Household Waste Paint In Manitoba: An Assessment of the Feasibility of Management Alternatives

By

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A Thesis Submitted
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Abstract

The subject of this research is the management of household waste paint in Manitoba. Proper management of this waste stream is important for a number of reasons. First, the chemical properties of household waste paint are similar to products which when used in industry are regulated as hazardous wastes, controlled products and/or dangerous goods by provincial and federal regulators. Second, because nearly all households will at some point generate waste paint, this material has the potential to become prevalent in the municipal waste stream if management controls are not in place. Both of these reasons suggest a threat to the environment, thereby making the sustainable management of household waste paint desirable for many jurisdictions including Manitoba.

In an effort to determine an optimal, sustainable method for the management of household waste paint for Manitoba, three case studies have been undertaken. The first, Manitoba, provides some contextual details and assesses whether change is necessary in the province. The second, Minnesota, is a review of a state-run program in which household waste paint is one component of a larger household hazardous waste (HHW) program. The final case study, British Columbia provides the details of how a product stewardship model has been applied to household waste paint. These jurisdictions provide a contrast in approaches and range of both financial and organizational commitment with varying degrees of success.

Based on comparative analysis of these case studies which include current best practices, this research finds that indeed, the current Manitoba system for household waste paint management requires change to eliminate unsustainable practices and the

environmental damage that results from such practices. A series of recommendations are presented for the province to move toward a sustainable management system for household waste paint. These recommendations include a transfer of responsibility for managing waste paint away from the provincial department of Conservation to the paint industry and paint consumers. Beyond this fundamental transfer, this research recognizes that provincial and local governments have a necessary role to play within a sustainable management system for Manitoba especially in the areas of education, non-program material management and integration of a waste paint management system within the existing provincial waste management framework.

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Finally and most importantly, thanks and love to Jo for having the most patient, biggest heart that a person could have. You have been through this entire process and I would never have been able to do it without you

List of Abbreviations

CAP	Capital Assistance Program
CPCA	Canadian Paints and Coatings Association
CSA	Canadian Standards Association
CPV	Cooperative Purchasing Venture
ELC	Equivalent Litre Containers
HHW	Household Hazardous Waste
MARCC	Manitoba Association for Resource Recovery Corporation
MPSC	Manitoba Product Stewardship Corporation
MPSP	Manitoba Product Stewardship Program
MSDS	Material Safety Data Sheet
OEA	Office of Environmental Assistance
PLP	Processed Latex Pigment
PCA	Product Care Association
PPC	Paint and Product Care Association
RCBC	Recycling Council of British Columbia
SCORE	Select Committee on Recycling and Environment
SWMCB	Solid Waste Management Coordinating Board
SWMT	Solid Waste Management Tax
VOC	Volatile Organic Compound
WHMIS	Workplace Hazardous Materials Information System
WMA	Waste Management Act

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Chapter 1-Introduction

1.1 Preamble

Paints that are unwanted by households that are improperly handled, disposed or stored represent a significant threat to the environment and an inefficient use of resources and money (Personal Communication-Yee, 1999). In Manitoba, in an effort to move toward more sustainable practices, household waste paint management is under review by the provincial department of Conservation. The conclusion of this process may lead to changes in the way waste paint management is funded, the collection methods that are employed and/or, the final uses and disposal of the collected paint. The exact form that these changes should take, if any, is explored through this research.

1.2 Background

Leftover paints that are generated in private residences are the largest component, by weight and volume, other than used oil, of a waste stream commonly referred to as household hazardous waste (HHW) (B.C. Environment, 1993, Laidlaw, 1992, Hotz, 1999). HHW is defined as waste generated in private residences that is corrosive, toxic or flammable (Environment Canada, 1996). In addition to paint, HHW is comprised of pesticides, automotive products, household cleaners, and other miscellaneous hazardous products (B.C. Environment, 1990).

Currently, many jurisdictions (e.g. Manitoba) do not provide proper facilities for all homeowners to dispose of waste paint properly (Manitoba Environment, 1993, Personal Communication-Labossiere, 1999). In these cases, the following unsustainable actions occur:

- Household waste paint is disposed of through the sewer system.
- Household waste paint is disposed of in yards, fields and other natural areas.
- Household waste paint is set out at the curb with regular trash thereby entering landfills.
- Household waste paint is unnecessarily stored in basements or garages. (Manitoba Environment, 1997, Personal Communication-Yee, 1999)

These practices are unsustainable for a number of reasons. First, many paints contain hazardous materials that when disposed of improperly contaminate our land and water resources and can cause negative human health impacts. Alternately, without proper disposal facilities, improper storage of paints represents a significant fire hazard. Second, many paints (whether hazardous or not) that are currently being discarded have the potential to be re-used, recycled for re-use or re-processed for use in other applications or materials. Simply discarding this potential raw material represents a waste of resources.

