01D108I

Domestic Paint Usage and Disposal

May 1st, 2001

Sponsor: Ken Lofhelm, SSL

Advisors: Professor Holly Ault
Professor Jonathan Barnett

SSL
Scientific Services Laboratory

WPI
WORCESTER POLYTECHNIC INSTITUTE

(HKA)
Project Number: IQP-41-HXA-OZ06

CONSUMER AWARENESS OF DOMESTIC PAINT USE AND DISPOSAL

An Interactive Qualifying Project Proposal
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science
by

Stephen J. Christopher

Pamela M. Graybeal

Heather A. Wadlinger

Date: May 1, 2001

Approved:

Professor Holly K. Ault, Major Advisor

Professor Jonathan R. Barnett, Co-Advisor

ABSTRACT

This Interactive Qualifying Project sponsored by Scientific Services Laboratory, a business unit of the Australian Government Analytical Laboratories in Melbourne, Australia analysed the level of awareness consumers had regarding proper usage, disposal, and hazards associated with paint. In addition, behavioural activity related to paint use and disposal was evaluated. Information gathered from literature searches, interviews with relevant experts, and two separate surveys of current paint consumers in Melbourne was analysed for content and statistical significance. Results indicated that there was a definite need to inform consumers of paint hazards and clean up and disposal methods in to order to increase the occurrence of proper methods. The final outcome of the project included the development of an informative point-of-sale brochure that was produced and distributed nationally to paint consumers throughout Australia. The goal was to provide a resource that could be used to immediately inform the general consumer of paint-related issues, in hopes of decreasing the occurrence of improper paint disposal.

Acknowledgments

We would like to acknowledge Ken Lofhelm of the Scientific Services Laboratory for his assistance and support throughout this project. He was always ready and willing to provide guidance and assist us in any way he could. We would also like to thank John Hardcastle, SSL's Marketing Manager for working on the brochure with us, in addition to helping with publicity. Damien Collis of Collis Design was extremely helpful and vital in the creation of the brochure. We would also like to acknowledge Elisabeth Gibson, Mahmut Horasan, Jill Dear, and everyone else at SSL for their support and for making us feel welcome.

Many thanks go to Professor Holly Ault for her insightful advice throughout the entire project. We valued her input and appreciated her reading through the report again, and again, and again, and yet still actively producing valuable suggestions each time. Professor Jonathan Barnett also deserves recognition for his patience with Worcester weather while we all enjoyed being "Down Under," and for his guidance during the project. Also, his efforts are greatly appreciated for securing this meaningful environmental project.

We would also like to acknowledge Lorraine Kibbis, Projects Manager of EcoRecycle Victoria, Bill Grant of the Victoria EPA, and Sue Cunningham of the New South Wales EPA for providing us with insights into various aspects regarding paint usage and disposal, and assistance in distributing the brochure. We would also like to thank EcoRecycle Victoria for allowing us to survey at their household chemical collection event.

Finally, we would like to thank everyone who participated in our study, including the managers of the paint stores at which we surveyed, Chemsal and Hatlar Environmental who ran the chemical collection event, and everybody that assisted us through interviews.

Table of Contents

Authorship Page

This Interactive Qualifying Project report is the result of work completed by all three members of the project team, including researching, interviewing, and surveying. Each member's written contributions are no longer completely unmodified by the other members since all of the final report's content has been revised and edited several times by all three team members. With this in mind, the assignment of credit for individual parts of this report will not be absolutely accurate. The distribution of recognition that follows attempts to disclose the members who feel they made a significant contribution to each section.

Stephen Christopher researched and wrote the health and safety issues, paint labelling sections, and disposal methods section in the background research chapter. He is also responsible for helping review and edit the methodology and results chapters. Stephen also did most of the work in creating the survey booklets, reported the results from the interview with Ms. Kibbis, and did a majority of the statistical analysis and write-up. The statistics section required extensive research into statistical analysis before any calculations could be made. He also contributed to the creation of various tables and charts throughout the document, in addition to writing a good portion of the analysis section. He was also the author of many of the contact scripts located in the appendices. Finally, the glossary and bibliography were also mostly Stephen's work.

Pamela Graybeal wrote the initial introduction to the entire report as well as the introduction to the background information section. She also researched and reported the various environmental hazards and government and voluntary regulations included in the background information section. Pam wrote about half of the interview questions, contributed greatly to the creation of the surveys, and undertook the geographic sampling project. She also reviewed and revised the methodology in addition to organising the background information section of the report. The surveys' data entry was done by Pam as well as various tables and graphs. In the results section, Pam wrote the results from the interview with Micheal Ball as well as part of the results from interviews with chemical collectors. She also made a large contribution to the original development of the brochure content. The report summary, executive summary, and many of the contact and cover letters (located in the Appendices) were also results of Pam's work.

Heather Wadlinger researched and wrote information regarding the disposal methods, recycling programs, and paint labelling sections of the background information chapter. She also wrote the first draft of a majority of the methodology chapter, in addition to writing half of the interview questions. She also wrote the results from interviews, including the one with Stuart McQuire, chemical collectors, and local councils. She also reported information regarding paint can labels in the results chapter, and contributed to the creation of various tables and charts. In addition, Heather composed a sizeable part of the analysis section, and made a significant contribution to the development of the brochure. Heather wrote most of the future recommendations, as well a good portion of the general summary to be received by interested parties.

List of Figures

List of Tables

Executive Summary

The issues involved with domestic paint use and disposal are of great importance, since painting is one of the most prevalent methods used to protect and beautify a majority of homes around the world. When paint is improperly used, it may pose many threats to the user's health and safety. In addition, proper disposal is vital to protecting the environment in which we live. The main goal of this study was to evaluate the public's awareness regarding paint use and disposal, and based upon those findings, produce a means by which to educate the public and thereby increase the incidence of proper usage and disposal of paint by domestic users.

Working in Melbourne with the Scientific Services Laboratory (SSL), the project's goal was to determine whether or not there was a need to increase the public's awareness of hazards and proper techniques associated with the handling of paint. Then, if there was a need to increase public awareness, the researchers would respond by creating a tool to disseminate the needed information to the public. SSL, an Australian government laboratory that conducts independent testing of various products, including paint, plays an important role in the building and construction industry both in Australia and internationally by testing products and certifying them if they meet government standards. SSL is interested in maintaining a healthy environment as well as catering to the needs of industrial paint manufacturers and their clients. In order to facilitate SSL's goal of extending services to their paint manufacturing clients, three students from Worcester Polytechnic Institute performed extensive research, conducted over forty interviews, and administered two survey interview sessions in Melbourne before determining the

best way to assuage shortcomings in the situation regarding paint usage and disposal.

The method used to collect the majority of raw data was face-to-face surveying. The surveys were used to assess the current paint consumers' level of knowledge concerning paint use and disposal. The first survey interviews targeted consumers at various paint retail locations in and around Melbourne. The second survey interview session was conducted at a household chemical collection day sponsored by EcoRecycle, Victoria. Of the people surveyed at the retail locations, 91% currently had excess paint stored in their homes. This figure emphasised the current problem of having excess paint in Australian homes. The retail survey also revealed that 21% of people surveyed were not aware of any of the hazards associated with the various aspects of handling paint, while an additional 51% were aware of only a few hazards. More importantly, it was also found that improper disposal methods, such as pouring paint down the sink or drain, or placing liquid paint directly into the rubbish, were being used quite frequently. From the results of the surveys, it was found that there was a definite need to increase consumer awareness in order to increase the occurrence of proper handling and disposal techniques.

Interviews with various paint industry and supply representatives were important in supplementing the survey and research data. The manufacturers and suppliers' points of view were very important in considering the outcome of the project because both groups would be affected in some way. In order to implement the best plan to assist paint users in proper handling techniques, the cooperation of the manufacturers and retailers was vital.

In response to the problem at hand, the researchers intended to make appropriate information easily available to consumers, so that the proper methods could be known and applied more frequently. The researchers concluded that the most feasible and effective short-term solution was the production and distribution of an informative point-of-sale brochure. This resource was chosen because of several different factors. One factor considered was space. A brochure provided enough space to include the amount of content that the researchers felt was necessary to provide. Also, survey respondents as well as paint suppliers indicated that a brochure would be helpful as well as feasible. Distribution of the brochure was targeted nationally to paint retail outlets, paint manufacturers, local councils, and environmental groups. Thus, in response to the information gathered in the study, an informative brochure was created and distributed in hopes of alleviating the problem of frequent improper handling and disposal of paint.

It should be noted, however, that analysis of the overall paint disposal situation revealed that a long-term solution to the problem of disposing of excess paint needed to be pursued. Interested groups should focus on increasing manufacturer responsibility for the entire life cycle of their products, so that the burden of disposal is taken off the consumers. Having manufacturers reclaim unused paint could prove advantageous because manufacturers may then be more likely to find a use for the paint rather than disposing of it, if reuse would provide long-term economic incentive over disposal. Alternatively, manufacturers would at least be monitored in their methods of disposal.

In conclusion, after research and collection of data, this study uncovered some shortcomings within current programs dealing with paint disposal in Australia. First of all, most homes have excess paint, and many of the home-owners do not

know what steps to take to dispose of it properly. Also, it was found that even the methods of disposal that are considered "proper" still have several drawbacks. Thus, it makes more sense to promote the usage of paint, or waste minimisation (which is already highly recommended in the hazardous waste hierarchy). Through encouraging waste minimisation, the amount of excess paint will be reduced, and costly disposal will be avoided.

The production and distribution of the brochure aims to quickly reach and inform paint users across the nation of the recommended methods for cleaning-up and handling excess water- and solvent-based paints. Ideally, the paint manufacturing industry will soon begin accepting more responsibility for the entire life cycle of their paint. By making manufacturers more responsible for their product, even after it has been sold, it is more likely that the companies will find ways to use the reclaimed paint. This assumption is made because once the manufacturers are forced to accept unused paint, it is more likely in their best economic interest to utilise it rather than to dispose of it. So, while groups work to change the paint manufacturing industry to a more "cradle-to-grave" system, the brochure can help paint users take more immediate steps towards minimising waste and reducing improper clean-up and disposal of paint. The increased consumer awareness will help protect the health and safety of the environment and its inhabitants.

1.0 Introduction

The issues involved with domestic paint use and disposal are of great importance, since painting is one of the most prevalent methods used to protect and beautify a majority of homes around the world. When paint is improperly used, it may pose many threats to the user's health and safety. In addition, proper disposal is vital to protecting the environment in which we live.

The Scientific Services Laboratory, an Australian government laboratory that conducts independent testing of various products, plays an important role in the building and construction industry both in Australia and internationally by testing products and certifying them if they meet government standards. SSL have expertise in the assessment of paints and coatings through product testing and is registered with the National Association of Testing Authorities. Since the laboratory is not directly affiliated with paint manufacturers, they are able to make objective assessments of coating products. SSL are interested in maintaining a healthy environment as well as catering to the needs of industrial paint manufacturers and their clients. Since one of the items SSL tests is paint, their goal is to provide services to their clients through studying the needs and concerns related to domestic paint use and disposal.

The main goal of this study was to evaluate the public's awareness regarding paint use and disposal, and based upon those findings, produce a means by which to increase the incidence of proper usage and disposal of paint by domestic users. In order to achieve the project goal, domestic paint consumers' perception and awareness of personal and environmental hazards related to paint usage and disposal were explored and analysed. The research took place in the state of

Victoria in Australia. Working in Melbourne with the Scientific Services Laboratory (SSL), work was geared towards determining and developing the best method (such as literature, labels, or other informative tools) to educate the public about hazards and proper techniques associated with the usage and disposal of paint and related products.

2.0 Background Information

The researchers undertook the project with little to no previous knowledge regarding the topic of domestic paint use and disposal; therefore, research was conducted in order to become familiar with the topic. The following background information section reports some of the major findings resulting from the preliminary research and interviews.

2.1 Introduction

Paint, as defined by the National Paint and Coatings Association in the US, is the "group of emulsions, consisting of pigments suspended in a liquid medium, for use as decorative or protective coatings (NPCA, 2001)." Paints and coatings are usually used either to protect surfaces from environmental corrosion or for aesthetics, acting as both a beautifier and protector of domestic homes. Paints are often mixtures of pigments (for colour), resins (for binding power), and other additives (that enhance their ability to dry, their spreading ability, and their application), which are added to water or organic solvents. The NPCA found that on average, manufacturers sell two gallons (7 litres) of domestic paint per person each year in the United States; in addition, the NPCA estimated that manufacturers produce up to almost 500 million gallons (1.9 billion litres) of architectural paints for residential and non-residential use annually. Other categories of paint include industrial coatings that are factory-applied to manufactured goods and special purpose coatings that are used especially when durability is required (NPCA, 2001). In the past, paint contained elements, such as lead, asbestos, and volatile organic compounds that have proven to be detrimental to the public's health or the environment. Currently, paint does not contain these elements, contains them in

very limited or regulated quantity, or has had precautions taken against their harmful effects (Benjamin Moore & Co., 2000).

Most domestic consumers use paint that is classified as "architectural coatings," which entails paint that is applied directly onto residential, commercial, institutional and industrial buildings, and may be classified as exterior waterborne (latex), exterior solvent-born (oil), architectural lacquers, interior waterborne (latex), interior solvent-born (oil), or "do-it-yourself" wood and furniture finishes. More than half of the paints and coatings sold and marketed in the US each year are architectural paints. This includes the category of household paints, and can be attributed to about US$6.3 billion of sales in 1998 (38% of all paint sales) according to the NPCA (NPCA, 2001).

In the current United States market, 75 to 80% of household paints are water-based latex formulations. These paints first appeared on the U.S. consumer market right after World War II, and they have become most preferential to consumers. Since these paints are water-based, they are easier to clean up. They are also preferred over solvent-based paints because they release fewer emissions of volatile organic compounds (VOCs) into the air than solvent-based paints. These VOCs are substances in paint that evaporate during use or drying out, and can react with sunlight to form smog (NPCA, 2001).

The shift from solvent-based paint to water-based paint has also been observed in European markets. In Europe, the paint and coatings industry is the largest consumer of solvents with a 46% market share ahead of the printing ink and adhesive sectors. Hydrocarbons are the predominant solvent used, accounting for just over half of the total solvent used by paints and resins. However, with the shift towards water-based paint (latex), a shift from hydrocarbons to oxygenated types of

solvents and aliphatic hydrocarbons is being observed. European markets prefer esters while American markets use ketones. Most emulsion paints contain between 3% and 10% of co-solvents, mainly 2,2,4-trimethylpentane (isooctane) and 1,3-diol monoisobutyrate (Texanol) (PRA, 2000). The use of xylene, another pollutant, is diminishing in Europe due to stringent labelling requirements. In the United States, its usage is decreasing due to hazardous air pollutant concerns imposed by the Environmental Protection Agency (US EPA, 1996).

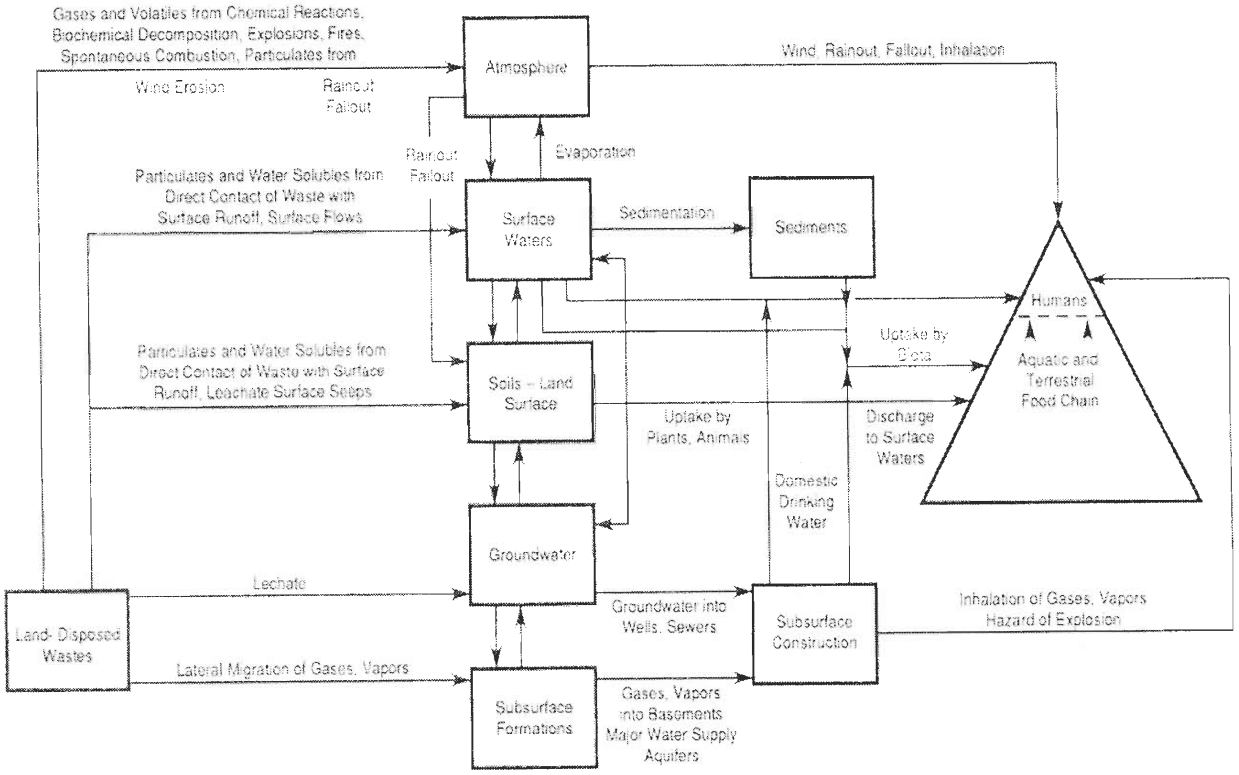
2.2 Environmental Hazards

Because paint contains chemicals, solvents, and metals that are not treatable by sewage or water treatment plants or septic systems, they can damage the environment and endanger human health. The traditional concerns revolving around the production of paint and its use involve waste water, air emissions, potential soil and groundwater contamination, solid waste disposal, and employee health and safety. Although domestic waste production is not as large in quantity as that produced industrially, it can cause significant environmental pollution because many countries do not regulate or provide proper disposal programs for small waste producers to properly dispose of their hazardous waste. In the late 1980's, the United States' Environmental Protection Agency established that producers of less than 100 kg (220 pounds) waste/month would not be regulated (Batstone et al., 1989).

2.2.1 Effects of Hazardous Waste

If hazardous waste is improperly disposed of, it may circulate throughout the environment, causing harmful effects. Paint and resin wastes fall under the category of organic wastes, and usually contain a combination of solvents and polymeric materials, which may include toxic metals such as lead. Organic wood preservatives may be considered halogenated solvents (Batstone et al., 1989). Most household hazardous waste should be disposed of at collection stations, where it is then usually taken to transfer stations, and finally to treatment plants or disposal sites. When it is improperly disposed of, it ends up in tips (landfills) among regular refuse. Harmful components may then be discharged into rivers or streams as well as groundwater where it can threaten fish, wildlife, and plants. If paint cans are disposed of to normal trash haulers, upon compaction in tips (landfills) by bulldozers, paint is released into the soil where it will slowly seep out, contaminating the ground water (PRA, 2000). The figure below, created by the EPA, shows the pathways through which hazardous wastes circulate throughout the ecosystem, being distributed to the atmosphere, ground water, surface waters, soil, and sub-surface formations, often eventually reaching humans.

Figure 1: Flow of Land-Disposed Waste Contaminants Through the Environment (EPA) (Blackman, 1992, 52)



A report by the Chemical Manufacturers Association of the Lipari Landfill in New Jersey conducted in early the 1980's provides one case example of improper disposal of paint into a landfill. Wastes, including cleaning solvents, paints, thinners, phenols, amines, resins, and ester press cakes were disposed of in the landfill; liquid waste was often directly dumped in, without a container. After about twelve years, an inspection by the Department of Health found leachate oozing from the walls of the landfill, causing inspectors to investigate the air and water quality nearby. Samples revealed that chemicals had indeed spread and contaminated some water supplies, and while initial studies revealed that no pressing danger to human health was present, it was possible that it could increase, especially since minimal action could be taken to prevent it after the wastes were already dumped into the landfill.

The closing of the landfill and continued monitoring of water quality were the actions taken (Highland, 1982).

2.2.2 Hazards and Regulation of Volatile Organic Compounds

Another environmental concern is the emission of volatile organic compounds (VOCs) from paint. VOCs are important to control because they lead to chemical reactions in the atmosphere, causing photochemical smog and other air pollution. Unfortunately, a problem arises in the regulation of volatile organic compounds because different nations and organisations characterise hazardous levels differently. Source control techniques are also made difficult because VOCs can originate from a wide number of sources, in addition to having various individual and total concentrations (Godish, 1991). The USA regulatory definition is "any organic compound that participates in atmospheric photochemical reactions except those designated by the EPA as having negligible photochemical reactivity," (PRA, 2000). The Australian Paint Scheme determines VOCs to be "organic compounds with a vapour pressure of more than 0.01mm Hg at 21 degrees Celsius, and with a boiling point of less than 250 degrees Celsius." (PRA, 2000) The EU (European) Eco-labelling scheme uses the standard as "any organic compound with, at normal conditions for pressure, a initial boiling point lower than or equal to 250 degrees Celsius," and the EU Solvents Directive defines them as "any organic compound having at 293.15K a vapour pressure of 0.01kPa or more, or having a corresponding volatility under the particular conditions of use," (PRA, 2000). When VOCs are released into the atmosphere, they react with oxides of nitrogen (nitric oxide and nitrogen dioxide) to form ozone, which is a primary component of air pollution and smog (PRA, 2000). VOCs also pose certain detrimental health effects, which will be explored in the next section.

Aerosol spray packs (aerosol spray paints) generate another environmental hazard. Aerosols and the propellants used in some spray packs may lead to changes in the climate of both the air and the oceans. This would be the result of aerosols interfering with the transfer of heat to the earth's surface as well as their interactions with cloud processes. It is important to note that the impact of man-made aerosols may only have a limited regional effect with heat transfer from the sun but the interaction with clouds could have a much more profound effect on global climate (UNEP, 1998). Additionally, the use of fluorocarbons as propellants in older spray packs has proven to have deleterious effects on the ozone layer (Lofhelm, 2001).

2.3 Heath and Safety Issues

The main issues related to domestic paint use encompass a variety of health and safety issues, depending on methods of application and type of paint. Due to the chemicals and additives in paints, proper use is very important in order to avoid hazardous effects. Solvent-based paints pose dangers that include flammability or combustibility, as well as dangers related to the deleterious health effects caused by inhaling solvent vapours or spray mists (NPCA, 2001).

Hazards resulting from improper use

Ingestion, improper contact, and poor ventilation may lead to several toxicological effects, which range from temporary ailments to cancers of the lungs and skin. Overexposure to some paint components may lead to acute or chronic health problems including dizziness, headaches, and nausea, or brain and nervous system damage, respectively. Warnings of this possibility usually appear on paint can labels in the United States, and should be followed carefully. It is also important to avoid swallowing most paints because they may be poisonous once ingested.

Preventative measures

The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health, both in the United States, outline hazards and preventive measures for working with chemicals that may be found in paints (NIOSH, 1975). The most obvious methods to reduce exposure to toxic hazards are to wear protective clothing and work in a well-ventilated area. Adequate ventilation also offers protection from potential fire or explosion hazards. To protect oneself from physical contact with solvents one must observe proper hygiene methods and utilise equipment like gloves, goggles, protective clothing and barrier creams for the skin. (NIOSH, 1975)

2.3.1 Hazards Related to VOCs

VOC emissions in floor/wall coverings and coatings

Volatile organic compounds (VOCs) create another health hazard, although it is less direct. Tests done by L. Molhave evaluated chamber air concentrations and emission rates of VOCs from various floor/wall coverings and coatings. It is important to note however, that results may vary greatly between products and manufacturers. The varnish and polyurethane coating has the highest emission rate of all material types, including categories in wallpaper, wall coverings, and floor coverings. The average emission rate occurring shortly after application ($mg/m^2/hr$) for wallpapers was 0.123, for wall coverings, 0.446, floor coverings had an average of 0.926, and coatings had the highest average with a rate of 1.815. Emission rates decrease as time after application increases. Below, in Table 1, the specific results from the coatings tests are listed.

Table 1: Total VOC Concentrations and Emission Rates Associated with Various Floor/Wall Coverings and Coatings
(Godish, 1991)

Material Type	Concentration (mg/m^3)	Emission Rate ($mg/m^2/hr$)
Acrylic latex	2.00	0.43
Varnish, clear epoxy	5.45	1.30
Varnish, polyurethane, 2-component	28.90	4.70
Varnish, acid-hardened	3.50	0.83

VOC components in paint

The major VOCs in latex paint have been identified as 2-propanol, butanone, ethylbenzene, propylbenzene, 1,1'-oxybisbutane, butylpropionate, toluene. Organic compounds, often found in indoor air, that are thought to be carcinogenic include formaldehyde, benzene, p-dichlorobenzene, chloroform, tetrachloroethylene, toluene, xylene, and styrene. While latex-based paints are commonly expected to release lower quantities of VOCs than varnishes and oil-based paints, this is not proven because levels vary widely by producer; tests of all products from all producers have not been conducted for a complete comparison. In fact, concentration and emission appears to be more variable among product brands than between oil and latex paints, with some latex paints having higher emissions than other oil based paints (Godish, 1991).

Effects of VOCs on health

Exposure to VOCs can lead to increased respiratory sensitisation and irritation (PRA, 2000). The most prevalent health concerns from VOCs actually result from the additive or synergistic effects of the total VOCs emanating from a combination of sources. The carcinogenic nature or potential carcinogenic nature of certain VOCs also contribute to health concerns. Usually, individual VOC concentration levels are substantially lower (several orders of magnitude) than the Threshold Limit Values set by the American Conference of Government Industrial Hygienists (Godish, 1991). Desired concentrations for VOCs are discussed later under the regulation section of this report.

2.3.2 Dangers Associated with Various Components

Additives

There are other precautions and hazards that must be taken into consideration when handling paint that are specific to the type of paint being used. Various additives may pose threats to the health and safety of people who come into contact with paint. In the past, additives such as lead, mercury, and formaldehyde were used; however these additives are no longer used because they were found to pose various health risks (Benjamin Moore & Co., 2000). It is for this reason that exterior paints should not be used for interior paint jobs. Exterior grades can contain mercury or biocides as additives that will cause health problems if used indoors. Thirty percent of interior latex paints manufactured before August 1990 contain mercury. In addition, any paint advertised to kill mildew or fungus also contains mercury. Paints made before 1978 in the United States may contain the additive lead and should not be used at all. Proper disposal of these paints will be explored in the next section.

Inorganic pigments

Not only can paint emissions, including VOCs, be considered toxic, but all inorganic pigments should also be considered toxic. These pigments can contain substances such as cadmium, copper, cobalt, arsenic and mercury. Pigments generally do not pose a threat when the paint is applied correctly, because the pigments are encased in the paint matrix (NIOSH, 1975), which is made of the resin and additives encasing the pigment. When ultraviolet radiation breaks down the resin, pigments may be released into the environment (Lofhelm, 2001). When these pigments are released after drying or improper application they may be harmful. Objects that are painted and then sanded can also release toxic dust particles into the air. Due to this fact, one must use the proper respiratory equipment when sanding painted objects. Pigments can also be ingested if the proper protective equipment is not used while painting. Any paint that gets on the skin (e.g. bare hands) can potentially be consumed while smoking or eating (NIOSH, 1975).

Solvents

The solvents used in paint can have profound effects on the central nervous system and skin. Inhalation of vapours can lead to serious damage to the blood, lungs, liver, kidney and gastrointestinal tract. When skin comes into contact with these solvents, dermatitis may occur because the natural protective layers of fats and oils in the skin are dissolved. Certain aspects of the composition break down in paint cause various harmful physiological effects to humans. Resins, which can contain many compounds that may be hazardous to ones health, are used in lacquers and varnishes. Formaldehyde resins, which contain phenol or urea, can irritate the skin. Polyester resins contain styrene that is irritating to the eyes and lungs and can cause nausea, headache, and light-headedness. Acrylic resins

contain acrylates that also irritate the eyes and throat and can lead to liver or kidney damage. Epoxy resins can lead to dermatitis (NIOSH, 1975). Paint can also contain isocyanates, which can cause asthma in people who are exposed to this paint on a regular basis (PRA, 2000). Certain isocyanates, such as toluene di-isocyanate, are also known carcinogens (Lofhelm, 2001).

