a non-confidential basis.

I would like to be listed under the following category(ies) at $125 per category per year:-

Transportation or Reprocessing ☐ Consulting ☐

I enclose a cheque for $_____ to cover the cost of this listing in 6 issues of the bulletin.

*Geographic Region(s) served	Material(s) handled	Company name; address; telephone number; contact

Please be brief. This is not intended as an advertising service. The exchange reserves the right to edit entries.

*Use letter identifiers from the map at the front of the bulletin.

Formule française au verso

ONTARIORESEARCH Sheridan Park Research Community, Mississauga, Ontario, Canada, L5K 1B3 (416) 822-4111

canadian waste materials exchange la bourse canadienne des déchets

FORM 3

I am interested in item number _____ listed in the waste materials exchange. I think I might be able to use/supply _____ (quantity/timing) of this material and I would be interested in discussing this possibility with the company listing the item. Please forward this inquiry to them.

Date _____ Signature _____

Name _____

Title _____

Company _____

Address _____

_____

_____

Telephone _____

Telex/TWX _____

Formule française au verso

APPENDIX "D"

SUMMARY OF RESULTS FROM THE SURVEY OF VIEWS ON HAZARDOUS WASTE MANAGEMENT IN THE OTTAWA-CARLETON REGION

The following is a summary of the responses to survey questions that could be tabulated numerically. Those questions that are open-ended, with comments, that cannot be numerically tabulated are outlined in the text as noted.

1. Which of the following industries or services best describe your operation?

   See Table 4.1.

2. How many employees are there in your organization?

   See Table 4.2.

3. Are You personally involved in plant operations?

Yes	46
No	5
No Response	1

4. If hazardous wastes are generated at your facility, what do you estimate the quantity to be?

Less than 100 kg/month	29
100-1000 kg/month	10
1000-5000 kg/month	3
More than 5000 kg/month	1
Cannot comment	5
Do not know	2
No response	2

5. (i) Where does your operation treat and/or dispose of its wastes?

On site	7
Off site	39
Sanitary sewer	2

Cannot comment	2
Do not know	1
No response	1

(ii) If off site, what locations?

See Chapter 4, Section 4.4.

6. Do you feel that hazardous waste management in Ontario is currently:

Over regulated	2
Under regulated	16
Properly regulated	26
No response	8

7. Do you feel that provincial and municipal hazardous waste policies/regulations generally make sense?

Yes	31
No	1
Do not know	18
No response	2

8. What is your opinion as to how government agencies are enforcing hazardous waste management law and regulations?

	Federal	Provincial	Municipal
Over enforced	0	0	0
Under enforced	15	14	13
Properly enforced	9	10	6
Inconsistently enforced	15	16	12
No opinion	11	10	19

No response - 2

9. Do you feel that hazardous waste management in the Regional Municipality of Ottawa-Carleton has been regulated by Municipal and Provincial governments without consultation of your organization?

Yes	35
No	10
No response	7

10. Do you feel that there are communication problems between hazardous waste generators and the Regional Municipality of Ottawa-Carleton?

Yes	32

No	11
No response	9

11. Could your operation benefit through obtaining more information about:

(i) The disposal practices of other generators in the region?

Yes	38
No	13
No response	1

(ii) Establishing and funding of new in-plant waste management technologies?

Yes	30
No	19
No response	3

12. Where, at the present, does your greatest cost burden lie in hazardous waste management?

Complying with regulations	5
Treatment processes	1
Ultimate disposal	27
Transportation	9
Storage	5
No response	5

13. (i) Do you feel that a transfer station within the Regional Municipality of Ottawa-Carleton would improve hazardous waste management?

Yes	43
No	3
No response	6

(ii) If established, how often would you utilize such a facility?

Daily	1
Weekly	4
Monthly	23
Yearly	11
Bi-weekly	9
No response	4

14. (i) Would your operation be interested in participating in a regional co-op aimed at recycling and reuse of industrial wastes through exchange within or outside the region?

Yes	26

No	25
No response	1

(ii) Would a regional co-op also be useful in helping generators comply with provincial regulations, e.g., emergency response teams?

Yes	38
No	6
No response	8

15. Can you identify any current problems with hazardous waste management in the Regional Municipality of Ottawa-Carleton?

See Chapter 4, Section 4.5.

16. (i) Do you think the Regional Municipality of Ottawa-Carleton should play a role in hazardous waste management?

Yes	44
No	7
No response	1

(ii) If yes, what do you feel the role should be?

See Chapter 5.

17. If the Ontario Waste Management Corporation's treatment facility is established in southern Ontario, do you feel it will benefit your operation in the management of hazardous wastes?

Yes	19
No	30
No response	3

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