1.3 Issue Statement

In Manitoba, household waste paint collection infrastructure has been insufficient to manage the volumes of household waste paint that typically could be expected to be generated by a province with a population of over 1 000 000. As a result, homeowners and others have often been forced to use one of the above four unsustainable actions when dealing with household waste paint. Taxpayers, environmental groups and local governments continue to demand changes in Manitoba in an effort to improve and

increase the waste management services available in the province for household waste paint (Personal Communication-McCormick, 1999).

Further, the relatively large volume of household waste paint generated and the potential for re-use and recycling makes household waste paint a candidate for sustainable management actions and improvements beyond other products within the HHW waste stream. By focusing on household waste paint, future changes may be more feasible from an economic, political and infrastructure perspective than if the issue of improved HHW management were to be approached as a whole. Potentially, future improvements in household waste paint management may be transferable to improvements in other HHW product management as a waste management system grows in an incremental, integrated fashion.

Overall, improvements in household waste paint management would support further progress towards waste reduction and prevention as legislated in the Manitoba Waste Reduction and Prevention Act. These improvements are also compatible with larger provincial sustainable development goals.

The alternatives for household waste paint management in Manitoba include technological changes to paint processing, collection method changes and/or changes in who will be responsible for the cost of the system that is implemented. Alternately, changes may not be feasible given the technological, economic and social parameters that currently exist in the province. The following questions regarding Manitoba's household waste paint management system exist and were addressed in this study.

1. How does the amount of household waste paint that is currently collected in Manitoba compare with the total amount that is available for collection and the amounts that are collected in other jurisdictions?
2. What happens to the household waste paint that is collected? What are the limitations that prevent sustainable use of collected household waste paint? How do these actions regarding sustainable use of household waste paint compare with other jurisdictions?
3. Who is responsible for the cost of the current disposal of household waste paint? How can funding mechanisms be arranged for household waste paint so as to promote sustainable practice? How have other jurisdictions funded household waste paint management and with what results?

The issues of collection, end-use and funding arrangements are presented separately but in reality are interrelated. Tradeoffs between technical, economic and collection parameters and factors will invariably occur. This research focuses on improvements that can be made in the management of household waste paint in Manitoba with reference to these interrelationships and tradeoffs and discusses how these improvements compare to a theoretical, sustainable management system.

1.4 Research Objectives

The primary objective of this study was to assess the feasibility of the various management alternatives that are available for household waste paint management in Manitoba. Specific objectives included:

1. To determine the components of a sustainable household waste paint management system.

2. To prepare a profile of current household waste paint volumes, collection, disposal and management in Manitoba.

3. To compare Manitoba's management system with best practices in other jurisdictions.

4. To make recommendations regarding household waste paint management in Manitoba.

1.5 Methods

To accomplish these objectives, the following methods were employed.

Objective #1: Literature review, Internet research.

Objective #2: Site visits, literature review, Internet research, interviews with key people, review of the minutes and attendance at provincial policy meetings.

Objective #3: -Site visits, literature review, Internet research, interviews with key people, review of the minutes and attendance at provincial policy meetings.

Case studies of three household waste paint management systems were undertaken and the components of these systems evaluated by comparing key performance measures. Successful components were then critically reviewed to determine applicability to the Manitoba situation. Finally, this information was used to forward a series of recommendations for improving household waste paint management in Manitoba.

1.6 Organization of the Study

Chapter 1 has provided a brief introduction to the issue of household waste paint management and the objectives of this study. Chapter 2 is a literature review that develops the issue further and reviews the theoretical components necessary for the sustainable management of household waste paint. Chapter 3 presents further details of

the methods employed to accomplish the objectives of the study. Chapter 4, titled, A Review of Household Waste Paint Management in Three Jurisdictions presents the results of the case studies-Manitoba, Minnesota and British Columbia. Chapter 5 is a comparison of these results and a discussion of how these results fit within a Manitoba context. Chapter 6 is a summary of the study and based on the previous chapters, contains recommendations for sustainable household waste paint management in Manitoba.