2.3.3 Health Hazards from Spray Packs

Spray packs can be particularly hazardous to ones health. These hazards include both fire/explosion hazards as well as physical ailments from exposure. The appropriate equipment one should use when spray painting includes a respirator and safety glasses. This equipment must be kept clean and stored properly to avoid damage. Since certain vapours may not be immediately noticeable, respiratory equipment is extremely important (NIOSH, 1976). Even when respirators are used, one must make sure there is adequate ventilation in the spraying area to prevent fire, explosion and over spray "bounce," which is the resulting cloud of spray paint particles that migrates back toward the source of the spray stream when too much paint is sprayed at one time.

2.3.4 Lead Paint

History

Lead paint came under scrutiny in the United States in the 1970's, half a century after it did in Australia, when it was found that lead in paint posed many health risks. This made it extremely important to handle and dispose of paint that contains lead properly (Kendler, 1994). While paint made currently no longer contains lead, many older buildings, especially those built before 1970 in the US, contain lead paint. It is estimated that 47 million residences have lead paint, which

exposes 13.6 million children under the age of seven to lead (Kendler, 1994). In Australia, basic lead carbonate was the primary pigment in paints until about 1950, resulting in lead levels as high as 50% of the dried paint film. However, levels of lead in paint dropped significantly after titanium dioxide pigment became the main pigment. Up until 1990, some lead was still used as a drying additive in solvent paints, although it composed less than 5% of the dried paint film. Today in Australia, practically none of the paints contain lead driers (Lofhelm, 2001).

Exposure

Unused cans of lead paint may also still be found in people's homes; therefore, it is important to remember that exposure to lead paint can create hazards to occupants of the house, the neighbours, and even pets. Lead can be stored in bones and teeth, while also inflicting damage to the liver, kidneys, and brain. Exposure can occur when paint dust, flakes, or fumes are ingested. The group that is at the highest risk is young children because by simply touching paint that contains lead, the contaminants may be absorbed and later swallowed. This is especially detrimental to children because they can absorb up to half of the lead swallowed, compared to adults who absorb about only one-tenth (Environment Australia: Lead Paint, 1999).

Health hazards

Continued exposure to contaminated lead paint may cause poor development of motor skills and memory, reduced attention span, reduced spatial skills, anaemia, colic and gastric problems, behavioural problems, and poor performance at school for children. Joint and muscle pain, cramps, anaemia, nausea, gastric and sleep problems, and concentration problems and headaches may be the effects adults exposed to lead paint experience. It is also important to consider the hazards

associated with exposure during pregnancy. Unborn babies that are continually exposed to lead in the mother's blood may experience premature birth, low birth weight, miscarriage or stillbirth, and impaired learning and mental ability after birth. A single exposure, such as eating a flake of paint, may increase blood levels for several weeks (Environment Australia: Lead Paint, 1999).

2.4 Waste Minimisation

To prevent the problem of having excess paint for disposal, measures can be made to reduce the waste at its source. This can be accomplished at both the household level and the industrial level (Monash, 1997). The Hazardous Waste Hierarchy, created by the Hazardous Waste Consultative Committee, also stresses the importance of (in preferential order) waste minimisation, reuse, recycling, and energy recovery (Hazardous Waste Consultative Committee, 1999). However, industry is reluctant to implement source reduction, which is most likely due to economic factors. Major changes in industry practice are resisted because of the cost the changes could incur. According to a survey conducted by the Australian Centre for Cleaner Production, waste generators generally did not considered the costs related to waste treatment and disposal when making decisions because the costs were considered necessary and inherent. Because of this attitude, the potential savings resulting from waste minimisation were often overlooked (Australian Centre for Cleaner Production, 1996). On the industrial level, there are several programs, worldwide, whose goals are to manufacture products while generating the least amount of waste possible. Industrial waste minimisation is explored more in Appendix N.

People on the household level can reduce waste at the source by not buying more paint than actually needed. Reusing leftover paint or reprocessing paint for

useful applications can also reduce waste. Waste reduction can be implemented through a management system of education, collection of paint waste, processing waste into useful channels (solvent/energy recovery or remixing/recycling) and distribution of reprocessed paint products (Monash, 1997).

2.5 Disposal Methods

Twenty-nine percent of consumers surveyed in the United States in 1995 had some unwanted leftover paint that was stored in their homes for an average of 4.6 years before they disposed of it. The 1995 survey also found that each household with unused paints had an average of 1.4 litres (0.37 gallons) of unused paint, paint primer, stain, aerosol spray paint, polyurethane/varnish, clear sealer, and paint thinner (NPCA, 2001). The issue of proper disposal of unused paint is thus very important and of concern to many households in the United States and other countries.

In Australia, a study conducted by the Monash Centre for Environmental Management estimated that between 10 and 15% of paint bought by householders and trade painters remained unused on completion of the painting (APAS, 2001). The study also showed that in Melbourne alone, more than 2.7 million litres (700,000 gallons) of paint are stored in homes. The study also showed that in Melbourne alone, more than 2.7 million litres (710,000 gallons) of paint are stored in homes. According to the Australian Bureau of Statistics, there were 1,254,568 households in Melbourne in 1999 (ABS, 1999); therefore, there is approximately 2.2 litres (0.58 gallons) of paint stored in each household in Melbourne. This amount indicates that the amount of paint stored in Australian homes is nearly twice as much as stored in American homes. Liquid paints, resins, inks, dyes, and adhesives made up 6.8% of all liquid wastes in 1995, and 5.2% of liquid waste in 1998 in Victoria (Hazardous

Waste Consultative Committee, 1999). The amount of disposed paint per year in Australia amounts to about 1.8 million litres (480,000 gallons) in landfills and 22,000 litres (5,800 gallons) in water drainage systems (APAS, 2001).

2.5.1 NPCA Six-Point Program for Paint Management

The NPCA, only one of many groups that have developed programs for managing leftover paint, provides consumers with tips to help reduce and eliminate the amount of paint that is disposed of, as well as providing information on exchange or recycling programs through their "Six-Point Program for Leftover Paint." The information is disseminated via the NPCA web page, brochures, and books. The items are available to the public for free. Several sources of information are obtainable through request from the web page including, amongst other things, their book about lead paint and a brochure on health and safety when dealing with paint. Additionally, the NPCA also publishes a free monthly e-mail newsletter that contains helpful information regarding paint that may be subscribed to online, with archives also available online (NPCA, 2001).

NPCA emphasises preventative measures for having leftover paint for disposal. First, "source reduction" can be implemented by taking careful measurements of the room or house to be painted. This can significantly reduce the amount of leftover paint a consumer might have. These measurements can be presented to a paint salesperson who can help estimate the quantity of paint needed. Paint labels often also give estimates. On average, a coverage rate is 9.5 to 10.7 square meters per litre (400 to 450 square feet per gallon) for one-coat coverage, with variance depending on the condition of the surface and the type of paint product in use (NPCA, 2001). Additionally, estimates can be found in Australian Standard AS 2311 Painting of Buildings Clause 1.8 (APAS, 2001).

Domestic paint customers often will exhibit behaviour similar to that of a psychological hoarding complex when in the store. A consumer might look and see a quart and a gallon of paint for nearly the same price, so to get the better deal and to have a little paint left over, for any 'just in case' conditions, they will buy the gallon. The public needs educative preventative measures to alert them to the greater hazards and efforts of disposal costs (Fiore, 2001).

Properly stored paint is good for several years and it can be blended and mixed with smaller quantities of paint for use on primer jobs or jobs where the final finish is not critical. The NPCA suggests that when storing paint, the lid should be capped tightly and it should be stored upside down (to create a seal around the lid to preserve quality) away from heat, cold, or flame sources away from pets, and the reach of children. Another way to store leftover paint is to fill up a small jar with it completely to the top and cover it with plastic wrap, and then a lid (NPCA, 2001).

The third step is to use up all the paint. If a small quantity of paint is left, it can be saved to later touch up scrapes, chips, or stains. The consumer should save only the quantity needed for touch-ups and not the entire remaining paint in the can. This should be dried out right away before it is forgotten (NPCA, 2001).

The fourth step is to recycle the empty paint can through either a local steel or plastic recycling, depending on the can. Step five includes redistribution of paint through yard sales or as donations to community theatre groups, churches, schools, recreational departments, day-care centres, or shelters. Finally, as the last resort, ensure that any leftover paint is properly disposed of in compliance with local regulations and programs (NPCA, 2001).

2.5.2 Recommended Methods for Paint Clean-Up and Disposal

The following methods for clean up and disposal are derived from APAS' suggestions for paint use and disposal, but are also supplemented by other research. These methods are also the suggestions used later in the project for development of the informative tool to be distributed to the public.

Clean up with acrylic (latex) paint

When applying two coats of paint the brushes and rollers do not need to be cleaned but can be stored in plastic bags if using latex paint or underwater for oil based paint until they are needed. When cleaning up after a job, the applicators can be run across paper to remove excess paint. After the applicators are cleaned with water, the water should be saved until the solids settle to the bottom then the water can be poured off and the solids can be dried on newspaper and disposed of with the normal trash. The water should be poured into the garden or yard, so the ground can act as a filter before the water reaches groundwater sources, as opposed to pouring the water into a drain that leads directly to water sources (APAS, 2001).

Clean up with solvent paint

Aside from requiring a different solvent, the steps for cleaning-up after using solvent paint are similar to those for cleaning up acrylic paint. After painting with oil paint, brushes or rollers should be soaked in a container of solvent (such as mineral turpentine). Again, the container should be covered and left in a safe place for a few days, to allow the solids to settle to the bottom. The solvent can then be poured off and reused and the solids can be dried on newspaper and disposed of with the normal trash. If the solvent is not going to be reused, it can be poured into the

garden or yard. Again, it is suggested that the solids be allowed to dry completely before they are thrown away in the rubbish (APAS, 2001).

Disposal of acrylic (latex) paint

Disposal methods for domestic paint depend heavily upon the type and quantity of paint to be disposed of. Latex paints can be mixed together; however, solvent and latex paints should not be mixed together. Interior and exterior paints may be mixed, however it is likely that these combinations will not be as durable as mixtures of only exterior grades (Spectrum, 1999). Water-based paints should be disposed of with regular waste and solvent-based paint, lead paint, and aerosol spray paint require hazardous waste precautions. Water-based paints (latex) may be allowed to dry on absorbent material, and thrown out with the regular waste. Latex paint products on brushes can be cleaned up with soap and water. Small quantities can be left in the can in a safe place to air dry; however, this process does take a while and stirring is needed to dislocate the film that will consistently form on the paint's surface. Larger quantities can be disposed of by pouring any residual paint on absorbent material (shredded paper, cat box litter, sawdust, plaster of Paris, soil, vermiculite, or charcoal), letting this mixture dry thoroughly, and then disposing of it with regular trash (NPCA, 2001). It should be noted, however, that drying paint before disposing of it still releases VOCs into the atmosphere. So, while less VOCs are placed into landfills, more is released directly into the atmosphere (Lofhelm, 2001).

Disposal of spray packs (spray paint)

Spray packs usually have disposal methods printed on the can's label. These cans are highly flammable and cannot be incinerated or punctured. Spraying the remaining contents onto surfaces such as cardboard or newspaper are methods

used to empty the cans. If the tip of the can is clogged or lost, another tip can be substituted from another can. Once the aerosol cans are empty, they can be recycled in a steel-recycling program. Partially used cans that cannot be emptied or donated must be collected on hazardous waste collection days if locally available.

Disposal of solvent paint

Solvent-based paints (oil) are considered hazardous and are collected at designated hazardous waste sites, depending on the local procedures, which usually involve a hazardous waste collection day. Drying out these paints would yield toxic fumes. Since solvent-based paints need to be cleaned up with paint thinner or mineral spirits, it should also be recognised that paint thinners and turpentine must be treated with the same procedures as solvent-based paint and are considered hazardous material (NPCA, 2001).

Disposal of lead paint

Procedures for dealing with lead paint that is already painted on household surfaces vary from careful removal to painting over it; the proper procedures should be consulted before taking on any painting project that may disturb contaminated paint. For disposal of unused lead paint, the local and state regulations should be followed. In general, it is usually considered a hazardous waste and may be disposed of as such. In Victoria, Queensland, Western Australia, Tasmania, and the Northern Territory, small quantities of waste containing lead can be placed in sealed heavy-duty plastic bags and placed with regular refuse. Lead-contaminated water should not be poured down drains or anywhere else, but should be placed into securely sealed containers and disposed of according to local regulations (Environment Australia: Lead Alert, 1999).

2.5.3 Community Hazardous Waste Collection Days

Many communities have certain days on which the public is encouraged to bring in their hazardous waste for proper disposal. The programs vary, and may be locally or nationally funded. Paint comprises 40-70 % of the household hazardous waste collected by local and state governments, which sponsor more than 4,000 collection programs nationwide in the US. These programs aim to prevent paint from posing health and environmental hazards resulting from improper disposal. These collection/drop-off days are voluntary and serve as a means of public service that the government, state, city or town provide. Any paints containing lead, cobalt blue, cadmium, cobalt yellow (such as automobile or artistic paints), shellacs, paint thinners, varnishes, or paints with heavy metals are considered hazardous and must be disposed of on local hazardous waste collection days (Spectrum, 2000).

According to the World Bank's technical report of 1989, "hazardous wastes means wastes other than radioactive wastes which by reason of their chemical reactivity or toxic, explosive, corrosive or other characteristics causing danger or likely to cause danger to health or the environment, whether alone or when coming into contact with other wastes, are legally defined as hazardous in the State in which they are generated or in which they are disposed of or through which they are transported," (Batstone et al., 1989).

Example of US hazardous waste collection

Hazardous waste collection days in Worcester involve counts of vehicles instead of people/paint cans because it is easier for the township to keep track of the number of vehicles than the amount of waste that is dropped off. In the last few years, the Worcester, Massachusetts, program has serviced 600-1300 vehicles per

drop off day. The Department of Environmental Protection in Massachusetts estimates that at least fifty percent of all chemicals collected at hazardous waste days are paint (Biocycle, 1994). For the Worcester Department of Public Works, if the collection event lasts less than 24 hours, the state does not need to supervise the event, which saves the city significant funds. The cost to hire a contractor for the 1999 Worcester, Massachusetts Hazardous Waste Collection Day (sponsored by the Worcester Department of Public Works) was approximately US$23,300 for all waste collected that day in addition to paint waste. Worcester averaged 42 drums (drums hold 55 gallons or 208 litres) of 'Paint sludge/Organic Waste' at US$100 per drum collected, thus a total cost of US$4,200. The Worcester Department of Public Works collected 77 drums of 'Paints, Resins, and Adhesives' costing US$160 per drum, totalling US$12,320.

Recycling containers gathered from collection

NPCA is currently working in the United States with the Steel Recycling Institute (SRI) to promote recycling of containers gathered from the collections. More than 3,500 municipal locations are currently collecting empty aerosol cans and 2,400 are collecting paint cans through municipal programs. Plastic paint cans can also be recycled, as they are generally comprised of high-density polyethylene (HDPE). Most recycling programs include these HDPE-type rigid plastic containers. Steel cans should be recycled with a steel-recycling program (NPCA, 2001).

Example of Australian chemical collection

Household chemical collections also exist in Victoria because of a program run by EcoRecycle. The average quantity of paint processed at these collections is 4,300 kg per year (less than 5% of paint disposed each year), with an average of 301 patrons per collection day (Monash Centre for Environmental Management,

1997). Collections take place every other weekend year round at rotating sites. They collect at approximately 44 different sites a year throughout Victoria, and usually each site is operated just once a year, although sometimes they'll run the collection at the same site two weekends in a row depending on the population size of that area.

An interview with EcoRecycle's Programs Manager, Lorraine Kibbis, revealed some facts about the Croydon Household Chemical Collection event. At the Croydon site, the peak influx of people occurs first in the morning with another wave occurring between two and three in the afternoon. Two contractors run the site, one for chemical collection the other for waste management. These contractors are Chemsal and Hatler Environmental. People wait in cars for average of ten minutes total before being able to drop off their chemical waste. While waiting in queue to drop off their waste there is a stop point for the collection participants. At this point, EcoRecycle volunteers conduct a very brief statistical survey to determine how the participant found out about collection day as well as obtaining their postcode so that EcoRecycle can determine from what locations people are coming. After consumers dropping off paint have been stopped for surveying, and the consumer ahead of them has finished dropping off their waste, they are allowed to pull around and drop off their waste onto a table. The people remain in their vehicles at all times. At this point as much sorting as possible takes place by the contractors to ensure proper disposal is used on the appropriate waste. Contractors also have a disposal machine for paint cans that crushes and empties the paint cans for disposal. BHP then takes the cans for steel recycle. The actual process of collection is performed by volunteers from PACIA (Plastics and Chemical Industries Association).

Inadequacies of voluntary disposal methods

It is the consumer's responsibility to voluntarily dispose of unused paint by an environmentally sound method. One inadequacy of voluntary hazardous waste disposal method is due to the fact that the disposal is not easily regulated or enforced. Another inadequacy is that Worcester collection programs are often offered only annually in the spring months (Fiore, 2001). Smaller townships often have trouble funding such events as the cost can rise to up to US$30,000 for just 500 vehicles dropping off items. Also, latex paints are not accepted because in Worcester, the collectors say that latex can be disposed of with regular refuse after being dried out. Other costs to fund the Waste Collection Day included costs for collection of other environmental hazards including aerosols, pesticides, chemicals, mercury, reactives, and automotive batteries (Fiore, 2001). The Department has found, however, that an annual collection day does not meet public demand. Beginning in Spring 2001, the Worcester DPW is implementing a program where a permanent household waste collection site will be open one day per month for seven months in a row during the warmer months at which Worcester residents can dispose of solvent based paint and other hazardous materials (Fiore, 2001). Similar inadequacies regarding capacity limitations and cost of collection compared to the percentage of people utilising the collections have also been uncovered through an interview with Stuart McQuire, (Western Regional Waste Management Group's Regional Educational Officer) which are further discussed in the Analysis section of this report.

2.6 Programs for Paint Recycling

Several programs have been created to aid not only correct disposal, but facilitate recycling or exchange of unused paint. Local governments, community groups, and paint manufacturers have implemented these programs. Manufacturers have also begun to formulate alternative paints by re-blending new paint with old paint as well as creating more environmentally non-toxic paints. The paint industry in the United States has especially looked at the possibility of paint recycling. While the focus on paint recycling is predominantly associated with latex paints, solvent-based paint can be used in 'Waste-to-Energy' programs. These programs include using the solvents as an alternative fuel source to fuel cement kilns (PRA, 2000).

Recycled paint programs in the US

One company in Manchaug, Massachusetts, Green Paint, has been marketing recycled products for over a year. There are two lines of their product, a solvent line that has a minimum post-consumer content of 90%, and a latex-based product that has a 15% post-consumer content. These products divert paint from being disposed at hazardous waste collection days and use them towards new product. This redirection of paint from collection days lowers the cost to the local municipality as costs associated with collecting paint at public disposal days are reduced. The company, Green Paint, also sets up their own collection day for just specifically paint waste at a lower cost than what would be charged by a hazardous waste collection program.

Another paint recycling company in Seattle, in collaboration with Morley & Associates and the Puget Sound Paint and Coatings Association, has produced a consistent, high-quality, marketable, 100% recycled latex paint that meets industry

specifications. Their company sorts used paint that enters the plant into four categories: solvent-based, hazardous latex, non-hazardous latex but defective and not recyclable, and recyclable latex. This last category is then sorted according to dark or light colours. A paint manufacturer then blends the recyclable latex into exterior and interior colours and these recycled paints are tested for quality, then additives and tints are included to meet standards (Biocycle, 1991).

Recycled paint programs in Canada

Laidlaw Environmental Systems in Mississauga, Ontario has added on a paint-recycling program as an extension of their waste processing services. Latex-based recycling has been more extensively explored than oil-based recycling. Oil-based recycling has been most recently explored on the market. When recycling paints, first, the paint must be processed through a screening and sorting process. This separates latex from oil paint as well as from contaminated paints. Later, materials that pass standards from analytical laboratories are incorporated or blended into a new finished product.

2.6.1 Paint Reprocessing for Latex Paint

Another latex paint recycling option is paint reprocessing which requires higher quality control. Approximately thirty American companies take old latex paint and re-blend it into new hybridised products that yield comparable quality to new homogenous latex paint (Spectrum Industries, 2000). This is a very small percentage of the 1,495 paint and coatings manufacturing establishments reported in 1997 (US Census Bureau, 2000). It would appear that few retailers are willing to provide this paint for sale, and the choices of colours are limited (Spectrum Industries, 2000).

An example of post-consumer paint reclamation and re-blending being explored involves Benjamin Moore & Co. Paints. This innovative paint manufacturing company, based in New Jersey in the United States, is currently working on a project that involves reclaiming their paint from paint sheds and re-blending it. Paint sheds, like hazardous waste depots, provide a place for consumers to get rid of their paint (both latex and solvent-based); however, they differ in that the paint is not thrown away, but reused.

One pilot study involving a paint shed and re-blending was conducted in Milford, which is located in eastern Massachusetts (Swanson, 2001). Milford has a population of more than 25,000 residents. The Board of Health in Milford coordinates the paint shed, and the schedule of drop-off dates is available on the city's calendar of events as well as on the Milford Home Page (Milford, MA Home Page, 2001). A charge of US$2 is required for each gallon container of oil-based paint, while US$1 is charged per gallon container of latex paint in order to pay for the cost of handling and disposal. There is no fee for pints or quarts of paint. Registration is also required prior to drop-off, and may be done by calling the Board of Health or contacting them in person. Other guidelines include "no packing in trash bags, no mixing paints, no evaporated paint, and no unmarked or illegible containers." (Milford, MA Home Page, 2001) According to Dennis Swanson, when the consumer brings leftover paint to their local paint shed, it is usually shipped to another plant, re-blended, and then sent overseas to be used. In the new program, Benjamin Moore plans on reclaiming all Benjamin Moore paints deposited at the paint sheds, in order to mix it in with a new host batch (Swanson, 2001).

2.6.2 Challenges with Paint Recycling

Various challenges have arisen with the paint recycling option. Old paint can be re-blended with new paint into low quality product, but not without several problems. Bacteria or other chemicals that do not meet stringent environmental regulations could have contaminated old paint given up for recycling. Paints with biocides or added metals can present problems as well.

The greatest challenge of paint recycling, according to Green Paints, appears to be marketing and assurance of quality to the customer. Price is not a barrier and recycled paints are above average, but not top of the line; colour is limited, however. Green Paints' oil-based recycled paints are limited to off-whites, greys, browns, and reds and latex paints are limited to whites and off-whites (Biocycle, 1994). The market for recycled paint is sometimes virtually non-existent as recycled paint often has a 'muddy' tint and thus lacks appeal because of the recycled, not pure white, tint base, and this recycled paint is often used for anti-graffiti purposes. Usually old or leftover paint comprises 10-20% of the finished product, with new paint comprising the remaining percentage of product (Spectrum Industries, 2000).

Morley Paints has found that the market is the most crucial issue in recycling. When his company tried to target paint contractors with their recycled product, the initial market test was not successful. The contractors were satisfied with the recycled paint quality and performance, but the industry as a whole was reluctant to adopt a recycled product, even when it does meet standards. Often 'recycled' is associated with something that is of a lowered quality as a new product, although recycled products might meet or exceed performance standards. Paint contractors might feel that their clients would not be happy with a recycle product, or might not

want to take the effort to explain to their client that the quality of the product is the same and that they are getting the best buy for their dollar. Industry might also balk at this change because it would require them to change their automated processes, which would incur an initial cost to paint manufacturers before they could see and realise long-term profit from distributing more recycled products. Marketing regimens would also have to be changed to persuade the public to purchase their recycled products. Finally if industry started to recycle paint, then they would end up having to produce less new paint, thus loosing economic market share in sales. Morley concluded that public agencies needed to be the initial market target for recycled paint (Biocycle, 1991).

Potential market for recycled paint in Australia

In contrast to Spectrum Industries' stance on the marketability of recycled paint, the willingness of the paint user in Australia to buy remixed paint products, as determined by a study conducted by the Monash Centre for Environmental Management, seems rather high. Seventy-five to eighty percent of respondents were willing to consider these products although thirty percent of these people had concerns about the quality and colour range of these paints. In addition, 50-70% of those willing to buy remixed paint were also willing to pay the same price or more (Monash Centre for Environmental Management, 1997).

2.7 Alternatives: Green paints, Stains, Thinners, and Waxes

Since pollution and waste are created at every phase of paint manufacturing from extraction of raw materials to transportation to refineries and manufacturers, various solutions have been explored by manufacturers to reduce this waste. Alternatives include "green" paints, stains, thinners, and waxes that are formulated from a variety of organic materials: citrus peel oils and solvents, essential oils, seed

oils, tree resins, pigments from earthen materials, inert mineral fillers, bee and tree waxes, and lead-free dryers. Wood surfaces could simply be oiled instead of painted using linseed oil, tung oil, and other oil and water emulsions that allow the natural sheen and colour of the wood to be heightened. This option is especially attractive for people with chemical sensitivities. Casein paint, "milk paint," is available to customers through specialty stores. It is composed of casein (a milk solid), lime, clay, cellulose, asbestos-free talcum, and salt. The paint is simply mixed with water and stirred according to directions on the package. The milk proteins make the pigment adhere to the surface being painted and lime is added so that the powder will be able to mix with water (Trucco, 1993). It comes as a white powder base to which natural earth pigments can be added to create sundry colours.

2.8 Government Regulations

Both the United States and Australian governments have imposed several laws and regulations to ensure the health and safety of both the environment and the public. The following sections explore the similarities and differences between the actions taken by the two nations.

2.8.1 United States Regulations

In the United States, both local and national governments provide regulation. The US Resource Conservation and Recovery Act (RCRA) of 1976 allows the Environmental Protection Agency to delegate the authority to administer hazardous waste programs to the state level governments. However, most regulation of hazardous waste is relevant to larger production of wastes than that of the household waste producers. Small-quantity generators of hazardous wastes (less than 100 kg (220 lb) per month) are exempt from regulation although state

authorities may set stricter limitations. Only after a large quantity of wastes has been accumulated from smaller sources, does regulation take place at collection or transfer sites. This regulation is lacking because it does not provide provisions for whether or not solvent-based paints are actually is disposed properly as hazardous wastes, or if they end up with regular refuse, and eventually, unmonitored in land fills (US General Accounting Office, 1985). The legislation discussed here does not strictly monitor the disposal methods used by small-quantity generators.

Proper use and disposal of paint falls under several Environmental Protection Agency regulations, including the Volatile Organic Compounds Reduction Requirements section of the Clean Air Act, in addition to regulations for hazardous waste disposal. Since the United States government provides few regulations on emissions resulting from paint (specifically paint containing VOCs), local governments have implemented several local regulations for their states and communities (US Congress, 1998).

2.8.2 Australian Regulations

The Australian Environmental Protection Authority sets regulations by state; therefore, the policies may vary (EPA, 1999). Australia also monitors paint use and disposal through governmental agencies at both the national and state level. The Australian Paint Approval Scheme (APAS) and the Australian Paint Manufacturers Federation (APMF) are two examples of the various regulatory units concerned with paint in Australia. The Australian Paint Approval Scheme (APAS) is the largest and most widely recognised paint scheme in the world (APAS, 2000). The APAS, as it became known as in 1996, has a long history, beginning as the Defence Paint Committee in 1946. Currently Scientific Services Laboratory (SSL), a sub-set of Australian Government Analytical Laboratory (AGAL), controls APAS. The goal of

APAS is to certify that paints and coatings meet certain specifications on performance and environmental and occupational health and safety issues. The APAS also has the freedom to withdraw certification of products if they fail to meet the specifications set by SSL. Random audits of manufacturing plants and the products they produce are administered in order to ensure that products meet the set specifications (APAS, 2001).

2.8.3 Australian Paint Approval Scheme (APAS)

When a manufacturer of paints wants to be included in the list of approved products by APAS, they must pass a review process. This process involves three steps. APAS must confirm the manufacturer's competence in the technology and manufacturing of their product. The products must be tested and the manufacturer must pass an audit to assure the maintenance of consistent quality (APAS, 2001).

APAS also plays other roles in government and industry. Paint expertise is localised in the government, which gives them the power to give advice on government and industry issues and to educate through various organisations like Australasian Corrosion Association (ACA) and Surface Coatings Association of Australia (APAS, 2001). Because there is a lower level of air borne pollution in Australia than in the United States in general, collaboration amongst involved parties is expected to succeed without the aid of government legislation (Lofhelm, 2001).