Chapter 2: Sustainable Management of Household Waste Paint

Chapter 2 is divided into two sections. The first section is a discussion of the waste stream under consideration-household waste paint. The second section draws upon the first to determine the components necessary for the sustainable management of this waste stream.

Section 1: Household Waste Paint

2.1.1 Introduction

The term paint, also paints and coatings, is used to describe a wide variety of complex chemical mixtures, some of which are chemically incompatible (Laidlaw, 1992). Paints are used as a decorative and/or protective coating for both indoor and outdoor surfaces (NPCA, 2001). Today, this category of products include common paint, enamels, lacquers, varnishes, undercoats, surfacers, primers, sealers, fillers and stoppers (Turner, 1980). See Appendix A for a comprehensive listing.

In an effort to define the scope of waste management programs, waste managers often employ the term consumer paint product to identify the material that becomes waste paint. Consumer paint products include all latex, oil and solvent based architectural coatings, including stains and paints, for commercial and homeowner use whether tinted or untinted. This includes paints and stains, whether colored or clear, sold in pressurized aerosol containers (B.C. Reg. 200/94 and proposed Manitoba legislation, 2000). By employing this definition, paints used in industrial and other heavy-duty applications, a significant portion of total paint sales (see Figure 1) in Canada can be discluded from

household waste paint management activities and managed using other regulatory and policy tools. Consumer paint products, then, that are no longer wanted by a user are the materials that become household waste paint.

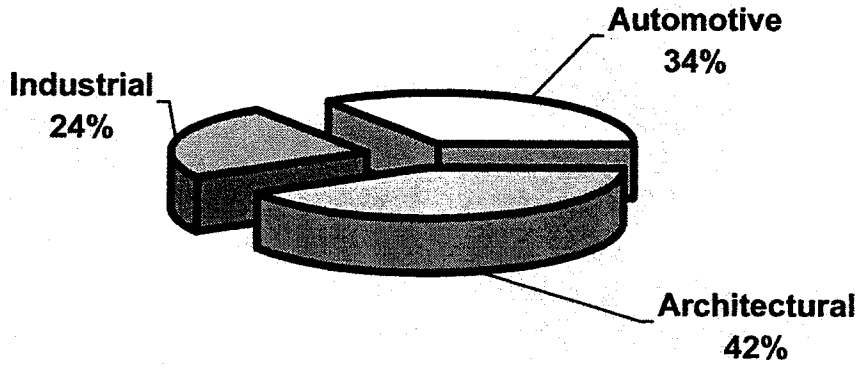

Figure 1: Estimated Dollar Sales by the Paint Industry in Canada in 1999.

Waste composition studies have almost universally included household waste paint within a waste stream known as household hazardous waste (HHW) (B.C. Environment, 1993, Laidlaw, 1992, Hotz, 1999). HHW is any unused/unwanted material in the home that may because of its chemical nature, endanger human health or contaminate the natural environment if not properly managed (Laidlaw, 1992). HHW can also be described as discarded solid or liquid materials or containers holding gases that may cause an adverse, harmful or damaging biological effect in an organism or the environment unless given special handling and treatment (Environment Canada, 2000). HHW includes all common consumer products that are corrosive, toxic, reactive or flammable (See Table 1). Currently, the CSA (Canadian Standards Association) is working, in an ongoing process, with various Canadian stakeholders to arrive at a

standard definition for HHW based on sound scientific analysis and criteria (Recycling Council of Alberta, 2001).

Table 1: HHW Product Classification.

Household Products	**Paint Products**
Cleaners.	Latex Paint.
Disinfectants.	Oil-based paints.
Floor/Furniture Polish.	Specialty Coatings.
Pool Cleaners.	Stains/Finishes.
Household Batteries.	Thinners/Solvents.
Pharmaceuticals.	Furniture Strippers.

Automobile Products	**Garden Products**
Motor oil.	Fungicides.
Antifreeze.	Herbicides.
Transmission Fluid.	Flea collars/sprays.
Brake Fluid.	Insect/rat poison.
Lead-acid batteries.	Fertilizers.

(Environment Canada, 1996)

Certainly, many paints, especially older ones fall within the broad area bounded by most chemical definitions of HHW. However, many new paints and leftover paint solids do not fall into the categories that often define and characterize HHW (Minnesota Pollution Control Agency, 2001. City of Chicago, 2001). Despite chemical content, the public often perceives all waste paint, regardless of actual composition, to be HHW. Often, differences between paint and other HHW; and between hazardous and non-hazardous paints may be difficult to determine, especially for a member of the public.

Because of these subtleties, if paint is to be managed singularly, its separation from the rest of HHW by both the public and waste managers is an administrative and

operational obstacle. The larger question of where paint fits within a broad HHW management strategy has been approached in two ways. British Columbia began managing paints as a means of jumpstarting a more comprehensive HHW management program (B.C. Environment, 2000). Presently, the original household waste paint program in B.C. has been expanded to include other solvent-based products (Personal Communication-MacDonald, 2000). Alternately, many other jurisdictions have included paint in a broader HHW program from the outset (Minnesota Department of Pollution Control, 2000).

Regardless, while the precise chemical composition of HHW is difficult to ascertain (B.C. Environment, 1990), paint is generally accepted to be the largest component of HHW not including used oil. It is estimated that between 40% (B.C. Environment, 1990) and 70% (Laidlaw, 1992) of the volume of HHW is paints. See Figure 2 for other more recent estimates.

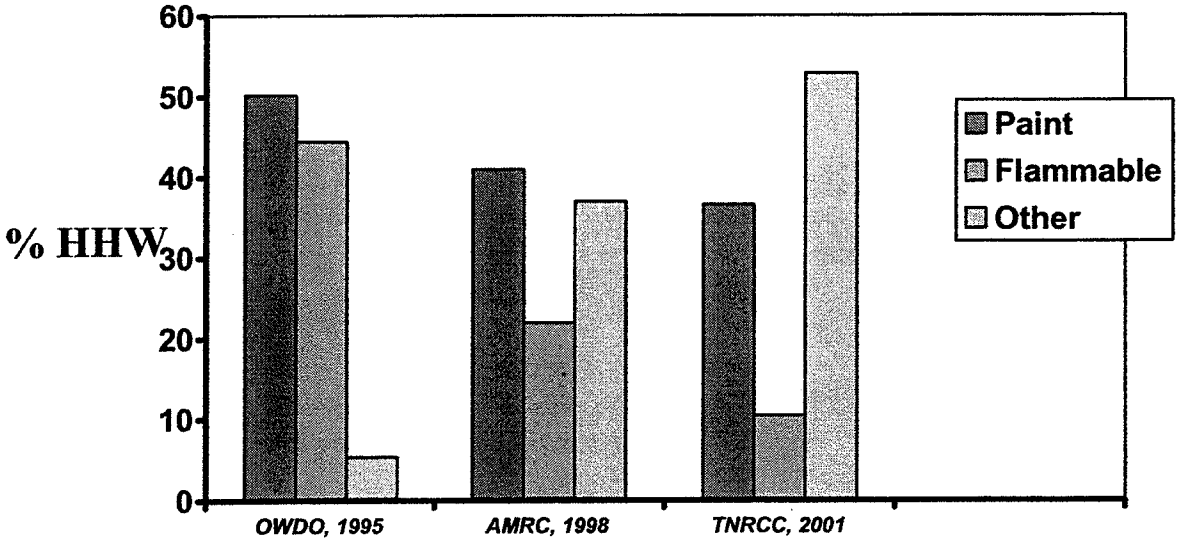

Figure 2: Estimate of the Composition of HHW by Percentage of Volume.

2.1.2 Volume of Household Waste Paint

In assessing the volume of waste paint that may be available for collection and management, both the annual amount that is generated and the total currently in storage are important to consider. Neither of these two figures are known precisely.

One B.C. study found that HHW represents approximately 1% of the total waste by weight generated by households (B.C. Environment, 1993). Other studies have estimated that HHW constitutes between .6 and .8 % of the municipal waste stream (compositional analyses by Ontario Waste Management Corporation, City of Barrie and Statistics Canada, 1995). See Table 2 for further details.

Table 2: Range of Estimates of Household Waste Paint Generation and Storage Rates.

Source	Amount HHW	Amount Paint *40% HHW*	Amount Paint *70% HHW*
Generation/household/year			
EPA, 1999	10 litres	4 litres	7 litres
Pollution Probe Foundation, 1999	20-40 litres	8-16 litres	14-28 litres
Storage /household			
Laidlaw, 1993	18 litres	7 litres	13 litres
Environment Canada,1999	11-37 litres	4-15 litres	8-26 litres

However, the figures from Table 2 suggest that an average home generates between 4 and 28 litres of waste paint/year and stores between 4 and 26 litres of waste paint.