2.8.4 Australian Regulation Of VOCs

Industry's dealings with VOCs provide an example of the collaboration among groups, since there is actually no Australian legislation that specifies acceptable VOC levels; rather, the government and industry have agreed to conform to a set

level. Therefore, APAS and the APMF, in cooperation, hope to reduce VOCs without needing government legislation.

Although they are not enforced as legislation, some guidelines for VOC levels have been determined. The National Health and Medical Research Council of Australia, in 1991, commissioned a working group to research and determine an acceptable level for VOCs indoors. The council determined that 500ug/m^3 was the goal Total VOC (TVOC) concentration. In addition, the council stated that no individual concentration of any VOC should exceed 50% of the total (Brown, 1993).

2.8.5 Australian Regulation Regarding Lead Paint

Australian legislation has traditionally been the responsibility of individual state governments. According to the National Health Forum, there are no known dates of national regulations but anecdotal information from the 1960's exists (National Health Forum, 1998). The National Health and Medical Research Council (NHMRC) produced the Standard for Uniform Scheduling of Drugs and Poisons (SUSDP) which dictated in 1992 that lead content of non-volatile portion of paint cannot contain more than 0.25% lead, down from 0.5% in 1990. Appendix P of a 1993 NHMRC regulation requires that paint containing more than set limits of heavy metals will have special restrictions of use or labelling (National Health Forum, 1998).

Most regulations on the state level in Australia were made for regulating lead content. In Queensland, the Health Act of 1937 prohibited lead, arsenic and antimony for application on toys, wallpaper and decorative paper. Section 127 restricts soluble lead concentration of paints to 5% and prohibits usage of lead paints on roofs. This act did not make any restrictions on indoor paint, but did stipulate that outdoor structures already painted with lead paint must have the paint removed;

otherwise, the owner of the structure could suffer punishment. Today lead paint is only allowed in industrial metal sprays, which may contain as much as 20-30% lead. Section 128 requires labels to include the names of ingredients and their quantities in paint. Another law in 1956 banned the manufacture, sale, and use of lead paint. The Tasmania Health Act of 1962 had similar provisions to that above with labelling. New South Wales' Poisons Act of 1966 also contains labelling requirements, while South Australia had no regulation until recently. The reason for this is because the government assumed that manufacturers already conformed to regulations made by other states, allowing them to participate in interstate trade (National Health Forum, 1998).

2.9 Voluntary Industry Programs Around the World

Voluntary programs have been created also throughout industry on a world level to help assuage the hazardous effects incurred by paint. One of the first countries to try to make voluntary agreements with industry concerning VOC levels, instead of legislation, was the Netherlands. In 1994, they created an agreement called KWS 2000 (Singh, 1994). Its goal was to reduce VOC emissions by 50% (based on the 1981 levels) by the year 2000 (within 6 years). While the voluntary agreements affected various industrial sectors, the agreements encompassed the consumer paint market by applying the reduction to emissions specifically from domestic paint. However, a failing in this initiative occurred because increased production was not considered, therefore making it very difficult to achieve (PRA, 2000).

Denmark has incorporated a voluntary agreement with its industry to reduce the amount of solvents in paints, and start a large information campaign promoting the use of low-VOC paints. Professional painters are strongly encouraged to apply

low-VOC paint (EU, 1992). Low-VOC paints in Denmark now account for between 90 and 95% of the market industry (PRA, 2000).

European countries have proposed the Solvent Emission Directive in 1997 to be implemented in 2007. The directive proposes emission limits and implements national reduction plans, with the most obvious being solvent substitution or promotion of environmentally friendly coatings. The directive is being left to member state jurisdiction to implement, and could include voluntary but legally binding agreements with industry and national laws such as the Environmental Protection Act in the UK (PRA, 2000).

2.9.1 ISO Programs

Several voluntary industrial programs exist. The International Standards Organisation (ISO) sponsors programs that deal with industrial standards. These programs are managed by inter-governmental as well as international private organisations based around the world. The ISO program specifically strives to help provide environmentally friendly guidelines for chemical industries, including paint producers and manufacturers.

The ISO Technical Committee 207 was created in order to develop voluntary international standards for "environmental management systems and tools." One category created by the ISO 14000 technical committee was the environmental management systems (EMS), which are voluntary programs geared towards integrating management of environmental practices and deterrence of non-compliance with environmental regulations. Environmental management systems include the company's overall environmental policy, their safeguards developed and executed to prevent non-compliance, and all regular procedures to "evaluate, detect, prevent, and remedy any environmental problems associated with the institution's

activities," (ANSI, 1997). Environmental audits, whether conducted internally to the organisation, or externally by auditors, help to assess the level of compliance to specified criteria and are reported back to the client (ANSI, 1997).

Another topic addressed by the ISO Technical Committee deals with graphic or text labels on the product concerning the company's environmental traits. Companies may declare specific qualities or traits that are intended to provide the consumer with information or services that they desire, thus creating a market for products with more environmentally sound features.

The Environmental Performance Evaluation (EPE) plays an integral role in measuring and evaluating a company's environmental operations relative to the company's own standards. By having access to environmental information on products and services, manufacturers' decisions regarding materials, production methods, and distribution methods may be influenced.

The Life Cycle Assessment (LCA) helps manufacturers manage and assess the environmental impacts that a product may have throughout its life cycle, beginning from the extraction of raw materials and ending with its final disposal. Company standards writers are given guidance regarding environmental aspects when creating product standards in hopes to guide them away from including specifications into product standards that may be found to be harmful to the environment. The guidance also encourages the writers to incorporate standards that would improve the environmental report of the product into the manufacturer's standards. These are only a few areas in which the ISO provides guidance for companies to be more aware of their activities and the environmental impacts that may result (ANSI, 1997).

2.9.2 Responsible Care Program

Another program that encourages manufacturers to produce environmentally friendly products in a conscientious manner is Responsible Care. This voluntary chemical industry initiative is co-coordinated by the International Council of Chemical Associations (ICCA), which is a council of leading trade associations representing chemical manufacturers around the world. Responsible Care is the official trade/service mark that represents the "chemical industry's international and voluntary commitment to continuous improvement of performance in health, safety, and environmental protection"(ISO, 1998). The Responsible Care Leadership Group (RCLG) claims that it strives to deal with sustainable development that would lead to increasing benefits for society, the economy, and the environment. According to RCLG, members of Responsible Care have reduced emissions with increased production, reduced injuries, and have safer and healthier workers (ICCA, 2001).

2.10 Paint Labelling

Throughout the world many nations have taken advantage of environmental labels to inform consumers about the positive aspects of a product. The intention of these labels is to motivate consumers to buy environmentally friendly products as well as motivate the paint industry to produce them (Hemmelskamp and Brockmann, 1997). The credibility of such a label can only be established if it is developed by "a neutral or state organisation on the basis of scientifically derived criteria." (Hemmelskamp and Brockman, 1997) Any such label must be the result of the efforts of a third-party organisation and not that of individual manufacturers. A survey conducted in Germany by IPOS (Institut für Praxisorientierte Sozialforschung or the Institute for Practically Oriented Social Research) showed that labels

established by single companies and associations who choose their own criteria for label inclusion have little credibility among consumers (Hemmelskamp and Brockmann, 1997). If the integrity of the company labels is compromised; then, state labels may also loose credibility by consumer association of the label ineffectiveness as a source of reliable information. Of the people surveyed in West Germany, 59% said that they recognised the blue angel label (a third party label put on environmentally friendly products, discussed below) as a symbol of environmentally friendly product whereas only 9% and 10% recognised "bio" or "eco" as indication of environmentally sound products, respectively (Hemmelskamp and Brockmann, 1997). This is a strong indication that state sanctioned or third-party labels are most effective in communicating characteristics of a product.

Influence of civil litigation on labelling

The effects of civil litigation, such as personal injury claims, have had a substantial effect on both products and manufacturers. Manufacturers have been influenced to improve their products as well as to include warning labels. According to Godish, "products are implicitly warranted to be fit for the ordinary purposes for which they are to be used...Strict liability does not question the conduct of the manufacturer, but the safety of the product itself." Therefore, it may be in the best interest of manufacturers to ensure that their products are labelled with sufficient information as to keep consumers of their products safe (Godish, 1991).

2.10.1 Use Of Environmental Paint Labels

Various European countries have begun to use environmental paint labels. The eco-label has been created to take "advantage of the current wave of green consumerism in a way that is acceptable and beneficial to both the environment and the members of industry," (Salzhaeur, 1991). The EC-label had been developed for

the European Community and the Green Seal label has been developed in the United States. Other countries have developed an Eco-label equivalent. Canada has developed the "Environmental Choice" label; Denmark, Finland, Iceland, Norway, and Sweden have developed the "White Swan" label; Japan has developed the "Eco-mark"; France had developed "NF-Environment"; and Austria has developed its own labelling scheme (Salzhaeur, 1991).

European Union Eco-Labelling scheme

The European Union Eco-labelling scheme began in December 1995 and the PRA laboratory in the United Kingdom acts as one of two laboratories that tests paint products for compliance. For the Eco-label to be awarded to a decorative indoor paint product or varnish, it must meet criteria such as freedom from toxic substances, efficient use of titanium dioxide pigment, and minimum volatile organic solvent content. For Class I paints, the VOC content must be less than or equal to 30g/l (minus water). For Class 2 paints, the VOC content must be less than or equal to 2000g/l (minus water). The Eco-label only exists now for indoor paints and varnishes; however, an Eco-label for exterior architectural paints is in the process of being developed. Only 40 licenses have been granted to 22 manufacturers (13 being indoor paint and varnish sectors) for the Eco-label for a total of 182 products. The future regulations of VOCs include three main alternatives to legislation: industry self-regulation and voluntary agreements, Eco-labels, and Coatings Care Program, a voluntary program sponsored by the NPCA (PRA, 2000).

German Blue Angel label

Germany has been producing the German Blue Angel label (Blaue Engel) since 1977 with the aim of promoting environmentally safe products. This qualification for paint requires that the VOC content of waterborne coatings is less

than 10% by mass, for dangerous substances less than 0.5% mass, and for solvent based coatings less than 15% by mass (PRA, 2000).

For these labels to be successful, there must be a certain level of environmental awareness in the consumer population. Environmental consciousness is the understanding of ecological consequences of personal consumer behaviour and willingness to assume behaviour that is consistent with solving environmental problems (Hemmelskamp and Brockmann, 1997).

Factors involved in environmentally friendly product purchasing

According to Hemmelskamp and Brockmann, consumers consider the following seven factors when deciding whether to use an "environmentally friendly" product. *Consumer satisfaction* is important because if the environmentally friendly product does not compare to other products the consumer will not purchase it. *Social values* also influence purchasing behaviour. If there is a perceived prestige in buying products safe for the environment the consumer will do so, however, there also may be social pressures against such behaviour. *Identification* of the environmental effects of a product will increase the likelihood of environmentally conscious behaviour. If the consumer is not aware of the consequences of using a product, they have no basis for deciding not to use the product and will continue to use products that may be damaging to the environment. *Personal utilitarian value* of environmentally compatible products allows the consumer to weigh the costs and benefits of using such a product. The more useful such a product is to the consumer the more likely they are to buy it. The perceived *effectiveness* of ones behaviour will also influence purchasing decisions. If a person feels as though their own actions have a profound effect on the environment they will modify their behaviour to accommodate a more environmentally conscious manner. If the effects of an

individual are convoluted or complex, the individual will tend to ignore modification of behaviour. The *cost* of using environmentally compatible products is another factor that influence consumers behaviour. The consumer must evaluate not only the actual cost of the product but information about environmentally compatible products, their procurement, utilisation and disposal. Finally, *availability* of these products plays a large role in whether people will buy these products. The products must be provided in retails that people can access. People must have easy access to knowledge and options (Hemmelskamp and Brockmann, 1997).

2.11 Public Awareness and Perception

Lack of public awareness or knowledge may contribute to the improper use or disposal of paint products. Since it is very difficult to monitor hazardous waste for larger producers, it is extremely difficult to monitor and regulate hazardous waste disposal on the domestic level, so the waste may often find its way into improper and unsafe places (US General Accounting Office, 1985). Therefore, public education may be the best way to increase proper disposal of household paint.

Example of publicising waste collection in US

The first step is alerting consumers that special days to dispose of hazardous waste are offered to the community. In Worcester, several methods are used to advertise hazardous waste disposal days. Mailers are sent to all residents of Worcester via government mailings to advertise the time and location of the event. The Worcester Department of Public Works has found it most effective to distribute these essentials: 'what,' 'where,' 'when' and 'who.' When the consumer has dropped off the paint at the site, they are offered environmental literature or brochures that may be reviewed at the domestic paint owners' convenience. Worcester also incorporates flyers into the box with their city trash bags to advertise the day, and

alert the customer to the other services the department offers. The Assistant Commissioner from the DPW also emphasised that word of mouth often acts as a predominant carrier of information (Fiore, 2001). Another method the DPW has tried is dispensing door hangers with advertisements, however this method is time intensive. They have talked to primary school children and sent flyers home with them, and found that the response of the flyers getting home with children this age is quite effective. Other methods include public service radio announcements, advertisements on the public access channel, and advertisements in the local papers (Fiore, 2001).

Example of publicising waste collection in Australia

The methods used by EcoRecycle to publicise their chemical collection events are newspaper ads, leaflets, web pages, brochures, and schedules. Because the city is split into two main demographic areas, the east and the west, EcoRecycle prints two ads for the east and more ads for the west. If there is an area that does not generally have a good turnout, they run a larger ad for a longer period of time in the big papers. They also have a web page set up for people to browse. EcoRecycle pays for the leaflets and then gives them to the councils to distribute however they want. The councils are responsible for paying for the distribution costs. EcoRecycle does not publicise what should not be done, nor does it publicise the hazards associated with improper disposal. Instead, they focus on what people should do with their waste. EcoRecycle feels that the most effective way of publicising is through leaflets that are dropped off by the local council at people's houses with rights notices or customer service newsletters. Another publicity method that seems to be effective is leaving notices at the public libraries. EcoRecycle's employees are paid to distribute these materials to various locations,

thus incurring more costs due to manual labour of distribution than other publicity methods like newspaper ads.

Example methods used for education in US

After the consumers' awareness of the environmental problem has been heightened, more direct measures towards prevention and education can be implemented. This can come in the form of pamphlets, web sites, information sheets, cartoons for younger children, television ads, billboards, posters, or other visually stimulating and informative material. Part of the American public mind set in the past has been that 'green issues' are presented as choices between industry/technology and the environment. By diminishing this 'choice' mindset, more optimism can be generated for the cause.

In April 2000 a Gallup survey was conducted that found that 67% of the American public would rather protect the environment than increase economic growth, if they had to choose between the two (Hinds, 2001). In a survey conducted in October 1999 by the Wirthlin Worldwide Survey, 69% of the public said "it was not a choice between the two," (Hinds, 2001). According to the survey half of all Americans consider themselves environmentalists, which is down from three-quarters of the public in 1989. Most Americans also expect the environment to get worse in the 21st century. In 1998, the Public Agenda offered focus groups in which the participants came to the conclusion that the underlying causes of environmental problems were human greed and selfishness, which cannot be easily addressed (Hinds, 2001). The key is not only to alert the public and provide solutions, but also to educate them in a concise and effective manner. The proper usage and disposal of paints, whether they be latex, solvent, spray, or lead is a movement in a positive

direction for consumers, suppliers, and manufacturers in preserving the integrity of the industry and the welfare of the environment.

2.12 Summary of Background Research

In order to undertake the project, it was necessary to understand several aspects surrounding the topic of domestic paint usage and disposal. The researchers began with little knowledge about the paint industry, and through intensive research, became familiar with the many aspects involved. The researchers explored the environmental and health and safety hazards related to paint, in addition to investigating current handling and disposal methods from around the world. The researchers gained a better insight into the paint industry through learning about practices in the United States and other countries, and were then prepared to undertake the project's challenge. By understanding the importance of paint-related issues, the researchers could readily pursue the study in order to gather raw data used to address the project problem.

3.0 Methodology

This project required the researchers to obtain raw data from various sources. The need for field research is especially clear because the problem dealt directly with assessing consumer knowledge and actions. Therefore, in addition to gathering information from literature sources, it was crucial to devise a plan that allowed the researchers to attain useful and valid data so that it could then be analysed. A task chart, which details the specific time frames and tasks completed, is illustrated in Appendix A.

3.1 Introduction: Overall Objective

The objective of this study was to assist SSL in achieving their goal of expanding the number of services that they provide from primarily services for paint manufacturers, in quality assurance, to encompassing the general public in providing services for domestic paint consumers. In order to accomplish this goal, domestic paint consumers' impressions and knowledge of paint disposal, usage and its associated hazards were collected through consumer surveys. These surveys were analysed in detail, and the compiled findings were presented to SSL. Additional information on paint use and disposal was collected through interviews with representatives from the Western Regional Waste Management Group, the paint industry (SPUG, SSL), waste collection companies (Chemsal, Nuplex, All Waste), environmental preservation groups (NSW EPA, EcoRecycle), paint manufacturers and suppliers. Upon completion of investigating how paint was currently being utilised and disposed of in Melbourne, a prototype for educational literature and resources was created and developed. The proposed educational resources included recommendations for public service announcements, paint can labels and brochures

to heighten public awareness about improper usage and disposal of paints and the related environmental consequences. The consumer's perspective, level of concern, and level of awareness regarding this issue were important factors in consideration of what content was to be included in the educational resource. In addition, it was important to take into account the manufacturers' and suppliers' perspectives, as they would have ultimate responsibility for distributing the final educational resources.

3.2 On Site Research

A preliminary literature review of databases, studies, journals, books, and literature from governmental sources that were available in the United States was conducted to obtain general background information pertaining to the project. However, upon arriving at the Melbourne site a quick literature review was conducted to obtain information not available in the United States. The main topic of information that was especially important to acquire pertained to Australian regulations and programs. A visit to the Victoria State Library provided some relevant information. The Victorian Environmental Protection Authority Library in Melbourne also provided useful sources on Victorian law and environmental regulations, as well as state-wide literature that was provided for the general public.

3.3 Interviews

In Melbourne, interviews were conducted with representatives from the paint industry (APAS, SSL), the EPA of Victoria, EcoRecycle, the Victoria Waste Regulation (Western Regional Waste Management Group), the Queensland State Paint User Group (SPUG) representative, paint manufacturers, and paint suppliers. Contact information for all of the interviews is available in Appendix B and interview

questions are included as Appendix C. The information gathered from these organisations revealed some current regulations and programs on paint disposal in Victoria, helped to devise what types of educational methods were most feasible, and identified information and disposal options currently available to the public. Additional information gathered from these sources included recommendations for paint disposal, willingness to distribute educational materials, perspectives on public knowledge and other pertinent issues related paint and its disposal.

Interviews were administered using a funnel method design in which initial questions, of interest to the interviewee, were followed by general and broad questions. Next, the most difficult questions were asked, and a final query of specific or sensitive questions that focused on getting the interviewee's opinion was made (Salant and Dillman, 1994). The interviews for each group selected were also semi-standardised, i.e., composed of the same basic questions but adjustable probing questions, so that comparison could be made among the responses.

Victoria and New South Wales EPA

Calling the EPA Victoria resulted in immediate transfer to EcoRecycle of Victoria. EcoRecycle acts as the predominant public service hazardous waste collection organiser in Melbourne. An interview with an EcoRecycle Projects Manager provided information on the chemical collection days that they sponsor. Correspondence with Sue Cunningham from the NSW EPA was maintained throughout the time on-site since a similar project to this one was being undertaken in New South Wales.

Chemical collection interviews

Chemical hazardous waste collectors were contacted and a more thorough investigation of these collections revealed the policies of the State of Victoria and the

city of Melbourne regarding paint disposal. The companies contacted were Chemsal Pty. Ltd., All Waste, and Nuplex Environmental. Topics explored in these interviews included what is done with paint after collection, using paint as an alternative fuel source, and some economics of paint waste collection.

Interview with Western Regional Waste Management Group

Another waste management organisation contacted was the Western Regional Waste Management Group of Australia. A phone interview was conducted with Stuart McQuire, who is the regional educational officer for the organisation. Topics explored included his opinions on waste collection in Victoria, governmental funding issues, as well as references to other sources and organisations.

Interview with State Paint User Group

State Paint User Groups (SPUG) are comprised of local representatives from the Federal, State and/or Local government departments. They consider and act on issues of local importance related to coatings technology and work to promote wider knowledge of coatings, their properties, and benefits (APAS, 2001). The SPUG representative from Queensland, Michael Ball, was interviewed via telephone for information regarding his opinion on paint disposal issues, contract purchasing, and initiating governmental action towards disposal regulation.

Manufacturer interviews

Specific manufacturers, two of whom have been approved by APAS guidelines and two who have not been approved, were interviewed via telephone. The manufacturers contacted included: Dulux Decorative and Dulux Protective Coatings Orica Australia Ltd., Wattyl Footscray Pty. Ltd., Wagon Paints, and Paint Factory. Manufacturers were asked questions concerning the current procedures for labelling paint cans as well as what regulations they had to follow when labelling.

Inquiry was sought as to what current environmentally friendly methods they adhered to as an industry, if they had invested in paint recycling or redemption programs, as well as inquiry as to whether they provided any educational services to the consumer.

Paint supplier interviews

Paint suppliers were interviewed in two different sets of interviews. First, retail clerks at sixteen paint stores in the Melbourne area were contacted via phone, with the researcher acting as a common consumer inquiring about how to dispose of excess paint. The purpose of these short conversations was to obtain a general idea of whether or not paint retail locations distribute any information regarding paint handling to their customers, as well as to learn what consumers were advised to do from retailers. Managers from twelve retail locations were then contacted for a more extensive phone interview to determine their willingness to distribute educational resources as well as to assess their general opinion and observations of the public's concern about usage, disposal, and hazards upon purchasing paint.

Local council interviews

Five Local Councils (Melbourne City Council, Melton Shrine Council, Monash City Council, Yarra City Council, and Whittlesea City Council) were also contacted briefly by phone interview, where the student posed as a paint consumer. The purpose of these interviews was to establish what a council recommended to the general public for paint disposal services.

3.4 Surveying Public Consumers

Surveying domestic paint consumers comprised a sizeable proportion of primary data collection. Two surveys were created, pre-tested, and administered. These surveys were 'survey-interviews' where the customer was approached by a

group member and asked to participate in a brief oral questionnaire. One survey was designed to be administered at paint retail locations, while the other survey was designed to be administered at a household chemical collection event. The main difference between the two surveys is one intends to reveal the knowledge of people before buying paint and their views on disposal information, whereas the second survey's purpose was to uncover peoples' views on disposal while they are attending a chemical collection. Several questions are common between the two surveys to facilitate analysis of subgroups within the sample population. The initial contact script can be found in Appendix D. The survey was read to each participant in the same way and no prompting for answers was given although clarification through restatement of the question may have been given.

The retail survey produced 103 responses, while 89 responses were gathered from the hazardous waste collection site. Both surveys were designed to assure the best sampling coverage achievable by the researchers. The frame for the interview surveys was the current consumer at retail paint stores as well as people utilising the household chemical collection day. By including the chemical collection day survey, paint consumers who had already used paint in their homes were included in the survey population sample. Some questions overlapped between surveys, while some were more site-specific.

Measurement error, or problems with mis-communication or understanding, was minimal because of the design of the survey. Pre-testing of the survey also identified any language that was ambiguous or culturally influenced. Because of the design of the survey interview, non-response error was minimal. By taking into account the effects of these possible errors, the actual occurrence of the errors was minimised.

3.4.1 Geographic Area Sampling

One hundred ninety-eight paint stores in the Greater Melbourne area were located from the phone book yellow pages and mapped out to determine the distribution and location of the stores. The area was then split into four regions labelled North, South, East and West. After consulting with Ken Lofhelm and Lorraine Kibbis, the researchers established that Melbourne could be divided into regions based on socio-economic status. The Met public transportation system was also considered when determining how to divide the geographical area of Greater Melbourne, since the researchers were reliant upon public transportation for accessing retail locations. Five stores were then chosen at random, one from each region and one additional store centrally located. In addition, the stores were located at varying distances from the Central Business District. This was to assure that an accurate cross section of the population was attained. When selected stores declined to participate in the study, other stores were randomly selected and contacted until approval was gained from a store in each region. The final locations selected for surveying can be view in Appendix E.

3.4.2 Survey Booklets

In order to assist respondents in answering the questions in the survey, small booklets of 75 x 125 mm (3x5 in) index cards were made with the scheduled responses for certain questions. The format for these cards can be found in Appendix F. The maximum font used on these cards was Arial 36 and the minimum was Arial 14 bold. Code 1 on the front cover card stands for the booklet used for the paint retail surveys, whereas Code 2 on the front card stands for the booklet used at the hazardous waste collection days. These cards were bound together and with

clear plastic covers on both ends. The front card that contains the WPI and SSL logos was printed in colour.

3.4.3 Surveying Paint Consumers at Retail Locations

The first survey was conducted at various paint retail locations throughout the city of Melbourne, and produced data used to assess the public's level of knowledge about paint usage and disposal. The respondents may or may not have had previous experiences in handling paint. Surveying was conducted on a weekend day as well as during the weekdays and at various times of the day in order to ensure that a diverse sample of the population was obtained.

The survey requested simple demographic information as well as responses to twenty-three simple questions. Each question was worded and ordered following the recommendations of Salant and Dillman's How to Conduct your Own Surveys (1994). The first questions asked determined whether or not the subject had ever bought paint, as well as establishing whether or not they were a trade painter. Then the survey continued with a simple yes/no guiding question followed by several three to four point Likert scale questions (the Likert scale allows a greater number of degrees for answering a question, rather than just yes or no), ending with optional demographic questions concerning age, level of education, and household income. The majority of the questions could be answered on a Likert scale, with a few others having specified options offered to the respondent. The last oral question was broad, and was intended to make the subject "feel good" about participating in the survey through offering any advice or suggestion that may help to promote better services to the future consumer. In hopes of increasing data acquisition of more sensitive information, i.e., age, income, household size, and education level, the survey was handed to the participant to complete. After completion, the respondent was to place

the survey in an envelope so that the information remained anonymous. The time required for completing each survey was approximately 4-6 minutes.

The researchers applied several techniques to encourage participation in the survey. One method to increase the incidence of subject response was to get the subject interested in completing the survey. This was accomplished by establishing rapport with respondent through identifying the intention of this study's research. Another engaging piece of information was the identification of the surveyors as students from the United States. The surveyors followed a script in order to maintain consistency. The introduction was concise and included a reason for the subject to participate, as suggested by Salant and Dillman (1994). The script used by the surveyors is contained in Appendix D, while the survey questions are included as Appendix G. Thank you letters were also sent out to each retail location upon completion of the project. This letter can be viewed in Appendix N.

3.4.4 Surveying Paint Consumers at Hazardous Drop Off Day

The second survey interviews were conducted at one of the hazardous waste collection sites sponsored by EcoRecycle Victoria. EcoRecycle is a government sponsored public service organisation that, among other activities, educates the public on environmental issues, preventative concepts, and household hazards. Through publications and their web site, EcoRecycle takes steps towards the goal of increasing the proper handling of paint in order to protect the environment and its inhabitants. Lorraine Kibbis, one of the project managers of EcoRecycle, was contacted to obtain permission for conducting these surveys. The script for obtaining this permission is in Appendix D. The date for surveying was April 7th from 8am-4pm in Croydon located in the Maroondah City Council District. This survey was administered to participants in their vehicles after their waste was collected. This

survey, although similar to the retail survey, was different in that it was more directly oriented towards discovering how the consumer knew about the collection, and what they thought about it. These surveys each had three questions that were different from the retail survey. The waste collection survey varied from the retail survey in that it lacked questions about paint stored in the home, and was more specifically directed towards disposal. From this survey, any inadequacies of existing information concerning paint disposal were revealed. The frame for this survey was residents who were disposing of domestic paint in the municipality of Maroondah in early April 2001. This survey was set up in the same format as the retail survey and also employed methods suggested by Salant and Dillman (1994). Each survey took approximately 4-6 minutes to complete. Sampling bias may have occurred in this survey because the domestic paint consumers that dropped off their paint waste at this site might have been more environmentally aware then consumers who disposed of their excess paint through improper methods. The survey is included as Appendix H.