More specific waste paint figures are available, if not conclusive. A 1991 American study estimated that there were 400 million litres of both latex and oil-based paints stored in American homes (Musick, 1991). Another study found that the average household had storage of 12 litres of paint (Garfinkel, 1994). In Canada, the CPCA (Canadian Paints and Coatings Association) has estimated that the average consumer has a waste volume of between 1/5 and 1/6 of a typical paint purchase (CPCA, 1999).

The broad range of estimates of the amount of household waste paint generated and in storage is a reflection of the uncertainty associated with this measurement. Landfill composition studies do not adequately account for waste paint in storage or

disposed of via alternative methods. Similarly, telephone surveys that attempt to ascertain waste paint volumes in households are subject to the respondent's uncertainty regarding the point at which paint ceases to be useful and becomes waste. In addition, different respondents from the same household may have a different opinion of what is waste paint and what retains value.

Regardless of the range of figures, one may conclude that household waste paint is a significant portion of the municipal waste stream. The figures provided above provide a comparative reference for actual collection totals until such time as more detailed studies become available.

Similarly, for waste paint management planning, collection results from established programs provide another tool for assessing the actual volume of household waste paint that may be eligible for a management program. In Minnesota, a planning guideline has been established that contends that every participant in a collection event will bring 10 litres of paint (Minnesota Pollution Control Agency, 1996). Similarly, it has been estimated that a collection program in an average municipality of 100 000 has the potential to collect 2 million litres of HHW per year (Canadian Paints and Coatings Association, 1999) or between 800 000 and 1 400 000 litres of household waste paint/year.

2.1.3 Hazardous Aspects of Household Waste Paint

HHW, including some paints, contain the same chemicals as those materials that are regulated in many jurisdictions, including Manitoba, as hazardous waste. By definition, the components of hazardous wastes pose a risk to human health and/or the environment. The dangerous characteristics of these chemicals include ignitability,

corrosiveness, reactivity and toxicity (Environment Canada, 1996). Special disposal techniques are necessary to make these wastes harmless or less dangerous.

Significantly different hazards are associated with the two major categories of paint- latex and oil-based products. These categories are differentiated by the type of solvent, also called the vehicle, used in formulation.

Latex	**Alkyd/oil**
Water.	Aliphatic hydrocarbon mixtures. Aromatic hydrocarbons. Alcohols. Esters. Ketones. Ethers and ether alcohols. (Ullman, 1992)

The alkyd solvents, volatile organic compounds (VOC's), are toxic, flammable and corrosive (CPCA, 1999). They have been proven to harm plant life and damage the human respiratory system (Schaleger, 1994). Depending on the concentration, symptoms after acute exposure to VOC's include respiratory tract irritation, vertigo, nausea and vomiting (CPPC, 2000). Long-term exposure has been shown to be a contributing factor to cancer, although other sources dispute this finding (Paints and Coatings, 1992).

Water, hence latex paint, is a much safer, non-toxic vehicle but is not ideal for all paint applications because of its limited miscibility with other liquids necessary for paint manufacturing (Morley & Associates, 1989). The components of latex paints must be soluble in water and therefore often become permanently sensitive to water even after the product has been applied (Morley & Associates, 1989). This leaves the paint open to deterioration from weathering, the consequence of which is a preference for oil-based

paints in some cases, especially in exterior applications over previous alkyd-based applications.

Beyond the solvent, other components of a paint can be hazardous. Lead, a carcinogenic compound that has other negative health effects related to its accumulation in the body, is often a part of paint pigments in both latex and oil-based formulations. However, it has not been added to consumer interior paint since 1990. The only lead in current formulations results from naturally occurring pigments (CPCA, 1999). Currently lead can only be present in exterior applications below a level of .05%. These paints must be labeled in order to alert consumers as to the lead content (CPCA, 1999).

Mercury, another hazardous heavy metal, has been used as a fungicide in latex paints. It is still used in between 20-35% of exterior applications (CPCA, 1999). However, mercury was banned from interior use due to concern regarding its relationship to acrodymia, a rare form of childhood poisoning, in addition to concern regarding impact on the nervous system and kidney function (Schaleger, 1994).

Legal changes that limit lead and mercury content, bolstered by growing scientific evidence linking the components of paint with human health hazards, along with improved paint manufacturing technology have combined to make paint formulations much safer over the past 20 years. This trend continues with an industry-led, consumer-supported move away from hazardous oil-based products to safer, easier-to-use latex applications. The current manufacturing ratio of paint solvent types is changing rapidly. Some paint industry sources estimate that a manufacturing ratio of 90% latex: 10% alkyd will be achieved in the near future (Personal Communication-Iverson, 2000). See Figure 3.