3.5 Reasons for Choosing Particular Methodology

Interviews and survey interviews were the chosen methods for the majority of primary data collection. These methods were used because they would directly supply the desired information in the appropriate time frame. The survey interviews method was best in that it eliminated any ambiguities that many traditional paper surveys (either mailed or simply given to a client to fill out) produce. Survey respondents when questioned face-to-face can ask the interviewer directly about clarifying a question that they do not understand in the survey process, so problems with misunderstandings between the respondent and the surveyor were reduced. Conducting the surveys on-site and in person put the researchers in direct contact

with individuals who were currently invested in the issues of paint use and disposal. Response rate for this type of survey was very high, in addition to producing immediate data. The number of people who refused to answer the survey was recorded. The respondents also more easily recognised the legitimacy of this survey because the surveyors were present with credentials. SSL stationary and official nametags helped to ensure the customer recognised the legitimacy of these government conducted interview surveys (Lake and Harper, 1987). One disadvantage of this survey interview method is the cost in time since the surveys were conducted in a large geographical area, and the only method of transportation available to the surveyors was public transportation.

Other survey methods not used were telephone and postal surveys. These were not used because postal surveys have a low response rate, around 30%, and telephone surveys are limited in the amount of time the respondent is willing to spend on the phone (Lake and Harper, 1987).

Interviews were chosen to obtain secondary information for the study. This information provided insight into the manufacturing industry that was not readily available or easily accessible through published literature. The interviews also provided unexpected information that was not found in the literature. Disadvantages of interviews included the amount of time necessary for transcription and note taking as well as the possibility of receiving false or unreliable data. The reason for deceit would be due to perceived risks by interviewee for divulging the truth.

3.6 Analysis of Interviews

Upon completion of each interview, transcription and field notes were recorded. Many of the interviews could be grouped into categories, such as those conducted with paint manufacturers, chemical collection companies, or paint

suppliers. Since the interviews that could be categorised were semi-standard, comparisons could be made among the interviews within each category. Thus, information gathered from interviews conducted with various paint store managers was compiled and compared. The responses to the most relevant and important questions were reviewed and taken into consideration for analysis. Recommendations from manufacturers were also taken into consideration for suggestions of the final educational resource as well as well as consumer opinion from surveys.

3.7 Data Analysis of Surveys

Once the data from the surveys were gathered the analysis was begun. The analysis of data collected included frequency distribution to determine the percentage of respondents that gave specific answers to each question. Summary statistics such as the mean and standard deviation were also calculated for individual questions. Responses to the scaled questions were recorded and tallied for descriptive statistics. This statistical analysis was aided by use of the statistical data analysis tools in Microsoft Excel in order to determine means and standard deviations.

The data gathered from the surveys were based on ordinal scales where there was a ranking of numbers, usually 1-4. This type of data lends itself to a limited amount of statistical analysis, namely non-parametric methods. It was determined from histograms of the data that most of the distributions were either non-normal (non-Gaussian) j-shaped distributions, or uniform (rectangular) distributions. Statistical measures and descriptive statistics could be made on data that were not normally distributed, although most standard statistical tests could not be made except when comparing the mean values of the same questions between surveys

because the distribution of these data was not Gaussian. This distinction is made because, even though the population distribution can be normal or non-normal, the sampling distribution of the means from a non-normal population distribution will be normal or nearly normal (Kachigan, 1986).

The major statistical measure used was the Spearman Rank Correlation coefficient. This is a non-parametric measure where the correlation coefficient ρ_s is calculated according to the following formula:

$$\rho_s = 1 - 6\sum_{n=1}^{n} \frac{V^2}{n(n-1)}$$

where V is the difference in rank between two variables $(V = Rank(x) - Rank(y))$. Rank is a value assigned to each individual value according to its relative placement with other values among the same variable. The variables are x and y, and n is the total number of measurements taken from the population. This measure determines if there is a monotonic relation between two variables. In other words, this means that if there is an increase in one variable it is invariably associated with either an increase or a decrease with the other variable. The Rank Correlation is not dependent on distribution. This test is also better than the standard correlation coefficient because the standard method only works if there is a linear relation between the variables. An online program called Spearman Rank Correlation was used to determine these values (IFA Services, 2001). The null hypothesis used in this measure assumed that no monotonic relation existed between the variables. The online program also returns the p value, which indicates probability that the null hypothesis is true.

After the calculation was made, the resulting value of the correlation coefficient, ρ_s, and the population number (n) were looked up in a table to determine significance (Statistical Power of *r*, Bissonnette, 2000). The significance is a number between 0 and 0.99. The larger the number, the higher the statistical significance of the correlation coefficient.

The previous measure can return a positive or negative value. Positive correlation occurs when large values of one set are associated with large values of the other set, while negative correlation occurs when small values of one set are associated with large values of the other set. Zero correlation means that the two sets are unrelated to each other (Rowntree, 1981). The following tables (Table 2 and Table 3) give a general view on how strong a correlation is and how significant the correlation is. The strength of the correlation shows how the values of two sets of data are related. Are large values of one set of data associated with large of small values of another set of data? The higher the correlation coefficient the more correlation exists between the two sets of data. The significance of this correlation is based on the distribution and the size of the sample. Correlations can be small but very statistically significant if the sample is large enough. Significance does not state whether the correlation is important, it only states that given the size and distribution of a given sample the data has so much validity. For the data analysis in this report a cut off was made at moderate correlation with medium significance. Any calculations made that did not meet this set of minimum requirements was not reported.

Table 2: Strength of Correlation Values

Absolute Value of Correlation Coefficient	Strength of Correlation
0-0.2	Negligible
0.21-0.4	Weak, Low
0.41-0.7	Moderate
0.71-0.9	Strong
0.91-1	Very Strong

Table 3: Rating of Significance

Power of significance	Significance Rating
0-0.2	Negligible
0.21-0.4	Low
0.41-0.7	Medium
0.71-0.9	Medium High
0.91-1	High

When analysing the data for correlation, an order of importance or value was placed upon each individual measurement from the survey. For example, for the questions on how one disposed of their paint , a value of 1 was assigned to "poured it down the sink/drain" because it was considered the least desirable method of disposing of paint, whereas 4 was assigned to "through hazardous waste collection programs" because it was the most desirable choice for disposal among the options given.

The descriptive statistics reported were the central tendency (usually mean but sometimes mode), percentages of proportion, and standard deviation. However, the standard deviation had little meaning because the data did not fit the normal curve. The meaning that could be gathered from the standard deviation was how much difference from the mean a typical value in the data set assumed.

Means were given as decimals even though the scaled numbers were discrete, because a variable that is scaled as discrete can have an underlying continuous nature. The assumption then could be made that a real world histogram of a fixed number of observations could move to a theoretical distribution based on an infinite number of observations (Kachigan, 1986). In other words, even though there were usually only four values in the scale, values in between the discrete numbers could be valid.

3.8 Development of Educational Materials

Finally, upon analysis of all data, a method for educating the public was proposed and developed. The development of a brochure was pursued, in response to the analysis of data obtained from the various interviews and surveys.

The content of the brochure was also determined in response to the analysis conducted regarding the interviews and surveys. The issues to be addressed were determined from information gathered from these interviews and surveys. The most pressing and relevant issues were addressed, specifically information on waste minimisation and proper disposal methods for wastes. The priority of these points was also evaluated based on the importance of the issue. The researchers then had the task of choosing which information should be included in the space available in a three-fold A4 sheet of paper. This was also done in consideration of aesthetic appeal for most attractive communication of the information. The goal was to ensure that the brochure was both appealing and informative so that consumers would read and consider the information provided.

The content was developed and sent to the Australian Government Analytical Laboratories' on site marketing manager, John Hardcastle, who assisted in the development of the brochure by informing the researchers of the guidelines for the

brochure's layout. Mr. Hardcastle also relayed the information and layout to Damien Collis, of Collis Design, who created the specific scheme of the brochure, in accordance with the descriptions provided by the researchers. Project members, sponsor, and advisors reviewed the format. Minor corrections and additions were then made, and the brochure was approved for final production.

3.9 Distribution of Brochures

After designing the point of sale brochure, a distribution strategy was investigated. The ultimate goal for distribution was to have the brochure available to all consumers and users of paint throughout Australia; however, this was a long-term goal and would require continued work for SSL after the conclusion of the project.

The first step taken towards the distribution goal was contacting the larger paint manufacturing companies and paint store chains in Australia. This would most likely reach more people immediately, since locating and contacting all of the smaller retail locations across Australia was a much larger undertaking. A letter and a copy of the brochure were sent to the Marketing or Customer Service departments of each company. The letter described the purpose of the brochure, and requested that the marketing or customer service manager e-mail SSL to request brochures for the company to distribute to its retail locations. A copy of the letter is included as Appendix K.

The availability of the new brochure was also announced through notices in the SSL newsletter which is distributed to SSL employees and affiliates, and a copy of the brochure is to be posted on the APAS web page. The announcement will also be included in a newsletter that SSL sends out to paint manufacturers several times a year. The announcement is located in Appendix K.

The researchers also sought to inform local councils, nationally, of the existence of the brochure. A letter was written to the editor of MAPS Link, which is the official magazine of Municipal Authority Purchasing Scheme (MAPS) Group Ltd. The magazine facilitates contracts for public goods and services nationally in Australia, but whose focus is in New South Wales, Victoria, and South Australia. Local governments, state government departments, universities, water authorities, and libraries all subscribe to MAPS. The letter sent to the magazine editors (Appendix M) briefly explained the research project and mentioned the availability of the new brochure for local council distribution. The brief notice will be published if accepted by the magazine editors.

Sue Cunningham from the NSW EPA was also contacted in order to determine if she had any suggestions for the distribution of the brochure through EPA channels. Ms. Cunningham, on behalf of the NSW EPA, offered to distribute the brochure to the public in addition to displaying the brochures at NSW EPA locations and by giving them to people inquiring on their pollution phone line.

The brochure was also presented as a poster at a science fair SSL participates in each year. The National Science Fair is held in Canberra, and is one of the largest in the nation. This week-long science fair attracts many educators, scientists, and the general public. All attendees to the fair will also have the opportunity to request the brochures.

3.10 Presentation of Results

The final results of the study were presented on May 1, 2001 at the Department of the Infrastructure to parties involved with the various Melbourne IQP projects. In addition, a summary report was sent to participants upon request. The report focused on results and conclusions, and is located in Appendix O.

4.0 Results

These results are comprised primarily from information gathered from interview sessions as well as results from the two survey sessions conducted. They provide the information needed to assess consumers' awareness as well as associated groups' perspectives regarding paint-related issues.

4.1 Paint Suppliers Interviews

Paint suppliers play a vital role in communicating information to the consumer. Therefore, it was then necessary to examine how paint suppliers interact with their customers regarding what type of information they give them concerning paint disposal. Two sets of interviews were conducted with paint suppliers. One set dealt with what information the stores gave customers regarding paint disposal. The second set of interviews determined the feasibility, through the supplier's perspective, of implementing different types of educational material.

4.1.1 Paint Suppliers' Advice on Disposal

In order to gather general information about the advice from paint store staff available to inquiring paint consumers in Melbourne, sixteen paint stores were called. In hopes of receiving a more genuine response, the researcher played the role of a paint consumer, and asked the paint store clerk three questions. The first question was whether or not the store distributed point of sale brochures on paint disposal. The second question was whether or not the store took back oil-based or water-based paint, and the third question asked the store clerk how to dispose of oil and water-based paint. The results of these questions are tallied in Table 4 below.

Table 4: Paint Retailers' Advice to a Consumer for Disposing of Paint

Paint Store	Distribute Brochures?	Take back paint?	How to dispose of paint?
1	No	No	Dry paint out (oil and acrylic), then dipose with rubbish
2	No	No	Dry out with kitty litter (oil and acrylic), then rubbish
3	Yes*	No	Dry acrylic paint out, chemical collection day for oil paint
4	No	Yes if small qty	Reuse it as base for something else
5	No	No	Call the council
6	No	Yes	Bring it back to store
7	No	No	Put sand in with it (oil and acrylic), then to the tip
8	No	No	Call council, chemical collection day (oil and acrylic)
9	No	No	Call council or paint manufacturer
10	No	No	Check the label on the can
11	No	No	Dry out with kitty litter (oil and acrylic), then rubbish
12	No	No	Call council for oil paint, dry acrylic out
13	No	No	Take it to the tip (oil and acrylic)
14	No	No	Dry paint out (oil and acrylic), then dipose with rubbish
15	No	No	Call the tip
16	No	No	Call the council

*This store sent their brochure in the mail. It consisted of phone numbers for EcoRecycle, the Victorian EPA, and landfills.

Thus, out of the sixteen stores interviewed, only one store, or 6.3% of all the stores, offered a brochure but this brochure only gave contact information for various organisations in Victoria that may have been able to give the consumer more information on how to dispose of their unwanted paint. Two out of 16 paint stores offered a service where the consumer could bring paint back to the paint store, representing 13% of paint stores. Thirty-eight percent of the paint stores suggested that both oil and water paint should be dried out using various methods (kitty litter, newspaper, sand, or products available at their store), and then discarded into the rubbish. One retail store did specify that acrylic paint should be dried out and oil paint should be disposed of through a chemical collection program. Chemical collection days as a means to dispose of unwanted paint was suggested by 13% of the retailers, while another 31% of retailers suggested that the consumer should call their local council to discern disposal methods. One supplier gave each of the

following suggestions for dealing with excess paint: reusing the extra paint for another project or for base coats, bringing the can back to the store, calling the paint manufacturer, checking the paint can label, calling the tip (landfill), and taking it to the tip.

4.1.2 Paint Suppliers' Opinions on Additional Information and Consumer Behaviour

Twelve paint store managers or owners were interviewed over the phone. Each interview consisted of nine questions, with the focus being on the owner or manager's willingness to distribute educational resources and the need, as they saw it, for such resources. These stores were different from the original sixteen contacted for the other paint supplier interviews. Stores were selected for these twelve interviews from different regions of the Greater Melbourne area as determined by the demographic project explained in Methodology section 3.4.1. The results of these interviews can be seen in Table 5 below.

Table 5: Paint Retailers' Responses on Consumer Behaviour and Information

Paint Store	Client Influx/Day	Type of Paint	People Ask About Disposal?	People Ask About Hazards?	Willing to Distribute Brochure?	Advantage of Brochure?	Disadvantage of Brochure?	Willing on Scale 1-5	Brochure or Label Sticker
3D Paint (W)	40	Acrylic	Not Really	Not Really	Yes	Service	None	4 or 5	Both
Bunnings (W)	2500	Acrylic	No	No	Maybe (Head Office)	Environment	None	Head Office	Brochure
Danes (C)	30-50	Acrylic	Not Really	Not Really	Maybe (Look First)	Environment	None	2 or 3	Brochure
Paint Factory (N)	20-30	Acrylic	Not Really	Not Really	Maybe (Head Office)	None	None	Head Office	Brochure
Paint Place (N)	30	Auto	No	Not Disposal Yes Application	Yes	None	None	5	Label Sticker
True Value (N)	80	Acrylic	No	Not Disposal Yes Application	Yes	Education	None	3	Brochure
Paint Magic (E)	20	Acrylic	Yes	Often	Maybe (Look First)	Education	Wrong Idea	2.5	Brochure
Paint House (E)	10	Acrylic	Not Really	No	Yes	Environment	None	5	Label Sticker
Paint Right (S)	40	Acrylic	Not Really	Not Really	Yes	Education	None	5	Label Sticker
Bristol (S)	30-50	Acrylic	Not Really	No	Yes	None	None	5	Label Sticker
Paint Spot (S)	50	Acrylic	Not Really	No	Yes	Environment	None	5	Label Sticker

Ten of the eleven stores sell mostly acrylic paint, which composes 50-90% of all paint sales. Seventy-two percent of store managers say that customers do not frequently ask questions about how to dispose of paint or if there are any hazards associated with using the paint (18% say a few, 9% say yes). However, consumers do ask questions regarding application, usage, colour and how to prepare surfaces. The major concerns that customers express about the hazards of paint application are regarding whether or not the paint will have affects on people like expectant mothers or people with asthma. Other people, referred to as "Greenies" by one storeowner, enquire about natural paints. Of the store managers interviewed, 63% said they would be willing to distribute educational material the remaining 37% said they might be willing but that it had to be cleared with head office.

The major advantages managers expected from the distribution of disposal information include education of the public, protection of the environment, and increased services to the consumer. The only disadvantage of distributing such material as viewed by paint store managers was that the material may be misinterpreted or left unread.

The general consensus concerning the willingness of stores to distribute material on a scale of 1-5 with 1 being not at all willing and 5 being extremely willing was 4.17 (with a standard deviation of 1.15). The type of material that stores would be more willing to distribute was split evenly between a brochure and a paint label sticker that would be applied to the paint can by store employees. The benefits of the label sticker, according to the store managers was that labels would be semi-permanently attached to the can of paint so people would not lose the information, also every time the consumer painted, they would see the sticker on the can. However, there was the possibility that the ink would fade from sitting in the sun on stock that did not turn over

very quickly, or the sticker could get obscured by the paint the consumer was using. One store manager suggested that paint can labels actually come off the can easily. The drawbacks of a brochure mentioned by retailers were that customers may not read the material, or it might be thrown out shortly after the consumer brings it home.

4.2 Local Council Phone Interviews

Five Local Councils were contacted via phone to determine what they recommended consumers do with their acrylic and oil paint. The interviewer posed as a domestic paint consumer for these interviews to obtain more authentic results. The councils contacted were Melton Shrine Council, Melbourne City Council, Monash City Council, Yarra City Council, and Whittlesea Council. Three of the five councils recommended contacting EcoRecycle, or mentioned that there would be a household chemical collection day in a local area hosted by EcoRecycle. Their response suggested that the consumer take all their paint to these collection days. One council suggested that the acrylic paint should be dried out, or taken to the local recycling facility for either disposal or recycling. The oil paint should just be taken to the local recycling facility. One council suggested contacting a hazardous waste collection company, Viachem Technology for disposal of both the acrylic and oil paint.

4.3 Label Information

Labels were physically examined at several paint stores around the Greater Melbourne area to gather information on what information was included on the labels. These labels came from several different manufacturers in Australia. The information was tabulated by category. It was also noted whether the label included information on hazards and disposal.

The researchers found that information included on most labels was about surface preparation, paint application, coverage, dry time, and clean up. Information on

hazards was only included on solvent-based paint and was usually in the form of symbols. Information on disposal, if included, stated simply not to pour the paint down the drain and/or to call the local council. A summarised table of disposal information found on paint labels Is shown below:

Table 6: Paint Label Information

Paint Manufacturer	# Products Checked	Products with Information	Products without Information	Disposal Information Listed
Berger	3	Wood Stains	None	▪ Do not pour paint down the drain ▪ Brush out excess paint from brushes onto newspaper ▪ Check with the local council for disposal information
Bristol	5	Acrylic, Enamel, Base, Satin, Flat	None	▪ Do not pour leftover paint down the drain ▪ Recycle empty paint cans ▪ Keep unwanted paint in sealed containers for disposal at chemical waste collections
Dulux	3	Oil Paints	Acrylic Paints	▪ Dispose of excess paint at special chemical waste collections (Oil Paint) ▪
Hi-Tech	5	Various Acrylic and Oil Paints	None	▪ Do not pour paint down the drain ▪ Recycle the can ▪ Check with the local council for disposal information ▪ Brush out excess paint form brushes onto newspaper for disposal in the rubbish
Taubman	4	Acrylic Living Proof Acrylic Sun Proof Timber Top	Tradex Series All ¼ Litre Cans	▪ Scrape excess paint from equipment and put it back in its container ▪ Wash up with water ▪ Do not put paint or waste water into sewers or drains
Wattyl	4	Various Acrylic and Oil Paints	None	▪ Protect our environment, keep unused paint sealed or bring it to a hazardous waste collection
White Knight	4	Various Acrylic and Oil Paints	None	▪ Do not pour paint down the drain ▪ Take unwanted paint to a chemical waste collection ▪ Recycle paint cans ▪ Wash up with mineral turps (for oil paint) and with water (for acrylic paint)

4.4 Paint Manufacturers Interviews

Paint manufacturers were interviewed to assess the current paint-labelling scheme as well as to get paint manufacturer's perspectives of the label changing process. The researchers inquired about paint recycling and redemption programs as well as the costs associated with adding or changing a label, thus investigating modifying the paint labelling process as an option for increasing consumer awareness. Paint manufacturers that were both approved and not approved by the Australian Paint Approval Scheme (APAS) were interviewed. The marketing managers of Dulux, Wattyl, and the production managers of Paint Factory and Wagon Paints were interviewed.

Label content

Dulux, Bristol, and Wattyl paints produce a short label section on their cans detailing disposal instructions which briefly advises against pouring the paint down the sink or sewer. Rather, they recommend to customers who were making inquiry that they should dry the paint out on newspaper to dispose of it, or to take it to a hazardous waste collection program. Manufacturers insist that the space allotted on the cans for these labels is extremely minimal. Physical examination of paint cans at retail outlets verified this claim. Dulux paints refers their customers on the paint can label to visit their web page, which more extensively details disposal procedures. Wagon Paints provides a contact phone number for their customers in the case of an emergency, but the rest of the information provided on their labels is strictly what is required by legislation to be included. The manager of Wagon Paints also mentioned that it is their policy to refer the customer to additional material as much as possible, since space is limited on the labels themselves. The manager of

marketing at Wattyl paints noted that all paint cans also are required to have the dg diamond label, which identifies the product as dangerous goods. Paint Factory places a simple warning only on oil-based paint cans that warns the consumer of the flammability of the product. However, they do not produce any labels on acrylic paint or oil paint detailing information on the hazardous effects of their paint. The warning on the cans of oil-based paint is not extensive and refers customers to the fact that the paint is hazardous, but does not explain why.

Changing paint can labels

Dulux Paints and Paint Factory noted that the Australian Paint Manufacturers Federation determines what information is put on paint labels. In order to change a label, which paint manufacturers say they do regularly, at least annually, there is a AU$600 cost per plate changed according to Wattyl paints. For Dulux paints, a sudden and mandatory change would likely cost approximately two hundred thousand dollars. However, if a different label was produced and added to cans in a "phasing-in" process, it would not cost Dulux a significant amount of money. Wagon Paints estimated that it could cost the company between AU$30,000-50,000 to change the printing plates used in creating labels. As for adding a label sticker to the cans that explained paint disposal methods, all of the manufacturers interviewed indicated that they did not think that it was as feasible as actually changing the label. This is due to the fact that adding a sticker would incur inherent labour costs since the existing process is automated, and the stickers would either have to be applied manually or the automated process would have to be altered. Paint Factory did not feel that it was feasible to add another section to their labels detailing paint disposal information because there is a section already on their cans that has a telephone

number for technical information. Consumers would be able to acquire information on disposal by calling this number.

Perspectives on environmental responsibility

The manufacturers seemed aware of, but not necessarily very interested in environmental goods and products. However, Paint Factory claimed that all of their products were environmentally friendly when used according to instructions. Paints used for roof coating were actually safe enough to allow water run-off to be used as drinking water. Wattyl paints did not see their role in industry as being responsible for implementing a take-back program, rather they saw disposal as the responsibility of the local council or local body programs. Dulux paints suggested that collection was EcoRecycle's primary responsibility because it was an effective program.

The research and development department at Dulux is investigating aspects of paint recycling as one of its many ongoing research projects. They were especially interested in biodegradable paints, paints made from renewable resources like soybeans, and reducing the amount of energy required for production. They have already produced a low-fume paint. However, most of the research is still considered long-term because these environmentally conscious products will not likely be produced within the next five years.

Exploring another aspect of environmental responsibility of manufacturers in the painting process, Paint Factory has also been attempting to implement aspects of recycling into their manufacturing process. The main waste stream they are attempting to recycle is waste water produced from rinsing of holding tanks. This water can be used as base water in the manufacturing of water-based paints. According to the manager of Wagon Paints, the company is not very interested in producing environmentally-conscious products because their customers are mainly

industrial companies, who are not likely to be willing to pay the extra costs new environmentally-conscious paint would incur.

Implementation of new programs

Regarding the possibility of imposing a levy on paint cans to fund retailers or manufacturers' collection programs, Wattyl Paints' marketing manager thought that Wattyl would end up carrying the weight of most the costs, and therefore did not see it as an applicable solution because either the manufacturers or suppliers would have their margins squeezed. Dulux's marketing manager claimed that she did not directly know much about the company's stance regarding "cradle to grave" responsibility (meaning manufacturers are responsible for a product through its entire life cycle). The production manager from Paint Factory did not see any problems with a collection program but deferred the ultimate responsibility to his superiors. If it was something they wanted to do, they had the capability to do it.

4.5 Hazardous Waste Collection Company Interviews

Hazardous waste collectors were interviewed to gain insight into what happens to paint after it is collected, if it is used as an alternative fuel source, and the economics of paint disposal. Four collectors around the Melbourne area were contacted: Chemsal, Nuplex, All Waste, and Hines Waste Collection Company. All hazardous waste companies estimated the cost for one litre of paint collected to range from AU$0.35 to AU$1.50.

At both Nuplex and Chemsal, after paint is collected at hazardous waste sites, it is taken back to the chemical company's site. The paint cans are sorted into stillages (metal racks used for sorting) before being sent to the hopper. The cans are then crushed in the crusher, and the paint is squeezed out into the intermediate bolt container (IBC). Then, the cans are taken out and shredded, and the metal is

recycled. The resulting mixture of oil and acrylic paint is left to be sorted. That mixture separates, with the acrylic paint coagulating and forming a semisolid mass that can be filtered off. The remaining oil paint is then burned as an alternative fuel in cement kilns. Nuplex sends their paint to be burned by a company in Dandenong called Teris. Nuplex also estimated that they get about 50% acrylic paint and 50% oil paint, and that they treat about 1000 litres of paint per month. Chemsal estimated that 70% of the paint collected from chemical collections, such as the one in Croydon, is solvent-based and can therefore be used as an alternative fuel. Nuplex promotes EcoRecycle's services; however, they usually do not participate in their chemical collections. They have been called out, though, to some city councils' public collections if a larger quantity of paint is collected than the council had expected. Nuplex does not see these collection as beneficial to the company, except in an altruistic community way. They require proper equipment and staffing to run, and Nuplex prefers to handle industrial waste.

At All Waste, acrylic paint is treated in the plant by using filter presses. The mixture is then separated until the paint coagulates, allowing the solid to be taken to an EPA-approved tip (landfill). Waste water from the process is treated and disposed of according to regulations of City Waste Water. Oil paint is subcontracted and is sent to incineration by Teris in Dandenong, or it is used to fuel Geelong cement tanks in their kilns. Some water-based paint, if it has a high calorific value, may be sent to incineration, although the occurrence of this paint is not very common. All Waste estimated that 90% of the paint they processed was acrylic, and that 10% of the paint was sent away to the Geelong cement company. All Waste noted that the cement company would get a savings in cost as they would usually substitute 10-12% of this alternative fuel for their normal fuel, thus saving AU$10-12

million a year. A possible drawback, All Waste noted, could be potential emissions of incineration and toxicity. All Waste has never participated in a household hazardous collection day because they are not set up properly to conduct one. All Waste noted that in order to participate, that they would have to see an economic profit, that most companies "do it for the dollar, not to save the world." They did see disadvantages, such as the high risk factor involved in that residents drop off unlabelled materials that need to be identified at the chemical collection days.

In addition to these interviews a follow up phone call was made to Viachem in response to interviews with local council mentioned earlier. It was found that it would cost $1.50 per litre to drop paint off at their facility, or it would be a $50 charge to have Viachem come to a home to collect the paint. Viachem disposed of the paint through incineration.

4.6 Interview with Queensland State Paint User Group's Representative

The interview with Michael Ball, SPUG Representative, revealed his opinions regarding the actions that should be taken to decrease the harmful effects improper disposal of paint. Mr. Ball believes that most paint is not disposed of in the correct manner, and that there is also insufficient information regarding disposal. In order to increase proper disposal, manufacturers need to take more responsibility. Industry standards also need to be altered. In order to motivate manufacturers, Mr. Ball believes that the manufacturers will first need to see a definite commercial benefit to participating in a recycling or reclamation program. Mr. Ball also felt that by increasing the cost of improper disposal through fines, people would be encouraged to look to manufacturers to provide methods for disposal of their paint. Mr. Ball also believed that if a charge was mandatory at chemical collection days to take back consumer paint, that consumers would put an increased pressure on manufacturers

in expecting them to fulfil their responsibility in the paint disposal process, providing more disposal options. He did not believe that an increase in cost of disposal of paint, such as charging a fee at a collection day, would cause more people to use improper methods such as pouring paint down the sink or drain or putting it directly in the rubbish. He felt that the people who would use those methods were likely to use them regardless of the costs, stating, "Those people would be doing it that way anyways. I don't think it would stop the people who wanted to do it properly." However, the solution to the issue of improper disposal of paint that Mr. Ball felt would be the best for now would be the implementation of contract purchasing. Contract purchasing occurs when a clause holds manufacturers responsible for taking back left over paint from consumers. Mr. Ball stated that the government would need to take a role in establishing the system, though.

4.7 Interview with Western Regional Waste Management Group's Regional Educational Officer

Stuart McQuire is the regional educational officer for the Western Regional Waste Management Group in Victoria. There are 16 total waste management groups in Victoria. Mr. McQuire mentioned that the Western Regional Group was not as active as some of the other groups. The Western Regional Waste Management Group primarily runs the Waste-Wise Business and Organisation program, which aids local businesses in recycling and being more environmentally aware. In addition, the Western Regional Waste Management Group produces brochures and flyers on recycling and composting, but not on paint or paint disposal.

Mr. McQuire made a reference to a study done by Monash University on paint disposal done in 1997, and also provided contact information for Bill Grant who currently works at EcoRecycle, who had a copy of the aforementioned report. In

regards to paint, Mr. McQuire recommends that industry needs to develop a scheme that funds the recovery of all paint. He emphasised that a lot of people go to the EcoRecycle programs for chemical collection; however, he pointed out that if the overall numbers were totalled, the total percentage of paint collected for Victoria was not that high. He estimated that EcoRecycle gets about 5,000 people annually dropping off paint through those programs. Mr. McQuire continued that if Victoria has about 5 million people, maybe 1.3 million households he suggested, then 5,000 is not at all a large number. Calculating this out, this would mean that EcoRecycle caters to just 0.39% of the households in Victoria. Mr. McQuire feels that EcoRecycle could not handle a higher influx of customers than it handles now because it would require increased resources in both finances and staff. Mr. McQuire estimated that EcoRecycle's budget is AU$10 million, and also suggests that that amount is diminishing. He noted that paint was probably the majority of what is recovered at the hazardous waste collection days; however, he came to the conclusion that EcoRecycle is really recovering very little paint for the high cost it takes to run the programs. Although the majority of what they recover is paint, the amount of paint that the really collect is very minimal compared to the amount of excess paint left in homes throughout Melbourne. He estimated that if 5,000 households used the chemical collection days a year, and that if EcoRecycle budgets about half a million dollars a year for the program, then it averaged to be AU$100 per household per service.

Mr. McQuire believes that the councils' involvement in paint disposal should be minimal. He suggested that they have enough to deal with, including other chemical management issues and programs. He again suggested that industry needed to pick up the bill here by creating a levy on each paint can to cover the cost of the

scheme. There could be a higher levy on more toxic kinds of paints, like oil based paints. The levy would most logically have to be implemented nationally; however, he notes that Australia relies predominantly on voluntary agreements with industry, thus extending producer responsibility. He believes that therefore, Australia does not see as many results with voluntary compliance since it is a matter of choice, and not necessity. For a final conclusion, he emphasised the need for store attendants and waste attendants to be educated about paint disposal and its consequences when improperly disposed. Mr. McGuire mentioned that he had seen waste attendants throwing partially full paint cans into the skips, or tip (landfill) bins, at waste transfer stations in and around Melbourne.

4.8 Interview with an EcoRecycle Projects Manager

The main reasons for contacting Lorraine Kibbis, EcoRecycle Projects Manager, were to obtain permission to conduct surveys at the hazardous waste collection days sponsored by EcoRecycle, as well as to gain a better understanding of EcoRecycle's purpose and role in the disposal of paint waste. The two sites originally chosen for surveying were the Ballarat and Bayside sites; however, in the past, these collections were very small. Therefore, only about 100 people at Bayside and 250 people at Ballarat were expected to participate throughout the day (8 AM to 4 PM). Due to this fact, Ms. Kibbis suggested that the survey be conducted at the Croydon site in the Maroondah City Council district on April 7th 2001. Here the expected number of people was greater than 1000.

Ms. Kibbis believes that the majority of Australians are very good at proper disposal techniques. She says that they are very aware of what they should be doing. At the chemical collections 80% of the waste collected is paint. This is from a

total amount of waste of about 250,000 metric tonnes. Also, in her opinion, the general attitudes of people towards waste management are positive. People are aware of what they should be doing. According to Ms. Kibbis, it is part of the Victorian culture to know what to do. She also believes that Victoria has the highest rate of recycling, although motives are split between Eastern and Western Melbourne. The Eastern region is generally more inclined to utilise the collection days. Ms. Kibbis suggests that the differences in participation in the waste collections are due to the East being generally wealthier, and primarily consisting of native Australians. People there have more of the "keep up with the Joneses'" attitude. They probably paint more often, whereas in the west, there are more cinderblock homes. The population in the West, according to Ms. Kibbis, is made up more of immigrants and the homes are smaller. Ms. Kibbis believes that country people do not come to drop off days because they have big sheds where they keep their paint supplies for future use. In addition, she suggests that the attitude the people in the country hold is that "there is always a fence to paint."

Ms. Kibbis feels that on a scale of 1 to 6 with 1 being not environmentally aware and 6 being extremely environmentally aware that the population of Victoria is about a 4. In her opinion, people in Melbourne are more aware of environmental issues than other places, as evidenced by the cleanliness of the streets. Yet, not everyone knows about recycling and waste disposal issues, and there is always more that needs to be done. Ms. Kibbis feels that educational material will increase the awareness of people if it stands out, such as something like a sticker on a paint can that has a cute fish that says "Don't kill me by polluting my water with improper disposal."

According to Ms. Kibbis the two major states that are up to date in waste management are probably Victoria and New South Wales. However, there are a few differences in the ways that the states regulate their waste. New South Wales uses more legislation to enforce waste management techniques, whereas Victoria focuses more on education and increasing public awareness. The Environmental Protection Authority oversees most of the regulation of waste management. The EPA NSW has greater manpower, with more than 1,000 people employed in contrast to the EPA in Victoria, which only has about 400 employees. Ms. Kibbis also mentioned that the EPA will be closing all unlicensed tip (landfills) in the near future.

EcoRecycle was created in 1996 with the purpose of reducing waste through implementing infrastructure, such as building transfer stations, in addition to the purpose of education of the public. There are 16 different waste regulation groups, EcoRecycle being one of them. Each waste regulation group has its own education plan with different components. In addition, the councils each come up with their own plans for waste regulation. Plans must be approved by EPA, which acts under the Environmental Protection Act. Group plans are monitored so that collaboration among the councils may occur. For example, not all councils have a tip (landfill), so they must use another council's. Money to execute the plans is gained from landfill levies. The money is then pooled by the EPA for distribution among the 16 regional waste management groups, and is usually used for the management of tips (landfills) and education of the public on litter management. The amount received by EcoRecycle, $650,000 annually, comprises most of the money collected from the landfill levy whereas the rest of the money is distributed among the other fifteen waste management groups.

4.9 EcoRecycle Statistics

From the 1998-1999 EcoRecycle Annual Report as well as the 1996-2001 EcoRecycle chemical collection database that the organisation provided, the researchers were able to draw some fiscal conclusions (EcoRecycle, 1999). In 1998-1999 approximately 50% of all the chemical waste collected by EcoRecycle at household chemical collection days was paint waste. This is from 200 tonnes of chemicals from 23 different sites, thus approximately 100 tonnes of paint waste chemicals was collected that year. EcoRecycle allocates about AU$2 million of its budget for Household Waste Reduction and Recycling programs, which consist primarily of their paper recycling program, a curbside recycling program, and the household chemical collection days program. Nearly AU$1 million is designated for the kerbside and the paper-recycling program, leaving approximately AU$1 million for the chemical collection programs. In the 1998-1999 year, EcoRecycle served 4,688 vehicles, or households, in their chemical collection. When dividing the annual amount spent for the household chemical collection program by this number of vehicles, the average cost per household/vehicle that drops off hazardous waste is AU$216.45.

Figures obtained from the Australian Bureau of Statistics' 1996 census revealed that Melbourne had 3,138,147 residents (ABS, 1996). The average household size in the Greater Melbourne region is approximately 2.7 persons, with 1,162,277 households in Melbourne. The average number of households that participated in EcoRecycle's chemical collection days between January 1994 and December 1996 was 4,850. Thus, EcoRecycle's household chemical collection days

program reached an average of 0.42% of the household populations in Melbourne in 1996.

4.10 Survey Results

The surveys were designed to help assess the paint consumers' awareness of paint-related issues. In addition to the geographic variation, the surveys were conducted on varying days and times in order to obtain a representative sample of consumers. The survey conducted at the household chemical collection event was designed to obtain similar information to that of the first survey, with the addition of gaining insight into the variations between the groups surveyed. The following results, in the form of charts, tables, and statistical values, reveal the outcome of these short survey interviews.

4.10.1 Demographics

Of the 103 consumers surveyed, 89% had bought paint at some point in their lives.

- 75% of people surveyed used the paint for personal purpose, while 25% of people surveyed used the paint for trade painting purposes
- 69% were male and 31% were female

Table 7: Description of Survey Sessions at Retail Locations

Store Location	Store Size	Customer Influx	Time of Day	Length (Hrs.)	# Surveys Collected
Central	Medium	Very low	Weekday PM	4	4
North	Medium	Medium	Weekend AM/PM	5	20
Eastern	Very Large	Very high	Weekday AM/PM	4	61
Southern	Small	Low	Weekday AM	4	13
Western	Small	Very low	Weekday AM	3.75	5

Of the 89 people surveyed at the disposal site, 99% had bought paint at some point.

- 2.4% of the people surveyed were trade painters
- 70% were male and 30% were female

Figure 2: Age Distribution of Surveyed Populations

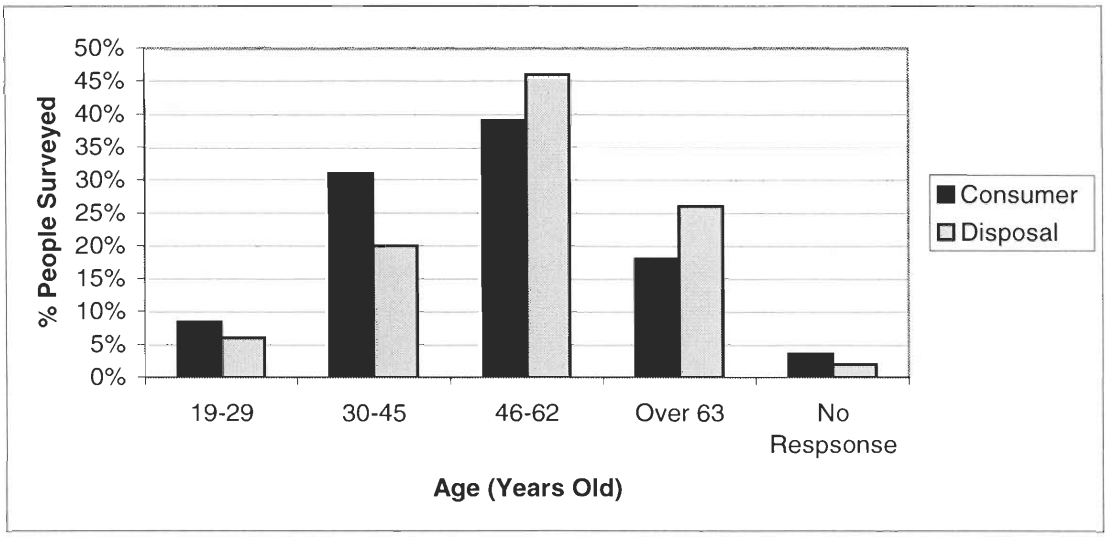


Figure 3: Education Levels of Surveyed Populations

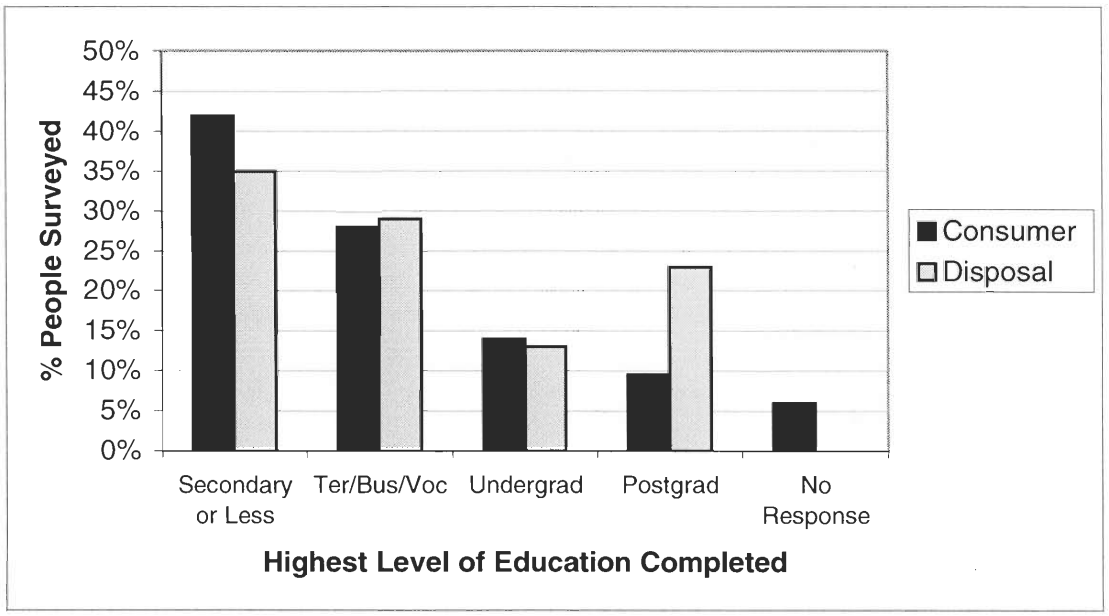
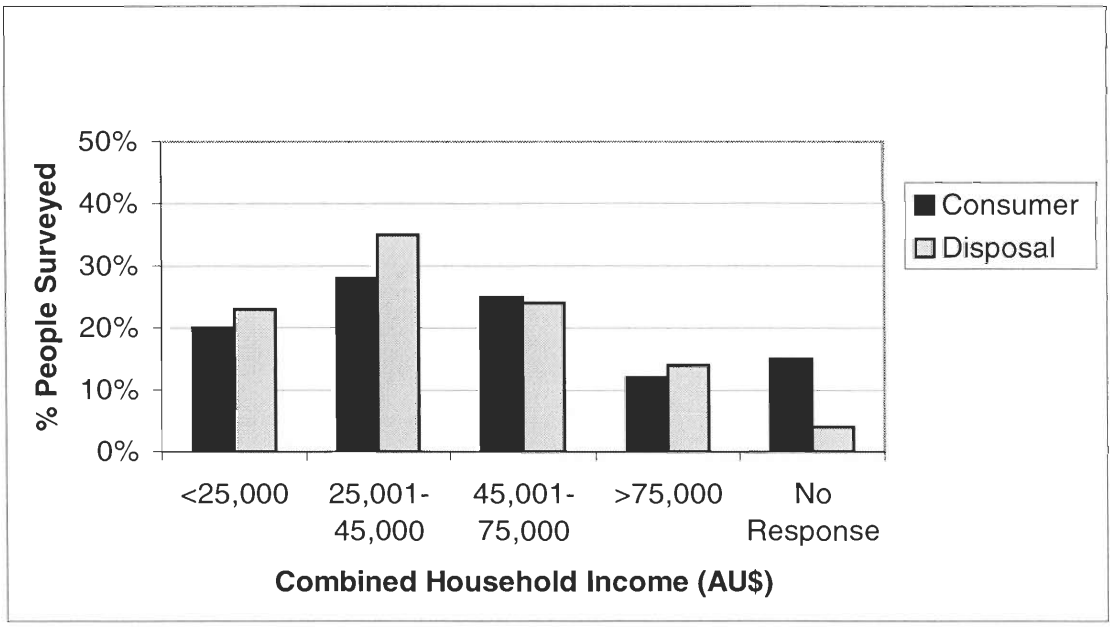


Figure 4: Combined Household Income of Surveyed Populations

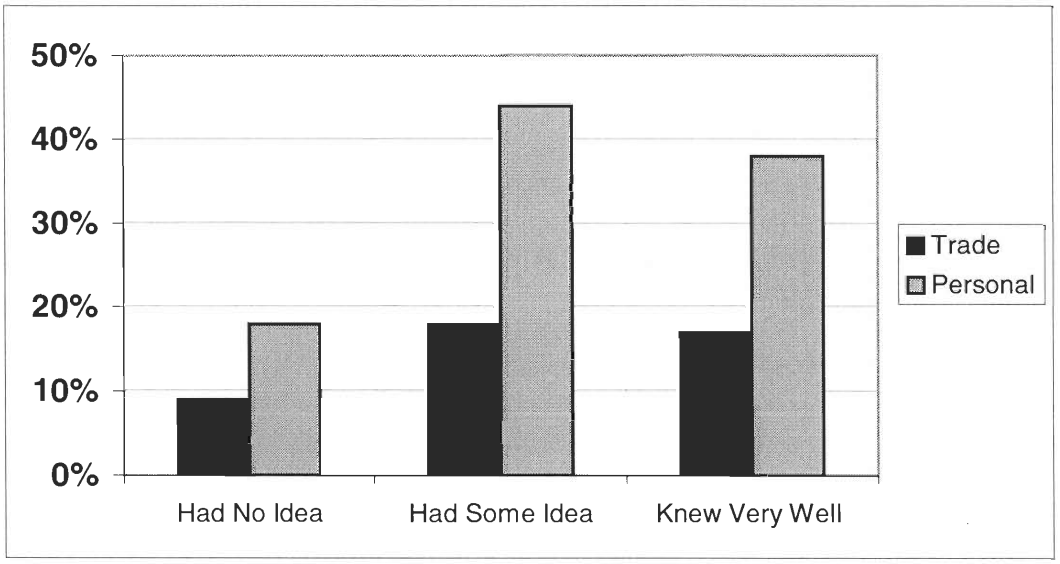


4.10.2 Tallied Question Results

Consumer Pre-purchase and Application Knowledge:

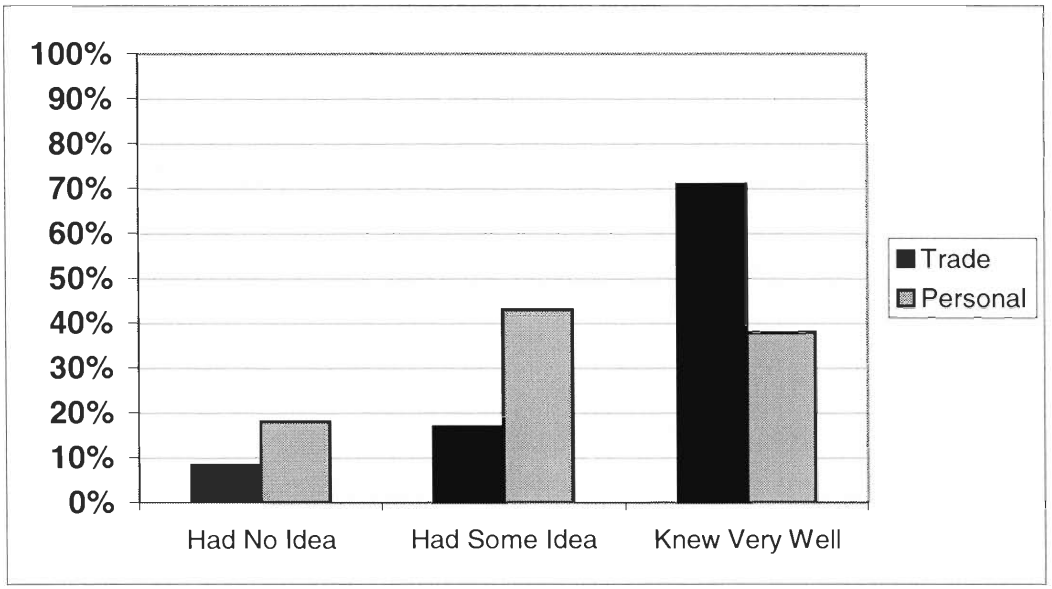
- *Before purchasing, did you have an idea of how much paint you would need for the specific job?*

Figure 5: Prior to Purchase Knowledge



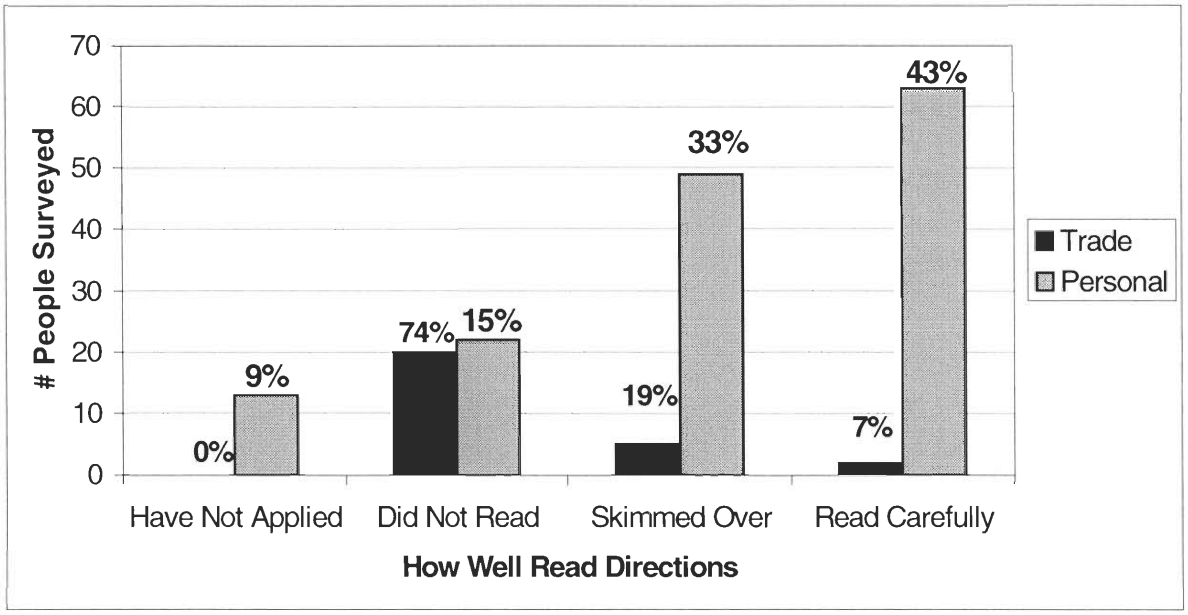
- *To what extent did the information provided on the label influence your purchasing decision?*

Figure 6: Label Influence on Purchasing Decision



- *If you have applied paint, how well did you read the label instructions first?*

Figure 7: Read Directions on Label with Last Painting Job

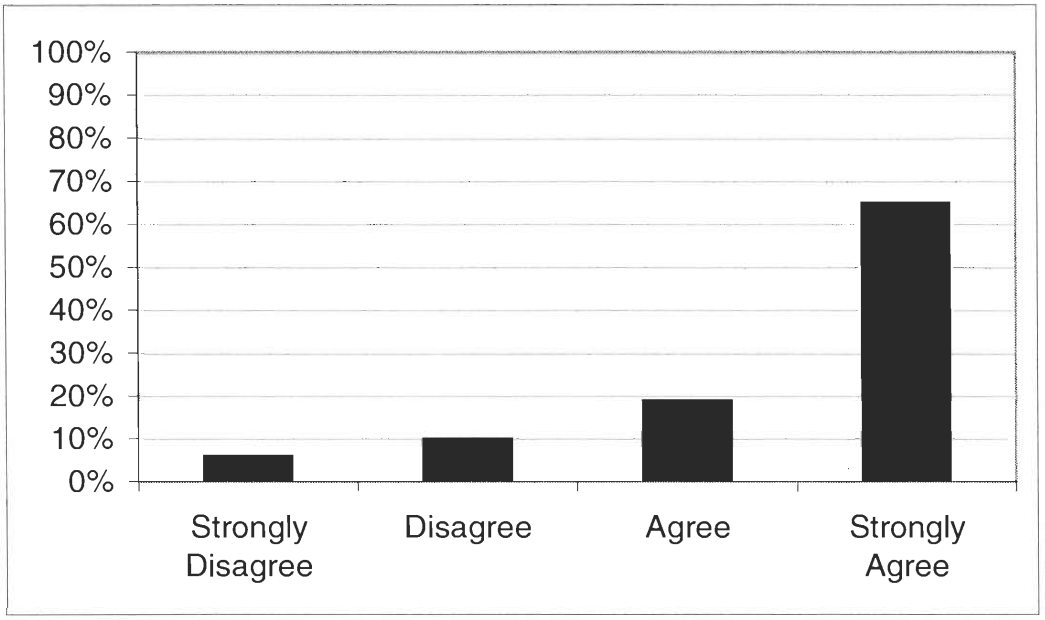


- *How easy or difficult were they (the label instructions) to follow?*

The mean was 1.6 on a scale of 1-3, with 1 being very easy and 3 being very difficult. The standard deviation was 0.74.

- *On a scale of 1-4 with 1 being not at all and 4 being strongly agree, to what extent do you agree with the following statement: I prefer paint that provides specific information on how to properly handle and dispose of paint on its label.*

Figure 8: Agreement with Statement on Label Information

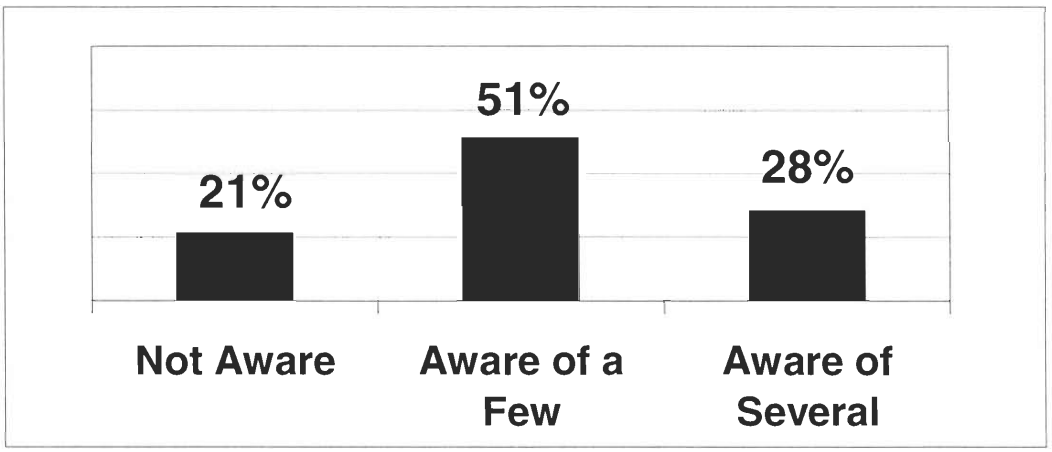


The mean of this response was 3.4. The standard deviation was 0.91. Very strongly agree received over 64% of total responses. Eighty-four percent of people surveyed agree with the statement (giving a 3 or 4 on the scale), and only 16% disagree with the statement (giving a 1 or 2 on the scale).

Consumers' Knowledge of Hazards Associated with Improper Disposal:

- *Are you aware of any hazards related to improper disposal of paints?*

Figure 9: Awareness of Hazards Related to Disposal of Paint



- *On a scale of 1-4 with 1 being not aware at all, and 4 being very aware, to what extent are you aware of any hazards that may be related to improper disposal of paints?*

The average was 3.1, with a standard deviation of 1.0.

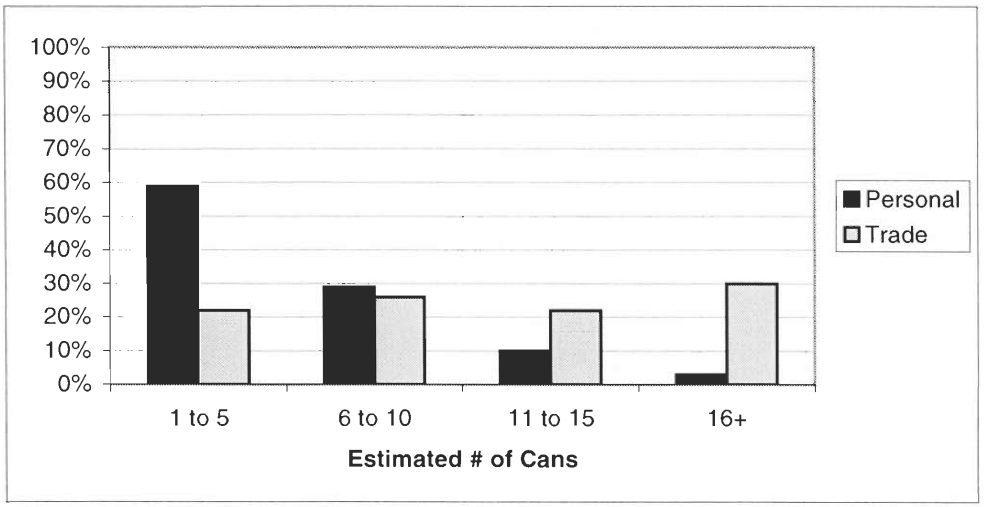
Evaluation of Excess Paint in Homes:

- *Do you have leftover paint in your home currently?*

Ninety-one percent of people surveyed at retail locations had leftover paint stored in their homes.

For people surveyed at retail locations, *how many cans do you have stored in your home?*

Figure 10: Amount of Excess Paint in Homes Currently



Consumer Disposal Trends:

- *Have you disposed of paint in the past 5 years?*

Sixty-eight percent of the people surveyed at both survey sessions had disposed of paint in the past 5 years.

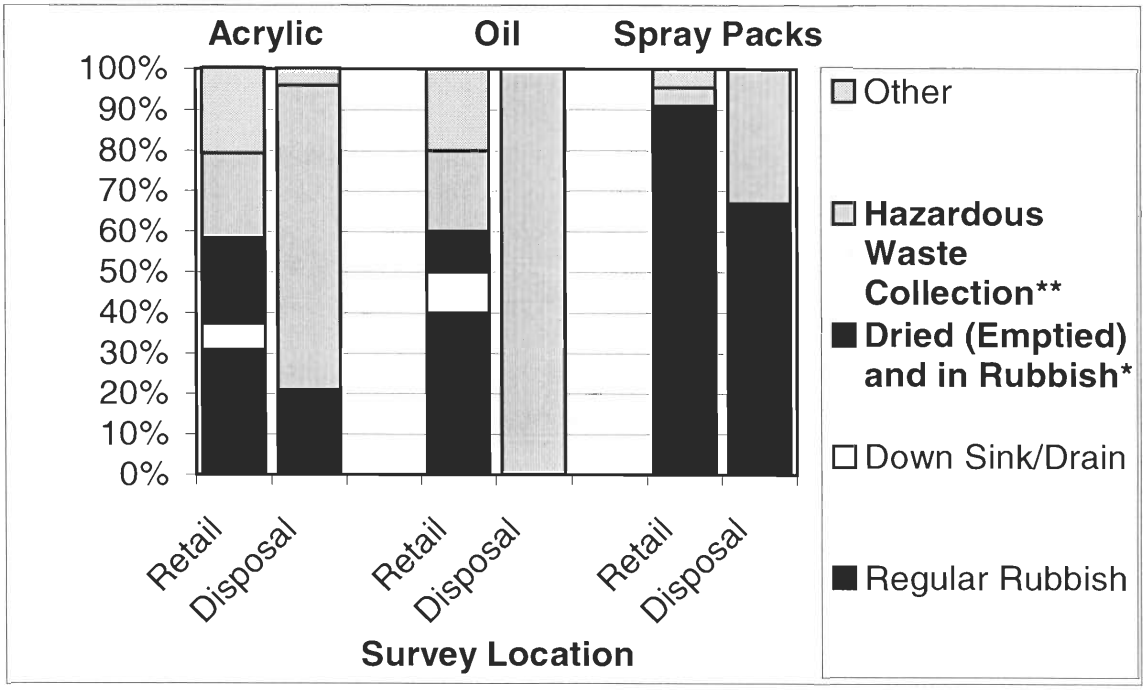
- *What type of paint did you dispose of?*

Table 8: Type of Paint Disposed of from Both Surveys

Type of Paint	Retail Survey Location	Disposal Survey Location
Acrylic	51%	79%
Oil	61%	70%
Spray Packs	24%	16%

- *Of the people who have disposed of paint in the past 5 years, excluding paint disposed of on the Chemical Collection Day, how did you dispose of your paint (acrylic, oil, and spray packs)?*

Figure 11: Paint Disposal Methods



** Appropriate method for acrylic paint and spray packs*
***Appropriate method for acrylic paint, spray packs, and oil paint*

- Of the people surveyed at the Chemical Collection Day, *how many disposed of paint?*

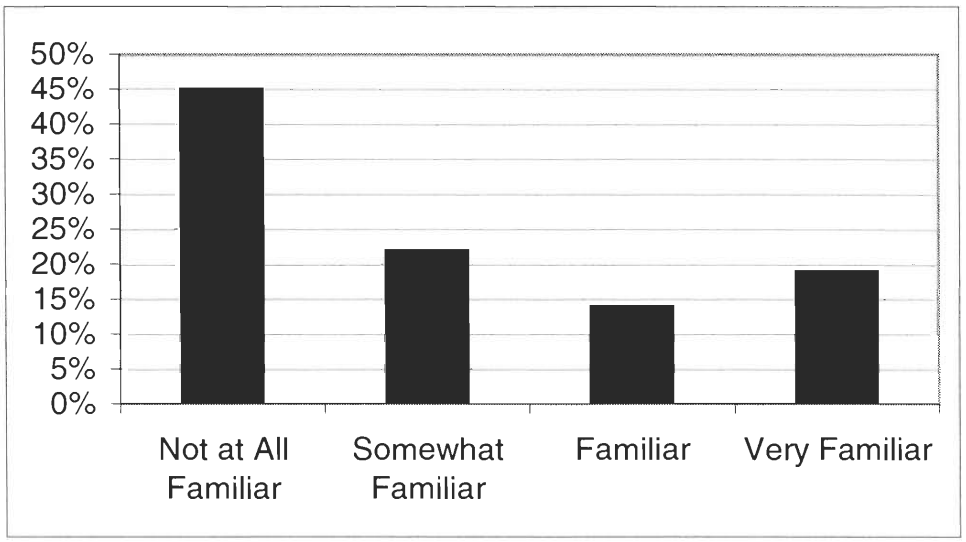
Note: This question was asked only at the chemical collection survey, and refers specifically to paint disposed of on that one day.

57% disposed of both acrylic and oil, 74% disposed of acrylic day, and 61% disposed of oil. 17% disposed of only acrylic and 4% disposed of only oil paint.

- *On a scale of 1-4 with 1 being not at all familiar and 4 being very familiar, to what extent are you familiar with programs geared towards paint disposal in your area?*

The average was 2.1 on a scale of 1-4. The standard deviation was 1.2.

Figure 12: Familiarity with Programs on Paint Disposal

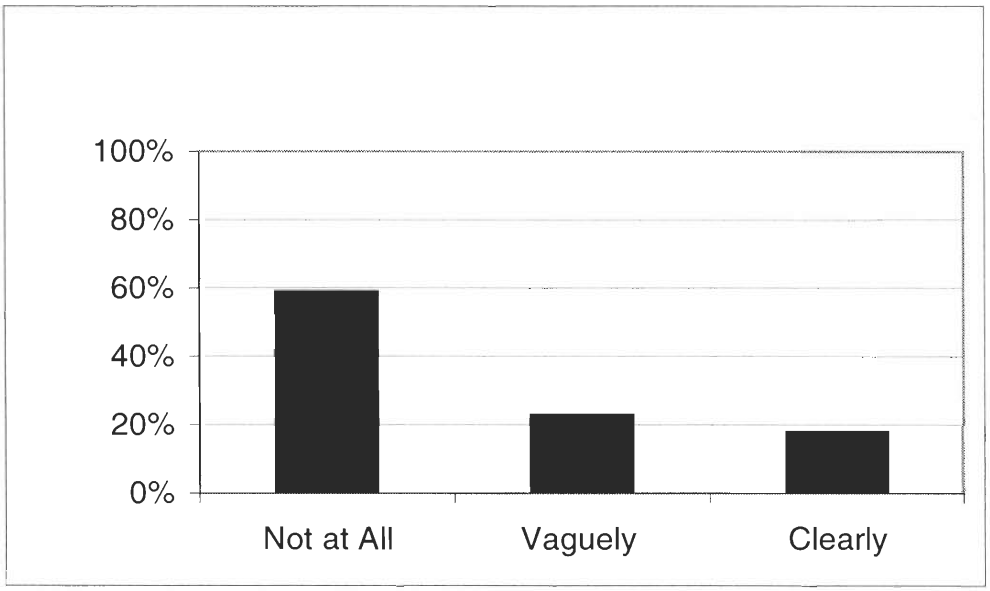


Consumer Awareness of Disposal Information:

- *Can you recall any brochures, labels, or other sources providing information on paint disposal?*

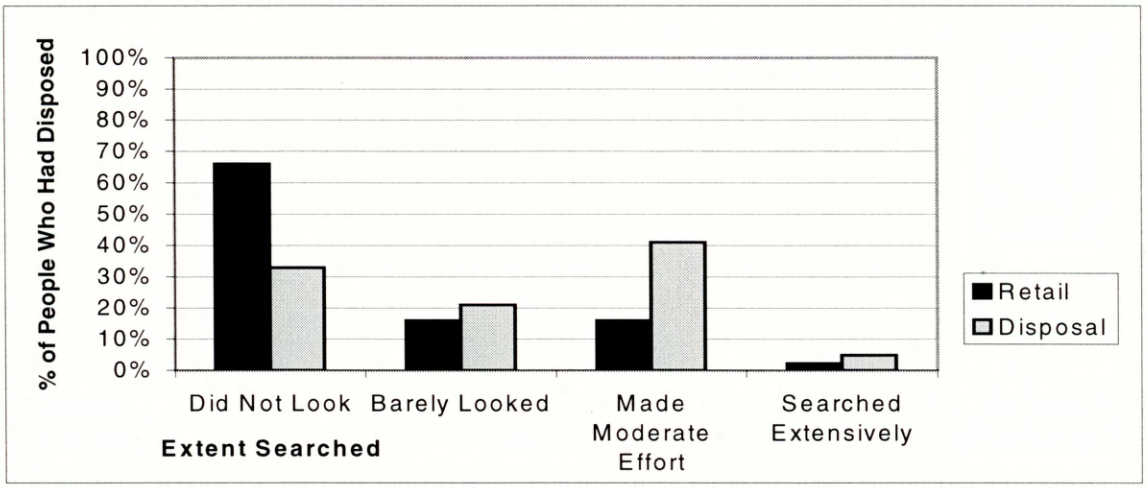
The average was 1.7 on a scale of 1-3 with 1 being not at all and 3 being clearly recall. The standard deviation was 0.78.

Figure 13: Recollection of Disposal Information



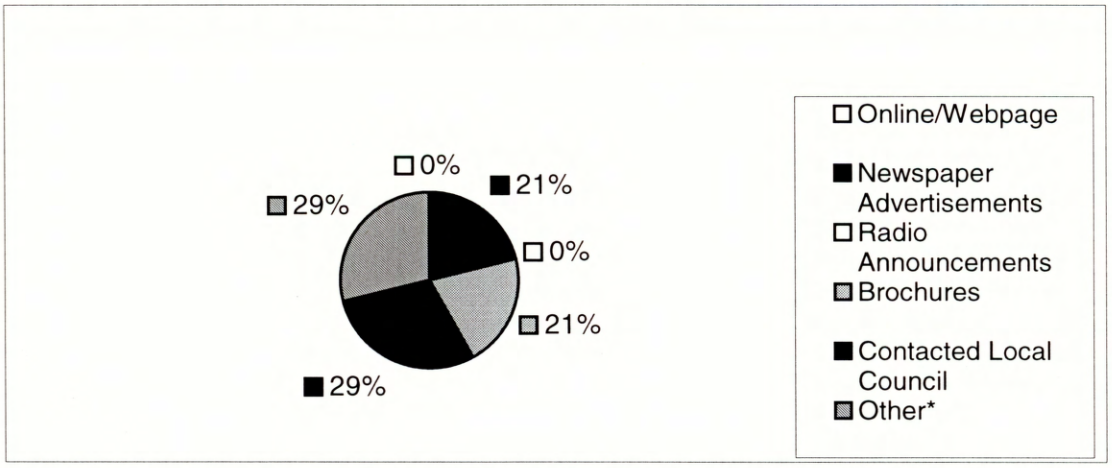
- *To what extent did you look for information on how to dispose of excess paint?*

Figure 14: Extent Customers Searched for Information on Paint Disposal



How did you go about finding information on disposal?

Figure 15: Sources of Disposal Information from Retail Survey

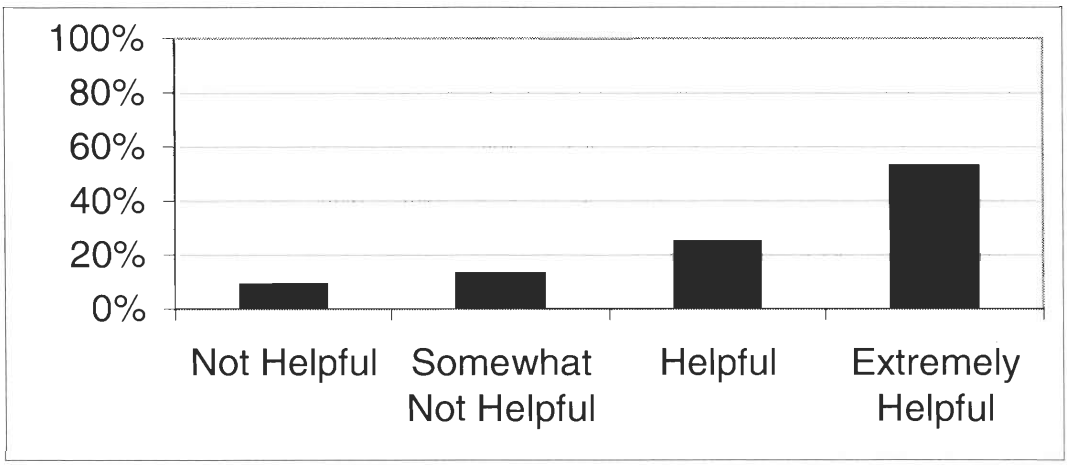


*Other methods include paint can labels, family members, television news, and contacting the paint company.

On a scale of 1-4, with 1 being not at all helpful and 4 being extremely helpful, how helpful would it be to you to have additional information on how to dispose of paint?

The average was 3.2 on a scale of 1-4. The standard deviation was 0.99.

Figure 16: How Helpful would Additional Information be?



- *How much influence on your actual actions would more informative material about proper handling of paint have on a scale of 1-4 with 1 being no influence and 4 being much influence?*

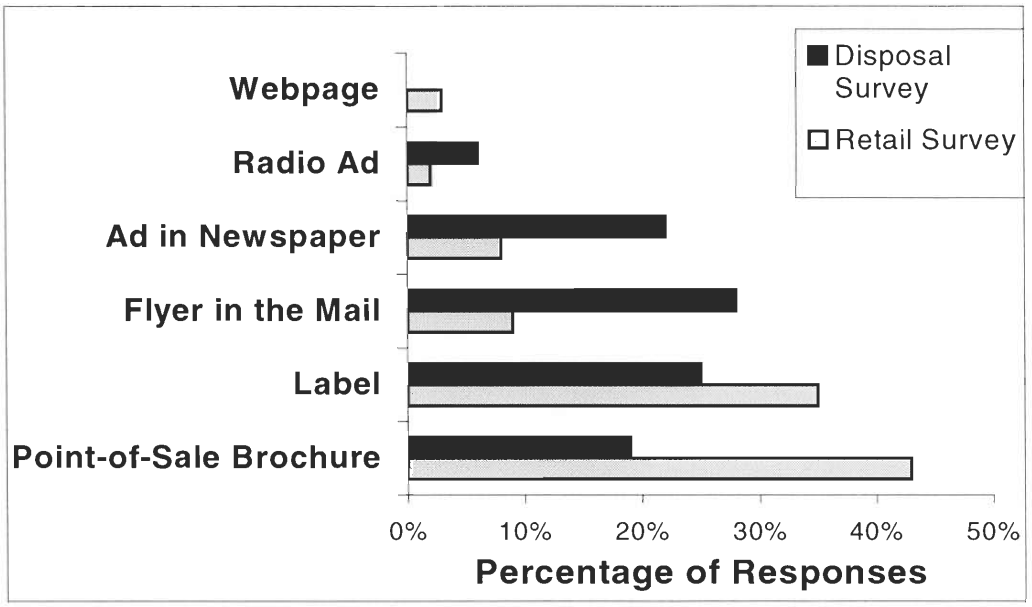
Table 9: Influence on Actions More Informative Material Would Have

Statistical Test	**Personal Use**	**Trade Use**
Mean	3.4	2.8
Standard Deviation	0.97	1.3

- *Of the following publicity methods, please rate your top two choices that you think would be the most useful to you in effectively communicating how to dispose of paint?*

The percentages for these graphs are calculated from all responses of preference of material. There was no distinguishing between choices. The preference was assumed to be for both methods chosen. All responses were pooled and the percentages calculated from the total number of responses.

Figure 17: Consumer Publicity Preference Method from Both Surveys



4.11 Correlation Results

The following correlations were determined to be significant. The data shows how information provided to people will affect them. The power of significance was determined using the statistical power charts for *r* at a confidence level of .05 this means that there is a 5% chance that the data is not statistically significant in correlation.

Disposal Survey:

Helpfulness of additional disposal information verses how much influence information would have on people's actions. Moderate correlation. High significance.

$\rho_s = 0.67$
$N = 71$ The power of significance is above 0.99.
$P \leq 0$

Preference for more information on disposal on labels verses influence information would have on people's actions. Moderate correlation. High significance.

$\rho_s = 0.49$

$N = 66$ The power of significance is above 0.99.

$P \leq 8.33 * 10^{-5}$

Extent of looking for disposal information verses proper disposal methods used (Spray packs). Moderate correlation. High significance.

$\rho_s = 0.50$

$N = 14$ The power of significance is above 0.99.

$P \leq 0$

Retail Survey:

Helpfulness of additional disposal information verses how much influence information would have on people's actions. Moderate correlation. High significance.

$\rho_s = 0.61$

$N = 92$ The power of significance is above 0.99.

$P \leq 0$

Preference for more information on disposal on labels verses influence information would have on people's actions. Moderate correlation. High significance.

$\rho_s = 0.67$

$N = 90$ The power of significance is above 0.99

$P \leq 0$

Extent of looking for disposal information verses proper disposal methods used (Acrylic). Moderate correlation. Medium high significance.

$\rho_s = 0.41$

$N = 43$ The power of significance is approximately 0.75.

$P \leq .01$

Extent of looking for disposal information verses proper disposal methods used (Oil). Moderate correlation. Medium significance.

$\rho_s = 0.43$

$N = 20$ The power of significance is approximately 0.51.

$P \leq 0$

Extent of looking for disposal information verses proper disposal methods used (Spray packs). Moderate correlation. High significance.

$\rho_s = 0.68$

$N = 22$ The power of significance is approximately 0.95.

$P \leq 0$

Recollection of educational material verses looking for information on disposal. Moderate correlation. High significance.

$\rho_s = 0.54$

$N = 67$ The power of significance is more than .99.

$P \leq 1.12 * 10^{-5}$

5.0 Examination of Findings

Through results obtained from the survey and interview analysis, it was determined that there was a need for an educational resource to be created to distribute to the general public, specifically paint consumers. From the study, the researchers found that there was a general lack of knowledge of hazards associated with paint use, and proper disposal techniques, as well as additional options for excess paint, besides disposal. The researchers then assessed what information needed to be conveyed to paint consumers, from the results portion of the report, concerning content, amount of information, cost, consumer preference, distribution strategy, and other factors. It was determined that a point-of-sale brochure would be the most effective publicity method to educate consumers. The brochure was designed and produced, and a distribution plan was synthesised.

5.1 Sample Population Demographic Assessment

The data gathered from the surveys can be considered reasonably representative of the average paint consumer since the demographics show similar distribution among age, education, and household income to data from the Australian Bureau of Statistics. A direct comparison of ABS data with data obtained from the surveys cannot be made due to the large brackets used for reporting age, however generalisations can be inferred. The only major difference can be seen when comparing Figure 2 with the average age of people in Melbourne reported by the Australian Bureau of Statistics, which is 33 (ABS, 2001). The graph shows that the sample is somewhat skewed towards a higher age from the general population; however, this increased age of the surveyed population is most likely explained by

the fact that these people are presumably home-owners. The age is also reasonable due to the expectation that children are not going to be buying paint nor disposing of it at a drive-up chemical collection. The income distribution, as seen in Figure 4, also corresponds with the average annual household income reported for Melbourne, which is $36,192, according to the Australian Bureau of Statistics (ABS, 2001). It should also be noted that the sample population of the disposal survey comes from a subset of about 0.4% of the households in the Greater Melbourne area that utilise the chemical collection services (calculated with figures obtained from ABS and EcoRecycle).

Most of the people who were surveyed were either in the process of buying paint or had bought paint in the past. In addition most of the people surveyed at the chemical collection were disposing of paint, thus supporting that the sample population was representative of the paint consumer. The surveys revealed 94% of the people surveyed had bought paint at some point in their lives. It is not surprising, then, that having excess paint in the home is a very common situation. Of all of the people surveyed, 91% have excess paint stored in their homes currently. This common occurrence is also supported by research and interviews. Therefore, the question of how to dispose of this excess paint, if deemed unwanted by home-owners, affects a large proportion of the population.

5.2 Assessment of Consumer Knowledge

Consumers awareness of paint hazards

Another important factor to be considered in the study is the awareness the respondents had regarding the hazards associated with paint. The survey conducted at the retail locations indicates that 72% of consumers were not aware of

any hazards or only aware of a few (Figure 9). As gathered from the disposal site survey, it can be found that 54% of people were not aware of any hazards or only aware of a few. Since there are people who do not know about the hazards associated with improper paint disposal or only know of a few hazards (64% percent of all people surveyed) this information needs to be communicated.

It may be concluded that people who utilise the chemical collection day to dispose of their paints will either know, or at least feel like they know about more hazards than the average consumer because they are aware enough to know that they should be disposing of their paint through the collection.

Consumers awareness of proper disposal techniques

Next, the process that paint users go through in disposing of excess paint is explored. Subjects were asked to rate their familiarity with disposal programs in their area on a scale of one to four, with one being not at all familiar and four being very familiar. A value of 2.1 was obtained, indicating that most people surveyed, even those who utilised the chemical collection day, felt that they were not very familiar with paint disposal programs. This could be attributed to the fact that the question is directed specifically towards paint disposal programs whereas the collection was for all chemicals. Sixty-eight percent of the people surveyed at both sites had disposed of paint in the past five years. Table 8 in the Results section breaks down the distribution of the different types of paints disposed both including and not including those disposed on the day of the collection. The distribution of the various methods can be seen in Figure 11 in the Results section. On the day of the chemical collection, 57% of the people surveyed were disposing of more than one type of paint. Of all the people surveyed at the disposal site, 73% disposed of acrylic paint and 60% disposed of oil paint that day. When comparing the methods used by the

people surveyed at the retail locations to those of the people surveyed at the disposal site, it can be seen that the people at the retail locations were more likely to have disposed of their paint, both acrylic and oil, in an inappropriate method. The people surveyed at the retail locations used all methods of disposal, including the unadvisable methods of pouring it down the sink or drain and putting it directly in the rubbish, while those who utilised the chemical collection did not report using any improper disposal methods. There is also a moderate correlation (0.50) with people who used proper methods of disposing of spray packs and the extent to which they looked for information on disposal. People who look for information are more likely to dispose of their waste properly.

By analysing the disposal methods graph (Fig 13.) it can also be noted that 100% of consumers who attended the chemical collection had disposed of their oil paint through other chemical collections in the past. Also, as gathered from figure 14, consumers who attended the chemical collection days were inclined to make more of an effort to find information on how to dispose of paint than consumers surveyed at retail locations. As mentioned before these people were generally more aware of hazards than the average paint consumer. The people from the chemical collection day generally used more legitimate disposal means in the past than consumers from retail locations. Nobody from the chemical collection survey had disposed of liquid acrylic or oil paint into the rubbish, and most emptied their spray packs before disposing of them in the rubbish as well, which is the most environmentally conscious choice.

5.3 Assessment of the Effectiveness of Possible Educational Resources

Assessment of consumer desire for educational resource

Most people feel that more information on how to dispose of paint would be helpful. The average was 3.2 on a scale of 1-4 for how helpful additional information would be. People want to have more information available to them.

The next factor considered in the study deals with the label instructions. Data were collected in order to assess the importance of labels to the consumer, whether or not the labels were being read, and to measure the difficulty of interpreting the information provided. When asked to rate the extent to which they agree with a statement about preferring paint with specific handling and disposal information on the label, 84% said they either somewhat agreed or strongly agreed. This means that the majority of people surveyed feel that paint labels should contain information on the proper handling and disposal of paint.

Influence an educational resource will have on consumers' actions

Of the several tests for correlation that were performed on various questions in the individual surveys it was found that there were only a select few relationships with notable correlations. A moderately strong, highly significant correlation (rho = 0.49 and 0.67, disposal and retail survey respectively) was found between people who preferred more specific information on the handling of paint and the influence more information would then have on their actions. People who prefer more information are also easily affected by that information.

When analysing the results of two different questions, asked on both surveys, comparing how helpful more information would be, with how much influence additional information would have on the actions of the respondent, a moderate

correlation was seen (rho = 0.67 and 0.61, disposal and retail survey respectively). People that are helped by more information will modify their behaviour in accordance to that information.

Both of the previous correlations suggest that people who feel they would be helped by more information or would like more specific information would also have their actions influenced by that information. The information would be heeded rather than disregarded.

5.4 Development of Content of Educational Resource

In creating the educational resource for national distribution, the researchers had to decide what content would be included in the brochure. This was accomplished through assessing results obtained from surveying and interviews. The researchers concluded that the most important areas to address in the resource included a brief description of environmental hazards, advice on how to clean brushes and rollers after painting, preferred methods for dealing with excess paint aside from disposal, proper disposal methods, and finally further contact information. Also, investigation into what all of the states in Australia offered for paint disposal services had to be taken into consideration.

Chemical collection days

The first topic investigated was the possibility of taking paint to household chemical collection days. In Melbourne, EcoRecycle has limited capacity, funding, and ability to handle only a certain number of clients at each collection. A substantial influx of new clients would be a challenge to process effectively on their Chemical Collection Days. Some states in Australia, such as Queensland, do not have chemical collection programs that cater to domestic consumer needs, while other

states are just starting to develop these programs; therefore, the recommendation for disposal of paint at a chemical collection day needed to be supplemented with other appropriate techniques for disposal to apply to the regions where chemical collection programs are not available. Instead of directly focusing on disposing of paint through chemical collection days and collectors, emphasis in the resource would have to be given to taking measures to minimise waste as well as using excess paint for other jobs. For example, one suggestion to be made in the resource would include application of a second or third coating for the existing job since the Australian Paint Approval Scheme emphasises that a second or third coat "provides extra durability, helps mask surface imperfections, and improves appearance" (APAS, 2001).

The fact that the majority (80%) of the waste collected at EcoRecycle's chemical collection is paint suggests that people should be informed on alternative ways of getting rid of their unwanted paint. The most common suggestion made by people responding to the disposal survey was that they wanted to have more frequent disposal days. They would not need more frequent disposal days if they realised that they could give their paint to a neighbour or community organisation. This type of information need to be conveyed to the consumer.

Cleaning brushes and rollers

The educational resource would also include suggestions on how to clean brushes and rollers after painting is complete. Twenty-four percent of all people surveyed are disposing of the water and/or turps that they clean their brushes with into the water system, either by throwing it down the inside drain or throwing it down the outside drain. This is almost one-quarter of people who are disposing of wastes in an improper manner. Information on the proper methods of cleaning brushes or

rollers should be included in the content of the brochure. The chosen methods are suggested because they are the most environmentally-friendly options found for waste water at this time. Dried paint waste poses less environmental threat than liquid paint waste in the tips (landfills) because unlike liquid, it will not create leachate. Since research is being conducted right now by the Sustainable Technology Group in Queensland regarding recycling of waste wash water, there may be better options becoming available in the future, but for now, research has not revealed a better option currently available (Michael Ball, 2001).

Preventative Measures

Emphasis in the resource would be given to preventative measures, such as making sure that consumers buy only the amount of paint they need for the job. From the survey results, only 38% of personal consumers knew very well how much paint they needed for the job. This means that 62% of paint consumers only had some idea, a rough idea, or no idea how much paint that they needed for the job. The suggestions in the resource would help the consumers avoid the common misconception that having extra paint, besides just the small quantity needed for touch ups, is beneficial. Having this recommendation will help consumers to realise that even though a larger can of paint might cost close to the same amount as a smaller can, allowing them to get more paint for their dollar with purchase of larger cans, that the burden of disposal of this extra quantity of paint would likely counter-balance the perceived economic benefit at the time of purchase. Another recommendation to be included in the resource advises consumers to obtain accurate paint estimates from retail clerks or paint can labels prior to purchase.

Recommendations for Excess Paint

Another resource recommendation would include using excess paint as a base coat for another job. Some paint suppliers will re-tint extra paint for a small fee if a consumer brings it back to the store. This re-blended paint can then be used for another paint job. The suggestions for reuse are made in priority over drying out or taking the paint to a chemical collector because of the fact that when extra acrylic paint is dried out, it releases VOCs into the atmosphere, causing environmental pollution. After chemical collectors take in excess paint, it is incinerated, which produces gaseous waste, but filters are used to minimise these gases' harmful effects on the environment. With these facts in mind, the best option remains using the paint since it helps to curtail environmental problems.

The educational resource would also need to recommend proper storage, another preventative measure, which can preserve the paint in good quality for reuse. A final recommendation for information to be included in the resource, is to donate the extra paint to community groups that accept paint. Paint swaps and exchanges are also an option, although they are not prevalent in Australia. The researchers also concluded that another fact that the resource should mention was a warning against mixing acrylic and oil paint together. Mixing the different types of paints together makes them unfit for reuse, and also eliminates the option of paint recycling.

Paint Disposal Recommendations

Based on the extensive background research it was determined that as a final resort, if paint absolutely must be disposed, the resource would offer several options. For acrylic paint, the resource should suggest drying out the paint on absorbent material, or taking the paint to a chemical collection program, depending on which

option is more practical to the consumer when considering their resources and time constraints. Drying out paint can be a long and messy process for larger amounts of paint; conversely, only some regions run chemical collection programs. The resource would stress that throwing away liquid paint in the can is not advisable because when the rubbish is compacted at the tip (landfill), the paint will seep from the crushed cans forming leachate. This leachate then makes its way through the ecosystem and contaminates the ground water supply.

The only suggestion made for oil paint, because it is solvent based and more hazardous, is to take it either to a household chemical collection day or to a chemical collection company. Chemical collectors will usually only charge a small fee, approximately AU$1 or AU$1.50 per litre of paint brought to the company for disposal. Thus, this approach is still a viable option in regions where household chemical collections are not provided. It is recommended that spray pack cans be not punctured. Spray packs are most effectively disposed of when they are completely emptied out and then either disposed of in the rubbish, or the can recycled if possible.

Paint store employees are generally aware of proper methods for disposal of paint, so if customers are curious they can ask their paint supplier for this information. Only one paint supplier, of the sixteen suppliers initially surveyed, suggested an incorrect method of disposal, which was taking the can to the tip (landfill). Retailers know what information would be helpful to consumers interested in disposing of their paint but in interviews paint store managers stated that customers do not usually ask questions about paint disposal or hazards associated with paint disposal. Furthermore, the retail clerk very rarely brings up the topics of hazards and disposal at the time of purchase. Instead, focus when purchasing paint

is concentrated on paint application, colour selection, and usage inquiries. Therefore, proper disposal techniques needed to be addressed in the resource. Interviews also indicated that some paint stores recommend calling the local council to determine what should be done with unwanted paint. Paint manufacturers also make recommendations to consumers about paint disposal. Some of this information is already located on paint cans, and advises the consumer to call their local council or visit a specific web page. The information given by the local councils in Melbourne, in general, is either to contact EcoRecycle about their household chemical collection days or to contact a chemical collection company. EcoRecycle offers free services while chemical collection companies charge for their services.

5.5 Selection of the Educational Resource

When assessing what educational resource would be the most effective and efficient, several factors were considered. These included things such as the amount of information that needed to be conveyed, the type of information that needed to be expressed, the display attractiveness of the resource, general consumer preference as obtained from surveying, an assessment of what has worked in the past as obtained from surveying, the costs of production, and the distribution technique that would be most prevalently and easily employed as well as the time frame centring around that distribution.

Assessment of amount of space appropriate for information

Upon analysis of all the content that needed to be conveyed in the resource, it was determined that a point-of-sale brochure would be the most effective educational tool. The amount of space available on a paint can label, paint can sticker, newspaper advertisement, or radio advertisement was not feasible to contain

the appropriate content. The method of advertising in the mail is effective for alerting residents of free chemical collection services; however, other options of handling and disposing of paint waste, besides chemical collection, are usually not addressed due to space restrictions.

Although a few paint cans do offer very brief explanations of how to dispose of paint, these explanations are brief and are not included on all cans of paint. Since some labels only offer hazard symbols such as the Material Safety Data Sheet symbol, it is possible that not everyone in the general public can properly interpret the meaning of such symbols. Again, options for paint disposal information on these labels is limited due to space, as space allotted for disposal instructions is restricted, and suggestions for reuse of unused paint are not mentioned. It is especially difficult to put disposal information on smaller cans, and often cans that are only a half or quarter of a litre, do not contain disposal information at all. As the size designated on the label is not of sufficient space to hold appropriate educational content, a brochure allows more space to detail different disposal options, excess paint alternative options, environmental hazards, and additional contact sources.

Despite the retail outlets' willingness to utilise a sticker, a brochure lends itself to this approach rather than the production of label stickers. These stickers hold the same space restrictions as those of a paint label. A brochure can transmit much more information than can be reasonably included on labels. Despite the notable support for a label, from consumer preference, implementing a new label is not a very feasible method at this time with the current labelling technologies.

Consumer Preference

Consumer preference was considered as one of the deciding factors for the type of educational material that would be created. From survey results, 43% of

consumers surveyed from retail sites preferred a point-of-sale brochure, while 35% of consumers preferred a label on the paint can. Other publicity methods were not as appealing to retail consumers. Only 9% of retail consumers preferred a flyer in the mail, 8% preferred a newspaper advertisement, 3% a web page, and 2% a radio ad. From the chemical collection survey, the distribution of preferred resources was more even between options. The consumers' preferences were: 28% prefer flyers in the mail, 25% prefer labels on the cans, 22% prefer advertisements in the newspaper, 19% prefer point of sale brochures, 5.6% prefer radio advertisements, and none prefer web pages.

The variance in the preferred methods can be attributed to several factors. Consumers who went to the EcoRecycle chemical collection survey would most likely prefer communications methods such as newspaper advertisements, or flyers in the mail as those were most likely the primary methods by which they heard of the chemical collection that took place that day. Twenty-five percent of the population surveyed at the chemical collection site preferred a label whereas only 19% preferred a point-of-sale brochure. However, when pooling both surveys, the majority (32%) of consumers preferred a point-of-sale brochure (Figure 17).

Production Cost

From the manufacturers' perspective the brochure is also a more feasible solution. Paint labels would create a cost to manufacturers to change their labelling panels which can range upwards to two hundred thousand dollars. Paint can stickers, if placed on the can at time of production, would have to be manually placed on the cans or integrated into the automated labelling process. This incurs a financial cost that manufacturers are not willing to fund. Some paint retailers would be willing to apply the stickers, which would eliminate the manufacturers'

responsibility; however, this type of service would not be assured and could not be expected from paint retail stores nationally.

The cost of sending flyers to all the home-owners in Melbourne is also not feasible as production of point-of-sale brochures, and there would be an undesired excess of paper product waste from brochures that might be thrown away as junk mail.

Assessment of past effective methods

Consideration was given as to how consumers found information on paint disposal prior to actual disposal of their paints. According to the retail survey results, people found information on disposal techniques from the following sources: twenty-nine percent contacted the local council, 21% used a brochure, 21% found information in a newspaper advertisement, and 29% utilised another method. The other methods mentioned included finding out from family members, television, labels on cans, and through calling paint suppliers and manufacturers.

Reaching the consumer market

According to survey results 39% of people do not read label instructions before painting so it is likely that a significant percentage of people would not notice a disposal section on the label if it already exists, or if it was added in the future. Although 61% of people do read the label only 26% read them very carefully. The majority of people do not read the label instructions carefully. Thirty-nine percent of people are not influenced by the information contained on labels. This means that reaching people especially trade painters poses even more of a challenge through the label medium. It was found that 74% of all trade painters surveyed reported that they did not read the label before their last painting job. Only 7.4% read the instructions thoroughly the last time they painted. This difference seen between

trade painters and the average consumer is probably because the painters feel that they already know how to use the paint. A point-of-sale brochure could catch a trade painter's attention because it would be something new offered to them.

It is expected that sales staff would be involved with distributing the brochure, whereas if a label was added to paint cans, the staff may not take as much notice. Thus, the sales stuff would most likely read the brochure and use its suggestions to store customers. Due to this increased involvement, it is also possible that sales staff will at least mention the brochure or its contents to trade painters, even if the painters do not initially take notice of it.

Distribution and timeliness

Paint stores in the Greater Melbourne area do not currently have brochures specifically geared towards hazards, excess paint options, and disposal of unwanted paint. Although paint stores offer brochures concerning paint application and usage that they currently distribute to customers, most paint stores contacted are also willing to distribute brochures on paint disposal. Paint stores are also willing to distribute label stickers detailing disposal information on cans of paint.

While distribution to customers is not guaranteed, a well-designed distribution plan and explanation to paint retailers via a cover letter may increase the likelihood that the information will be disseminated to customers. Newspaper distribution or flyers in the mail could reach a significant population; however, as discussed before, the space allocation is not sufficient. Radio advertisements were not preferred from survey results. Another problem with these three sources would be that they would have to be run repeatedly, and that a physical hard copy of the information could not be kept for later reference by the consumer. Web sites were also not of interest to the sample survey population.

Point-of-sale brochures are expected to be more useful than the current options offered to consumers, which require initiative to locate the information. Since the brochures are distributed right at the point of purchase, the consumer would be exposed to paint disposal issues before they paint, resulting in their actions being more mindful of proper usage and clean up, as well as waste minimisation. From the survey results the actions towards paint disposal of 70% of people would be somewhat or extremely influenced by having more information on how to properly dispose of paint. Point-of-sale brochures can also be pushed by retail clerks for the consumer to take along with them, or at least bring the topic to the attention of the consumer. The brochure can also be easily passed between people.

Another issue that the researchers were aware of was time. The researchers had only approximately two to three weeks to develop the resource. Suggestions could be made in that time to paint manufacturers to change their labels; however, no significant changes could be made in that time, and the researches would have a hard time following up from the United States on their own time. A point-of-sale brochure could be produced in that time with a plan proposed to facilitate distribution.

Assessment of point-of-sale brochure

An additional benefit of a brochure is that it is not likely to be obscured by paint. A projected problem with adding a section on the label with disposal instructions from a consumer use perspective is that the label could become obscured by spilled paint. Also one trade painter mentioned that, from his experience, labels tend to fall off the cans easily. Problems with the brochure include that it cannot be assured that the consumer would take or read the brochure. In addition, the brochure could be lost or disregarded as junk mail. A major benefit of a label is that information is always on the can, allowing the consumer to see it

with each paint job or to refer back to it at the time of disposal. Overall, by assessing the above areas of necessities for an educational resource, a point-of-sale brochure was found to be the most effective educational resource to be produced and distributed.

6.0 Future Recommendations

After evaluating the current paint disposal situation in Melbourne, the researchers found that there were several areas that needed to be addressed in addition to the creation of the brochure. Alleviating the problem of excess paint, would require a long term commitment on the part of paint manufacturers to change their processes. In addition, environmental groups need to reassess their programs to prioritise their effectiveness.

6.1 Recommendations for EcoRecycle, the EPA, and Government-Funded Programs

As consumer awareness is heightened, consumer demand directly increases for more environmental programs, strategies, and actions. Therefore, organisations like EcoRecycle will find that they need increasing funds to meet the increased demands for educational environmental action plans. Prioritising the allocation of limited funds to the most successful environmental programs reaching the greatest number of people is critical. In addition, advertising for these agencies is crucial.

EcoRecycle is responsible for the free household chemical collection service in the Melbourne area, yet the survey results reveal that only a small percentage of people are aware of their services. To extend their programs to a greater number of people, organisations like EcoRecycle need increased funding from the EPA, which is a government funded organisation. However, organisations like EcoRecycle also need to assess the cost-effectiveness of their programs. For example, since it costs EcoRecycle approximately $216 per household to collect a few litres of paint each year from the 0.42% of households in Melbourne it reaches, their resources may be

better invested in other methods or programs.

Areas that EcoRecycle might be able to investigate are door-to-door, or kerbside, collection services, if economically feasible. When local councils host large rubbish collection days, or 'spring cleaning' days, paint could also be accepted and disposed of properly. Also, transfer stations could create sections at their disposal facilities specifically for paint waste. The creation of a permanent paint drop off location, centrally located where there is the most need for such a station could also be investigated. Finally organisations like EcoRecycle could also explore ideas like hosting community exchange programs or having permanent paint swap centres.

6.2 Recommendations to Industry

The primary recommendation to industry would be to research and emphasise paint recycling options and more "green" paints. This study found that manufacturers do not extensively explore these areas currently. Although the common negative responses to aspects of paint recycling include a lower-grade product or complications in collecting and sorting used paint before it could be re-blended, both of these obstacles could likely be overcome in the foreseeable future with more applied research. A Monash University study conducted in Melbourne in 1997 found that seventy-five to eighty percent of the respondents in their study were willing to consider using remixed paint products" (Monash, 1997). Of these respondents, "Fifty to seventy percent of the potential users of remixed paint would be willing to pay the same or more as they would for new paint." Thus, there is a ready market for these products if they can be successfully chemically synthesised.

One solution includes changing paint labels to ensure that proper paint disposal issues are addressed on the can label. Brief statements that direct the

consumer to more specific disposal information may be possible if the additions are phased in at the time when the label is being changed for other reasons. An oil-based can label should include reference to household chemical collection days or to contact the local council for disposal. An acrylic-based can label should instruct the consumer to dry out their paint before disposal or to contact the local council for proper disposal procedures. Both oil and acrylic based can labels should state not to simply pour the paint down the sink for disposal or to throw the paint directly into the rubbish. It would be ideal if both acrylic and oil based cans had a simple statement on the label that strongly encouraged usage of all of the paint for another job or purpose in order to avoid having excess.

Another area for manufacturers to explore would be to investigate new labelling technologies that would provide more surface area for information. Such an option would be a 'twist' label where there is a primary label with open windows on the can and a secondary label under the first where the primary label could be rotated to reveal additional information on the secondary inner label. Another option would be a label that had a small additional 'tag' sticking off of it that could be ripped off by perforation if desired or left on the can in order to provide detailed disposal instructions. A third option could be a two-decked label where the outer label could be peeled off the can to reveal more information on proper disposal or application techniques.

Another avenue that can be investigated by manufacturers are retail take-back programs and drop-off points. A small levy could be introduced on cans to help to mitigate the cost to manufacturers of such programs. Retail suppliers could also offer a retinting service of used paint at a small cost to the consumer to encourage reuse instead of disposal.

7.0 Conclusion

In order to facilitate SSL's goal to extend services to their paint-manufacturing clients, three students from Worcester Polytechnic Institute assessed the level of knowledge about paint use and disposal, as well as current use and disposal methods employed by domestic paint users. Data were also collected to further investigate the current response to hazardous waste collection and awareness. The researchers used this information to determine what the public should be educated about and what methods should be used to inform them of knowledge about paint clean-up and disposal that they are unfamiliar with. This report summarises the strengths and weaknesses of the current information and programs, and provides recommendations for future strategies to improve awareness regarding paint usage, disposal, and hazards to domestic paint consumers.

This project uncovered many significant findings regarding the domestic paint situation in Melbourne. Ninety-one percent of the people that the researchers surveyed had leftover paint in their homes, thus showing that having excess paint is common among home-owners in Melbourne. Since ten to twenty percent of paint bought by householders and trade painters in Melbourne is not used, 4,450,000 litres of waste paint is generated every year (Monash, 1997). As much as 1,800,000 litres of waste paint is disposed of incorrectly, including disposal in the domestic garbage or in a tip (landfill) every year. Also, consumers are not very aware of the hazards associated with paint disposal, nor are they familiar with local paint disposal programs. Since this study found that consumers would be helped, and their actions influenced by more information on paint disposal, it may be concluded that there is a

definite need for more consumer education concerning proper disposal methods of paint.

Upon assessing the need for a method designed for public education through various interviews with paint experts and through conducting two survey sessions with the general public, the project culminated in the creation of a brochure to be distributed nationally to paint consumers at retail outlets throughout Australia. A point-of-sale brochure was found to be the most easily mass producible and distributable, time- and cost-effective method available. The point-of-sale brochure provides an adequate amount of space for information in its tri-fold design.

Consumer awareness is the first step in kerbing environmental hazards resulting from improper handling of paint. Production and distribution of the brochure will quickly reach and inform paint users across the nation of the recommended methods for cleaning-up and handling of excess of water and solvent-based paints. The brochure is available for distribution through paint manufacturers, retailers, government councils, as well as through EPA public channels. SSL is currently producing and distributing the brochure, throughout Australia, as a result of the researchers' study and efforts.

After research and collection of data, this study uncovered some shortcomings within the programs dealing with current paint disposal in Australia. First of all, most homes have excess paint, and many of the home-owners do not know what steps to take to dispose of it properly. Also, it was found that even the methods of disposal that are considered "proper," still have several drawbacks. For instance, the method most commonly recommended for disposing of water-based paint is drying it out before disposing of the waste into a tip (landfill). However, this process still releases harmful VOCs into the atmosphere. Meanwhile, the collection

of oil-based paint by chemical collectors is considered the only correct method, yet the collected paint is usually incinerated. And while this paint is used as an alternative fuel source, it still has drawbacks because industry is trying to move away from relying on solvent-based fuels. The disposal methods for both types of paint are far from ideal. Thus, it makes more sense to promote the usage of paint, or waste minimisation (which is already highly recommended in the hazardous waste hierarchy). Through encouraging waste minimisation, the amount of excess paint will be reduced, and what is left-over can be used for another job, in hopes of avoiding wasting the paint.

Ideally, the paint manufacturing industry will soon evolve, and begin accepting more responsibility for the entire life cycle of their paint. By making manufacturers more responsible for their product, even after it has been sold, it is more likely that the companies will find ways to use the reclaimed paint. This assumption is made because once the manufacturers are forced to accept unused paint, it is more likely in their best economic interest to utilise it rather than to dispose of it. As seen from Benjamin Moore & Co. Paints in the US, it is more cost-effective to use the paint than it is to pay to dispose of the hazardous material. So, while groups work to change the paint manufacturing industry to a more "cradle-to-grave" system, the brochure will hopefully take more immediate steps towards minimising waste and reducing improper clean-up and disposal of paint. The increased consumer awareness will hopefully help protect the health and safety of the environment and its inhabitants.

8.0 Glossary of Terms

Aerosol: A suspension of liquid or solid particles in a gas.

Air Pollution: The presence of contaminant substances in the air that do not disperse properly and interfere with human health.

Aliphatic: A non-aromatic compound.

Amines: Compounds that contain amino or amide groups.

APAS: Australian Paint Approval Scheme: A government run system for certification of paints that meet certain specifications.

ARROW: Assessment of Reduction and Recycling Opportunities for Hazardous Waste: A New Jersey program designed to assess where in manufacturing processes waste streams can be reduced.

AS: Australian Standards: A set of Australian government set industrial standards.

Asbestos: A mineral fibre that can pollute air or water and cause cancer if inhaled or ingested.

Atmosphere: The body of air surrounding the Earth.

Cadmium: A heavy metal element that accumulates in the environment.

Dermatitis: A disease that causes flaking of the skin.

Eco-label: An environmental label used in Europe.

Ecosystem: The interacting system of a biological community and its non-living surroundings.

EMS: Environmental Management Systems: A voluntary program created by the IS0 14000 technical committee geared towards integrating management of environmental practices and deterrence of non-compliance with environmental regulations.

Environment: The sum of all external conditions affecting the life, development and survival of an organism.

Environmental Consciousness: The understanding of ecological consequences of personal consumer behaviour and willingness to assume behaviour that is consistent with solving environmental problems.

(Victoria) EPA: Environmental Protection Authority of the Australian state of Victoria.

(United States) EPA: Environmental Protection Agency a US government agency designed "to protect human health and to safeguard the natural environment."

EPE: Environmental Performance Evaluation: An ISO program that measures and evaluates a company's environmental operations relative to the company's own set standards.

Floc: A clump of solids formed by biological of chemical action.

Flocculation: Separation of suspended solids during waste treatment by chemical creation of clumps of flocs.

Groundwater: The supply of fresh water under the Earth's surface that forms a natural reservoir.

Hazardous waste: Waste materials which, by their nature, are inherently dangerous to handle or dispose of.

Host batch: Term used for paint still in manufacturing process.

Hydrocarbons: Compounds that contain carbon and hydrogen.

HWAP: Hazardous Waste Advisement Program: A New Jersey program responsible for waste minimisation and program implementation.

ICCA: International Council of Chemical Associations: A council of leading trade associations representing chemical manufacturers around the world.

ISO: International Standards Organisation: A voluntary industrial program that helps to provide environmentally friendly guidelines for chemical industries

Landfill: An area of land reserved for solid waste disposal.

LCA: Life Cycle Assessment: A program through ISO that helps manufacturers manage and assess the environmental impacts that a product may have throughout its life cycle.

Leachate: Materials that pollute water as it seeps through solid waste.

Lead: A heavy metal that is hazardous to health if breathed or swallowed.

Mercury: A heavy metal that is highly toxic if breathed of swallowed.

Nitric Oxide: A gas formed by combustion under high temperature and high pressure in an internal combustion engine. It changes into nitrogen dioxide in the ambient air and contributes to photochemical smog.

Nitrogen Dioxide: The result of nitric oxide combining with oxygen in the atmosphere; a major component of photochemical smog.

NPCA: National Paint and Coatings Association: A non profit organisation representing the paint and coatings industry in the United States :

Organotin: Organic compounds that contain tin.

Over spray bounce: The resulting cloud of spray paint particles that migrates back toward the source of the spray stream when too much is paint is sprayed at one time.

Paint shed: Place for consumers to drop off left-over paint for it to be reused by manufacturers; term only known to be used New England, US

Photochemical smog: Air pollution caused by not one pollutant but by chemical reactions of various pollutants emitted from different sources.

RCLD: Responsible Care Leadership Group: An organisation that strives to deal with sustainable development that would lead to increasing benefits for society, the economy, and the environment

Scheme: In Australia a system used for certification of products or services.

Solvent: A liquid that is used to dissolve other compounds.

Spray pack: The Australian equivalent to a can of spray paint.

Stillages: Metal cages containing compartmentalised storage units.

Tip: The Australian term for landfill

Vertigo: The sensation of being dizzy.

VOC (Volatile Organic Compound): An organic substance that evaporates at a low temperature.

Waste water: Water carrying dissolved or suspended solids from homes, farms, businesses, and industries.

9.0 Works Cited

Australia. Australia Paint Approval Scheme (APAS). "An Explanation of the Australian Paint Approval Scheme." Document D188. March 2000.

Australian Bureau of Statistics (ABS). 2001. <www.abs.gov.au>

Australian Centre for Cleaner Production. "A Study of Aspects of Prescribed Waste Generation in Victoria." 1996.

Batstone R, Smith JE, Wilson D, eds. The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries. World Bank Technical Paper No. 93. Washington, D.C.: The World Bank, 1989.

Benjamin Moore and Co. "What's Really in a Can of Paint?" About Benjamin Moore: Paint and the Environment. 2000. <http://www.benjaminmoore.com/w/w3/w32.html.>

Berg, Bruce L. Qualitative Research Methods for the Social Sciences. Allyn and Bacon, Boston: 2001.

Bissonnette, Dr. Victor L. "Statistical Power of r" Department of Psychology Berry College <http://fsweb.berry.edu/academic/education/vbissonnette/tables/pwr_r.pdf>

Blackman, William C. Jr. Basic Hazardous Waste Management. London: Lewis Publishers, 1992.

Brehm, Sharon S., Kassin, Saul M., Fein, Steven. Social Psychology. 4th ed. Boston: Houghton Mifflin Co., 1999.

Cornish, Steven. "ISO 14000." American National Standards Institute Online (ANSI Online). 1997. <http://www.ansi.org/testsite/grace/public/iso14000/form_2.html>

EcoRecycle. Adding Sustainable Value: Annual Report 1998/99. The Communication Edge. 1999.

Environment Australia: Lead Paint Alert 1999

Envirolinx. "Envirolinx." 1999. <http://www.envirolinx.org.au/Default.htm>

Hazardous Waste Consultative Committee. "Hazardous Waste Management in Victoria: Discussion Paper #1." 1999.

Hemmelskamp, Jens; Brockmann, Karl L. Environmental Labels—The German 'Blue Angel.' *Futures*. Vol. 29. No. 1. 67-76. 1997.

Hinds, Edward. "Paint Disposal." 2001. <http://bsd.edu/paintdisposal/advice.htm>

IFA Services Statistics, Rank Correlation Coefficient. <http://www.fon.hum.uva.nl/Service/Statistics/RankCorrelation_coefficient.html/>

Kachigan, Sam Kash. Statistical Analysis: An Interdisciplinary Introduction to Univariate and Multivariate Methods. New York: Radius Press, 1986.

Kendler, Barry S. Environmental Lead Contamination: A Metaphor for Destructive Industrial Practices; Lead Abatement: A Model for Ineffective Societal Responses *Structural Survey*, Vol 12 Issue 3 Date 1994.

Milford, Massachusetts Home Page. "Board of Health." 2001. <http://www.milford.ma.us/default.htm>

National Paint and Coatings Association (NPCA). 2001. <http://www.paint.org>

The Paint Research Association (PRA). "Environment –Under Development" Advise Centre. Middlesex, UK: 2000. <http://www.pra.org.uk/advice/enviro.htm>

Responsible Care. "ICCA Responsible Care Status Report 2000." International Council of Chemical Associations. 2000. <http://www.icca-chem.org/rcreport/>

Rowntree, Derek. Statistics Without Tears: A Primer for Non-Mathematicians. Penguin Books, England; 1986.

Salant, Priscilla and Don Dillman, How to Conduct Your Own Survey. Boston: John Wiley & Sons, Inc. 1994.

San, Rob van. "Rank Correlation Coefficient." Institute of Phonetic Sciences (FTA). 2001. <www.fon.hum.uva.nl/service/statistics/RankCorrelation_coefficient.html>

Singh, D. "VOCs: An Update" Paintindia, June 1994, 56 (6), pp 33-45.

Spectrum Industries. "Paint Disposal." 2000. <http://www.spectrum-industries.com/paint.htm>

Trucco, Terry. "Chocolate Milk? No, it's Milk Paint." The New York Times. 1993. < http://www.milkpaint.com/articles.htm#The New York Times>

Ulbrect, Alan and Watts, Daniel J. EPA Environmental Research Brief. Waster Reduction Activities and Options for a Manufacturer of General Purpose Paints and Painting Supplies. 1992.

United States Census Bureau. "1997 Economic Census: Manufacturing-Industry Series EC975-3255A." 2000. <http://www.census.gov/prod/www/abs/97ecmani.html>

United States. EPA's Rule on Paints and Coatings: Has EPA Met the research Requirements of the Clean Air Act? Hearing before the Subcommittee on Energy and Environment of the Committee of Science U.S. House of Representatives One Hundred Fifth Congress Second Session. No 51. Washington: 1998.

United States. US Department of Health, Education and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health. Division of Technical Services. Spray Painting—Good Practices for Employees: Your Health and Safety are in Your Hands. 1976.

United States. US Department of Health, Education and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health. Division of Technical Services. Health and Safety Guide for the Manufacturers of Paints and Allied Products. Cincinnati, 1975.

United States. US General Accounting Office. Illegal Disposal of Hazardous Waste: Difficult to Detect or Deter. US General Accounting Office. 1985.

WHO/UNEP/UNESCO: Interaction of the Oceans with Greenhouse Gases and Atmospheric Aerosols: UNEP Seas Report and Studies No. 94. UNEP, 1988.

Page missing or incorrectly numbered in original

IQP/MQP SCANNING PROJECT

10.0 Bibliography

Australia. Australian Paint Approval Scheme (APAS). "An Explanation of the Australian Paint Approval Scheme." Document D188. March 1, 2000.

Australia. Australian Paint Approval Scheme (APAS). "Some Hazard Aspects of Paint and Painting" Document D129. November 17, 1999.

Australian Bureau of Statistics. 2001. <www.abs.gov.au>

Australian Centre for Cleaner Production. "A Study of Aspects of Prescribed Waste Generation in Victoria." 1996.

Australian Paint Approval Scheme. "Minimising Paint Waste & Safe Paint Disposal:
A guideline for the minimisation of waste paint and effective disposal or reuse." Success Stories. 2001.
<http://www.apas.gov.au/MPWaste.htm>

Batstone R, Smith JE, Wilson D, eds. The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries. World Bank Technical Paper No. 93. Washington, D.C.: The World Bank, 1989.

Benjamin Moore and Co. "What's Really in a Can of Paint?" About Benjamin Moore: Paint and the Environment. 2000.
<http://www.benjaminmoore.com/w/w3/w32.html.>

Berg, Bruce L. Qualitative Research Methods for the Social Sciences. Allyn and Bacon, Boston: 2001.

Bissonnette, Dr. Victor L. "Statistical Power of r" Department of Psychology Berry College
<http://fsweb.berry.edu/academic/education/vbissonnette/tables/pwr_r.pdf>

Blackman, William C. Jr. Basic Hazardous Waste Management. London: Lewis Publishers, 1992.

Brehm, Sharon S., Kassin, Saul M., Fein, Steven. Social Psychology. 4th ed. Boston: Houghton Mifflin Co. 1999.

Colvin, M.; Myers, J.; Nell, V. A Cross-Sectional Survey of Neurobehavioral Effects of Chronic Solvent Exposure on Workers in a Paint Manufacturing Plant. *Environmental Research*. Vol. 63, 122-132. 1993.

Cornish, Steven. "ISO 14000." American National Standards Institute Online (ANSI Online). 1997.
<http://www.ansi.org/testsite/grace/public/iso14000/form_2.html>

EcoRecycle. Adding Sustainable Value: Annual Report 1998/99. The Communication Edge. 1999.

Envirolinx. "Envirolinx." 1999. <http://www.envirolinx.org.au/>

Environment Australia: Lead Paint Alert 1999

European Commission, ISBN: Official Journal, "Study of the implementation of an EC policy for reducing VOC emissions from private and architectural use of paints and varnishes, Phase II," 1992.

Finkel, Asher J. and Duel, Ward C. Clinical Implications of Air Pollution Research. Publishing Sciences Group, Inc., Acton, MA., 1976.

Hazardous Waste Consultative Committee. "Hazardous Waste Management in Victoria: Discussion Paper #1." 1999.

Hemmelskamp, Jens; Brockmann, Karl L. Environmental Labels—The German 'Blue Angel.' *Futures*. Vol. 29. No. 1. 67-76. 1997.

Highland, Joseph H., ed. Hazardous Waste Disposal: Assessing the Problem. Ann Arbor, Michigan: Ann Arbor Science Publishers. 1982.

Hinds, Edward. "Paint Disposal." 2001. <http://bsd.edu/paintdisposal/advice.htm>

IFA Services Statistics, Rank Correlation Coefficient. http://www.fon.hum.uva.nl/Service/Statistics/RankCorrelation_coefficient.html/

Kachigan, Sam Kash. Statistical Analysis: An Interdisciplinary Introduction to Univariate and Multivariate Methods. New York: Radius Press, 1986.

Kendler, Barry S. Environmental Lead Contamination: A Metaphor for Destructive Industrial Practices; Lead Abatement: A Model for Ineffective Societal Responses *Structural Survey*, Vol 12 Issue 3 Date 1994.

Massachusetts Department of Environmental Protection. "Paints and Stains." Recycle: Remake a Difference. January 24, 2000. <http://www.state.ma.us/dep/recycle/hazards/paint.htm>

Milford, Massachusetts Home Page. "Board of Health." 2001. <http://www.milford.ma.us/default.htm>

National Paint and Coatings Association (NPCA). 2001. <http://www.paint.org>

The Paint Research Association (PRA). "Environment –Under Development" Advise Centre. Middlesex UK, 2000. <http://www.pra.org.uk/advice/enviro.htm>

Responsible Care. "ICCA Responsible Care Status Report 2000." International Council of Chemical Associations. 2000. <http://www.icca-chem.org/rcreport/>

Rowntree, Derek. Statistics Without Tears: A Primer for Non-Mathematicians. Penguin Books, England; 1986.

Salant, Priscilla and Don Dillman, How to Conduct Your Own Survey. Boston: John Wiley & Sons, Inc. 1994.

Salzhauer, Amy Lynn, "Obstacles and Opportunities for a Consumer Ecolabel (Approval and labelling of environmentally friendly products)," il v 33, Environment, November 1991, pp 10-20.

Singh, D. "VOCs: An Update" Paintindia, June 1994, 56 (6), pp 33-45.

San, Rob van. "Rank Correlation Coefficient." Institute of Phonetic Sciences (FTA). 2001. <www.fon.hum.uva.nl/service/statistics/RankCorrelation_coefficient.html>

Spectrum Industries. "Paint Disposal." 2000. <http://www.spectrum-industries.com/paint.htm>

Tammenagi, Hans. The Waste Crisis. NY: Oxford University Press. 1999.

Trucco, Terry. "Chocolate Milk? No, it's Milk Paint." The New York Times. 1993. < http://www.milkpaint.com/articles.htm#The New York Times>

Ulbrect, Alan and Watts, Daniel J. EPA Environmental Research Brief. Waster Reduction Activities and Options for a Manufacturer of General Purpose Paints and Painting Supplies. 1992.

United States Census Bureau. "1997 Economic Census: Manufacturing-Industry Series EC975-3255A." 2000. <http://www.census.gov/prod/www/abs/97ecmani.html>

United States. EPA's Rule on Paints and Coatings: Has EPA Met the research Requirements of the Clean Air Act? Hearing before the Subcommittee on Energy and Environment of the Committee of Science U.S. House of Representatives One Hundred Fifth Congress Second Session. No 51. Washington: 1998.

United States. Environmental Protection Agency. "Painting the Town Green: Aberdeen Proving Ground's Paint Pilot Project." Environmentally Preferable Purchasing Program. EPA742-R-99-005. November, 1999.

United States. Environmental Protection Agency. "Moving or Cleaning? Handel Hazardous Wastes with Care." Solid Waste and Emergency Response. EPA530-F-99-047. December, 1999.

United States. Environmental Protection Agency. "How to Recondition Used Paint Thinner." April 1994. <http://www.epa.gov/seahome/housewaste/src/thinner.htm>

United States. Environmental Protection Agency. "How to Recondition Used Paint Thinner." 1996. <http://www.epa.gov/seahome/housewaste/src/credits.htm>

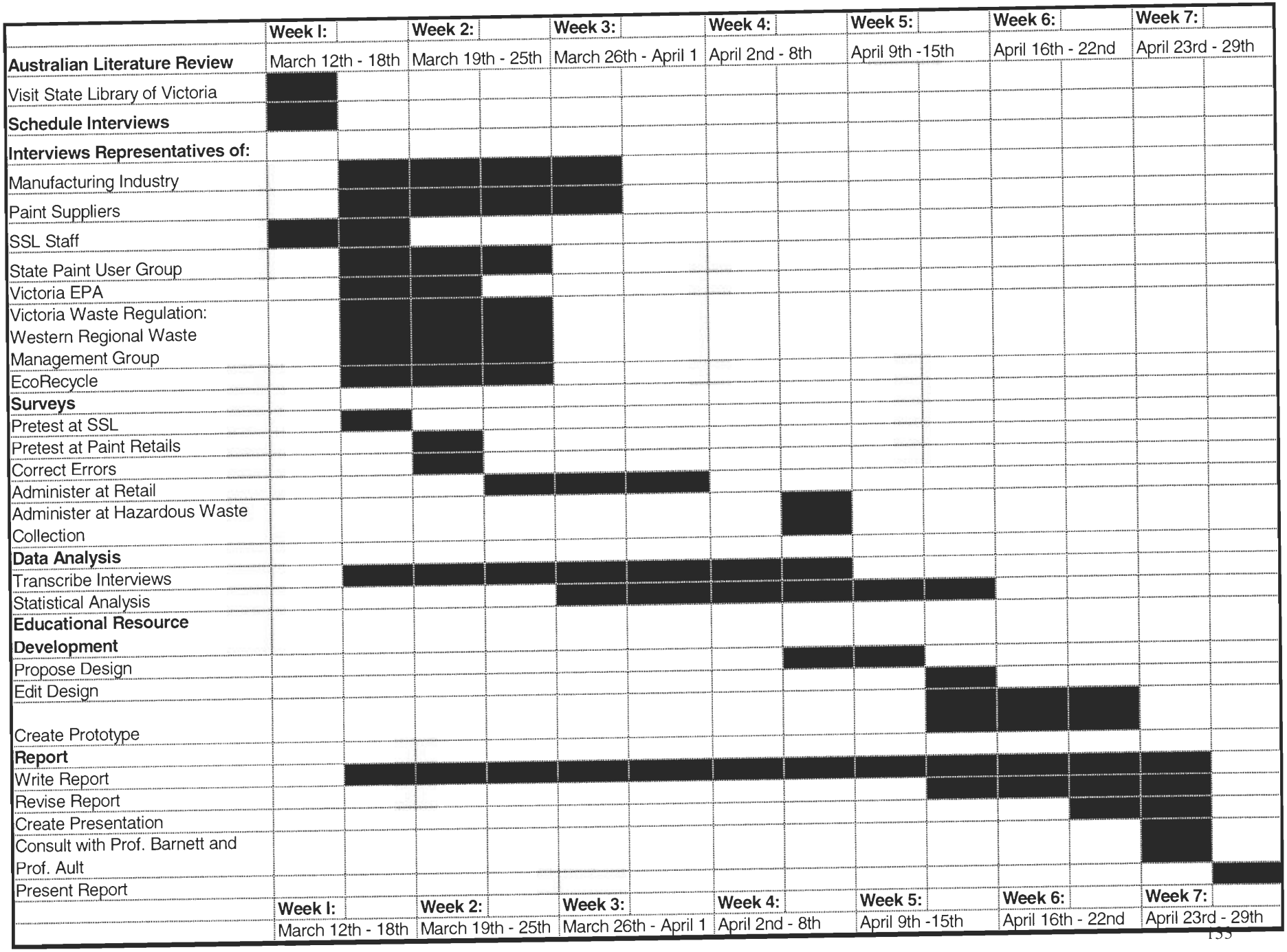
United States. US Department of Health, Education and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health. Division of Technical Services. Spray Painting—Good Practices for Employees: Your Health and Safety are in Your Hands. 1976.

United States. US Department of Health, Education and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health. Division of Technical Services. Health and Safety Guide for the Manufacturers of Paints and Allied Products. Cincinnati, 1975.US EPA Office of Public Awareness. Common Environmental Terms. 1977.

United States. US General Accounting Office. Illegal Disposal of Hazardous Waste: Difficult to Detect or Deter. US General Accounting Office. 1985.

WHO/UNEP/UNESCO: Interaction of the Oceans with Greenhouse Gases and Atmospheric Aerosols: UNEP Seas Report and Studies No. 94. UNEP, 1988.

Appendix A: Task Chart: Completion Dates for Methodology of SSL Project D Term '01



Page missing or incorrectly numbered in original

IQP/MQP SCANNING PROJECT

Appendix B: Contact Information for Interviews

- **Environmental Protection Authority Victoria**
  Head Office:
  Herald & Weekly Times Tower
  40 City Road
  Southbank
  Victoria, 3006
  Ph: (03) 9695-2700

- **Environmental Protection Authority New South Wales**
  Sue Cunningham
  Cleaner Industries Unit
  Email: cunninghams@epa.nsw.gov.au
  Ph: (02) 9995-5361
  Fax: (02) 9995-5915
  Sydney South 1232

- **EcoRecycle**:
  Lorraine Kibbis
  Project Manager
  Ph: (03) 9639-3322
  Fax: (03) 9639-3077
  lkibbis@ecorecycle.vic.gov.au

  Toll Free Number: 1 800 35-3233 (in Victoria)
  EcoRecycle Victoria
  Level 2, 478 Albert Street
  East Melbourne 3002
  Victoria, Australia

- **Hazardous Waste Collection Companies:**

  All Waste
  53 Albemarle St
  Williamstown VIC
  Ph: (03) 9397-6855

  Chemsal Pty. Ltd.
  83 Dohertys Rd
  Laverton North VIC
  www.chemsal.com.au
  Ph: (03) 9369-4222

Nuplex Environmental
88-90 Ordish Rd
Dandenong South VIC 3157
Ph: (03) 9794-7211

- **Paint Manufacturers (APAS, 2001)**

Dulux Decorative and Dulux Protective Coatings (Orica Australia Ltd.) VIC (APAS Approved)
PO Box 60 MDC Rosebank
Clayton South
VIC 3169
Ph: 03-9263-5678
Fax: 03-9543-4346
Marketing Manager: Susan Williamson
Fax: 9263-3656

Paint Factory (Not APAS Approved)
Ph: (03) 9761-5931
Production Manager: Phil Dellisola

Wagon Paints (Not APAS Approved)
Ph: 03-9729-1344
General Manager: Ian Todd

Wattyl Pty. Ltd. (APAS Approved)
Sydney (Main Office)
Ph: (02) 9621-6255
Fax: (03) 9689-5727
Marketing Manager: Tricia Williams

- **Queensland State Paint User Group Representative:**
Contact: Michael Ball
Ph: (07) 3224-5205
E-mail: micheal.ball@publicworks.qld.gov.au

- **Retail Paint Stores Interviewed (Sixteen Clerks or Managers--Session I):**

1. Just Paints,191 Chesterville Rd., Moorabbin VIC, Ph: (03) 9555-6333
2. Morgans Paint Spot, 2 Levanswell Rd., Moorabbin VIC, Ph: (03) 9555-0555
3. Haymes Paint, Ballarat VIC, www.haymespaint.com.au, Ph: 1800-033-431
4. Otto's Paint Bazaar, 26 McDonald Rd, Brooklyn VIC, Ph: (03) 9318-9333
5. Colours 'R' Us, 495 Malvern Rd, South Yarra VIC, Ph: (03) 9827-6469
6. Paint Right, 20 O'Shanassy St., Sunbury VIC, Ph: (03) 9744-2593

7. Paint Mart, 21 Hawker Street, Airport West VIC, Ph: (03) 9335-2063

8. At Your Service Hardware, 268 Coventry St., South Melbourne VIC, Ph: (03) 9699-8655

9. Classic Paints, 155 Barkly Ave, Brnly VIC, Ph: (03) 9429-3377

10. 3D Paint Store, 1154 Mt. Alexander Rd, Essendon North VIC, Ph: (03) 9374-3800

11. H&K Paint Sales Pty. Ltd., 274 Albert St., Brunswick VIC, Ph: (03) 9380-5148

12. Valley Paints, 163 Para Rd., Greensboro VIC, Ph: (03) 9434-7800

13. Velvet Paints, 366 Queens Parade, Clifton Hill VIC, Ph: (03) 9489-6765

14. The Paint Place, 151 Main Street, Croydon VIC, Ph: (03) 9725-2800

15. Bristol Decorator Centre, Geelong West VIC, Ph: (03) 5222-4944

16. Bristol Decorator Centre, Footscray West, Ph: (03) 9314-7011

- **Retail Paint Stores Interviewed (Twelve Store Managers --Session II):**

1. 3D Paint Store... The Paint People (W), 144 Pakington St., Geelong West VIC, Ph: (03) 5221-6620

2. Bristol Decorator Centre (S), Cranbourne VIC, Ph: (03) 5995-2912

3. Bunnings (W), Altona VIC, Ph: (03) 9399 2255
Carrum Downs VIC, Ph: (03) 9776-9277

4. Dane's Color Centre (C), 726 Nicholson, Fitzroy North VIC, Ph: (03) 9489-6139

5. Manfax (C), 166-182 Gertrude St., Fitzroy VIC, Ph: (03) 0419-4166

6. Paint Factory (N), 5 Greenaway, Bulleen VIC, Ph: (03) 9852-3188

7. Paint Magic-The Finishing Touch (E), 5 Main St., Upwey VIC, Ph: (03) 9754-1042

8. Paint Place (N region), 151-216 Settlement Rd, Thomastown VIC, Ph: (03) 9465-5111

9. Paint Right (S), 100 Frankston-Dandenong Rd, Dandenong VIC, Ph: (03) 9793-6544

10. Paint Spot (S), Cnr Frankston-Dandenong Rd & Frankston Gardens Dr,

11. The Paint House (E), 485 Warrigal Rd, Ashwood VIC, Ph: (03) 9885-7300

12. True Value Hardware (N), 460 Sydney Rd, Brunswick VIC,
Ph: (03) 9380-1989

- **Western Regional Waste Management Group:**
Stuart McQuire, Regional Education Officer:
(For Brimbank, Hobsons Bay, Maribyrnong, Melbourne, Melton, Moonee Valley, Port Phillip, Yarra, and Wyndham)
GPO Box 5038Y
Melbourne VIC 3001
Ph: (03) 9384-1752
Fax: (03) 9347-9660

Appendix C: Interview Questions

- **Environmental/Educational Groups (EcoRecycle/VIC EPA):**

1. Can you describe to me how a typical hazardous waste collection day is run?

2. During which months of the year do the chemical collection program run?

3. Would you say that the majority of domestic paint is disposed of properly?

4. How do you publicise or advertise the collection days?

5. Do you distribute any educational literature at the collection events?

6. Can you describe to me the different ways and methods in which you employ and distribute educational literature and information? (For example, web pages, brochures, pamphlets, flyers, etc.)

7. Do you publicise the hazards associated with improper disposal of paint? If so, how? If not, why not?

8. Which methods of publicity would you say are most effective towards increasing proper handling of paint?

   How did you come to this conclusion?

9. What have you noticed to be the trend in peoples' attitudes and motives when they drop off paint?

   Do they seem to be concerned about the environment or are they simply following governmental regulation?

10. How environmentally aware do you think the public is on proper disposal methods for paint and paint products? For example, on a scale of 1-5 with 1 being not at all aware and 5 being expertly aware, where do you see the public's awareness level as a whole?

    Why do you rank it that number?

11. Do you think an educational resource such as a brochure or a paint label on a can distributed to a paint consumer would directly correlate with an increase in consumers properly disposing of paint?

    Do you think such a resource would be overlooked?

12. What have you found to be the most effective tool in distributing educational information that consumers use?

    How did you come to that conclusion?

- **Chemical Collection Companies:**

1. Do you take in domestic consumer paint for disposal?

2. At what charge?

3. What is done with the paint after collection?

4. Approximately how much paint is collected per year? How much of it is oil?

5. Is any of the paint collected used as an alternative fuel source?

6. If so, what percentage of paint collected is converted into fuel?

7. What is this fuel used for?

8. What are a few of the benefits and disadvantages of this fuel?

9. Do you collect any aerosol spray packs?

10. What's the procedure for the disposal of them?

11. Do you participate in any public household chemical collection days?

12. If so, what does the company see of the advantages/disadvantages (costs) of such an event?

- **Queensland State Paint User Group Representative:**

1. Have there been similar studies in the past regarding paint disposal issues?

2. Are there government policies regarding consumer disposal of paint?

3. Would you say that most paint is disposed of properly?

4. Do you feel that adequate disposal programs for the average consumer of paint exist?

5. What do you think could increase the occurrence of proper disposal?

6. On a scale of one to five, with one being not at all aware, and five being extremely aware, how aware do you feel the public is regarding environmental issues related to the handling of paint?

- **Retail Paint Suppliers (Session I)*:**

*Researcher posing as consumer

1. Do you have any information or brochures on what to do with excess paint?
2. How should I dispose of acrylic paint?
3. How should I dispose of oil paint?
4. Will you take back my excess paint?

- **Retail Paint Suppliers (Session II):**

1. What is the average influx of clients on an average day?
2. What type of paint do you generally sell the most of?
3. Do you find that domestic paint consumers ask any questions about how to dispose of excess paint product?
4. Do you find that consumers ask any questions about the hazards associated with paint usage and disposal?
5. Would you be willing to distribute free educational resources provided by APAS on how to properly dispose of paint and its environmental hazards?
6. What do you see as any advantages to the store upon distributing these resources?
7. What do you see as any disadvantage to the store upon distributed these resources?
8. On a scale of 1-5 with 1 being not at all willing and 5 being extremely willing, where do you rank the store's willingness to distribute such information?
9. Would you find it easier to distribute, or would you prefer to distribute a brochure or a paint label sticker?

- **Manufacturers in Paint Industry:**

1. Do you produce any labels currently on paint cans for how to apply the product, such as directions, or application guidelines? And, which products do you put these labels on, all retail products or only some retail products?

   Do you produce any labels currently on how to dispose of the product? What specifically do these labels say?

   Do you produce any labels that detail any hazardous effects, if there are any, of the product? How extensive are these labels?

2. Who or what organisation determines what information goes on the labels?

3. Is it feasible to add to the label another section detailing paint disposal methods if they are not already present? Why/Why not?

4. Is it feasible to add to the label another section detailing hazards associated with improper disposal if they are not already present? Why/Why not?

5. What would be the costs (in money and time) for manufacturers to create new labels?

6. Would a pre-made standard label sticker that could be "stuck" onto existing paint cans be feasible? Why/Why not? What would be more feasible?

7. Are you interested in, or do you market or promote, any environmentally-friendly products?

8. Have there been any studies on consumer awareness or trends related to paint use and disposal that you know of?

9. Has a redemption program, or a 'take-back' program, for unused domestic paint been considered by your company?

10. Has the company explored any aspect of paint recycling?

11. We understand that the policies Australia employs are voluntary agreements between government and industry in regulation of certain components of paint such as VOCs, this is different from what we're used to in the US. Could you tell us a little bit more about how the system here works?

12. If there was to be a small levy imposed on each can of paint so that

    manufacturers would have funding to take back unwanted consumer paint,

    how would that affect your company?

- **Western Waste Management:**

1. What does the Western Waste Management Group do?

2. Does it distribute any information or newsletters regarding to paint to the public?

3. What are your opinions of EcoRecycle's hazardous chemical collection days?

4. How do you see the local councils' involvement with the paint disposal process?

5. What method do you feel would best facilitate future paint disposal?

6. Do you know of any paint recycling or redemption programs in Australia?

Appendix D: Contact Scripts

Script for obtaining permission from paint retailers for conducting surveys at their stores.

Hi, my name is _____. How are you today? May I speak to a manager?

Hi, my name is _____. How are you today? I am a student from the United States working on a project for the Scientific Services Laboratory in Port Melbourne. The purpose of this project is to determine the level of knowledge the consumer has regarding paint usage and its disposal. Our study aims to assist future consumers and users of paint in its proper handling in order to protect both environmental and personal health. Therefore, your participation is this study would be very beneficial to future paint consumers. Would you be willing to have three students come into your store one day later this week to administer short surveys to your customers as they are leaving?

Response: No

Thank anyway for your time. Have a nice day.

Response: Yes

What is your average influx of customers per day?

During what hours are you busiest?

Script for obtaining permission from EcoRecycle.

Hi my name is _____ and I am a student working with the government's Scientific Services Laboratory in Port Melbourne under the direction of Ken Lofhelm. I am seeking permission to conduct surveys of patrons of the hazardous waste collection days. The purpose of this study is to find better ways of educating the public about proper disposal methods for paint and related products.

Script for approaching people to take survey.

Hi, my name is _____ and I am a student from the United States doing a paint disposal project with the Scientific Services Laboratory in Port Melbourne. Do you have a few minutes to answer some questions, because your input would help to assist future customers like yourself.

Appendix E: Store Locations

- **Bristol** -1069 Mt. Alexander Rd Essendon (9379 2160)
- **Bunnings** - 268 Maroondah Hwy. Croydon (9727 3100)
- **Good Interiors** - 232 High St. Preston (9480 5698)
- **Paint Place** - 238 Sommerville Rd. Footscray West (9314 8610)
- **Paint Spot** - Crn Frankston-Dandenong Rd and Frankston Gardens Rd. Carrum Downs (9776 0165)

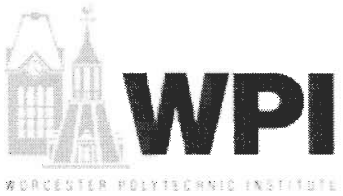
Appendix F: Survey Booklet Formats

Code 1 – Retail Locations
Code 2 – EcoRecycle Chemical Collection Day Location

Domestic Paint Disposal Survey

SSL

Scientific Services Laboratory



Code 1

1—NO IDEA
2—SOME IDEA
3—KNEW VERY WELL

CARD 1

1—DIDN'T INFLUENCE ME AT ALL
2—LOOKED FOR CERTAIN INFORMATION ONLY
3—THE INFORMATION WAS VERY IMPORTANT IN THE PURCHASING DECISION

CARD 2

1—NOT AWARE OF ANY
2—AWARE OF A FEW
3—AWARE OF SEVERAL

CARD 3

1—HAVEN'T PAINTED
2—DIDN'T READ
3—SKIMMED THEM OVER
4—READ VERY CAREFULLY

CARD 4

1—VERY EASILY
2—MODERATELY HARD
3—VERY DIFFICULT

CARD 5

A--[1-5]
B--[6-10]
C--[11-15]
D--[16+]

CARD 6

1—NOT AT ALL
2—VAGUELY RECALL
3—CLEARLY RECALL

CARD 7

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH
2—POURED DOWN THE SINK OR DRAIN
3—DRIED OUT AND DISPOSED OF IT WITH REGULAR RUBBISH
4—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS
5—OTHER

CARD 8

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH
2—POURED IT DOWN THE SINK OR DRAIN
3—DRIED OUR AND DISPOSED OF IT WITH REGULAR RUBBISH
4—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS
5—OTHER

CARD 9

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH
2—EMPTY ALL IT'S CONTENTS AND DISPOSED OF IT WITH RUBBISH
3—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS
4—OTHER

CARD 10

1—DISPOSE OF BRUSHES AND ROLLERS INTO RUBBISH
2—CLEAN BRUSHES IN TURPENTINE AND POUR DOWN SINK
3—CLEAN BRUSHES IN TURPENTINE AND POUR DOWN OUTSIDE DRAIN
4—CLEAN IN TURPENTINE AND DISPOSE OF IN GARDEN OR GROUND
5—OTHER

Card 10b

1—DIDN'T LOOK
2—BARELY LOOKED
3—MADE MODERATE EFFORT
4—HAD TO SEARCH EXSTENSIVELY

CARD 11

1—ONLINE
2—NEWSPAPER ADVERTISEMENTS
3—RADIO ADVERTISEMENTS
4—BROCHURES
5—CONTACTED LOCAL COUNCIL OFFICIALS
6—OTHER

CARD 12

--LABEL
--WEB PAGE
--AD IN NEWSPAPER
--FLYERS IN MAIL
--ANNOUNCEMENTS ON RADIO
--POINT OF SALE BROCHURES

Card 13

Domestic Paint Disposal Survey

SSL

Scientific Services Laboratory

Code 2

1—NO IDEA
2—SOME IDEA
3—KNEW VERY WELL

CARD 1

1—DIDN'T INFLUENCE ME AT ALL
2—LOOKED FOR CERTAIN INFORMATION ONLY
3—THE INFORMATION WAS VERY IMPORTANT IN THE PURCHASING DECISION

CARD 2

1—HAVEN'T PAINTED

2—DIDN'T READ

3—SKIMMED THEM OVER

4—READ VERY CAREFULLY

CARD 3

1—VERY EASILY

2—MODERATELY HARD

3—VERY DIFFICULT

CARD 4

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH

2—POURED DOWN THE SINK OR DRAIN

3—DRIED OUT AND DISPOSED OF IT WITH REGULAR RUBBISH

4—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS

5—OTHER

CARD 5

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH
2—POURED IT DOWN THE SINK OR DRAIN
3—DRIED OUR AND DISPOSED OF IT WITH REGULAR RUBBISH
4—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS
5—OTHER

CARD 6

1—DISPOSED OF IT IN CAN WITH REGULAR RUBBISH
2—EMPTY ALL IT'S CONTENTS AND DISPOSED OF IT WITH RUBBISH
3—THROUGH HAZARDOUS WASTE COLLECTION PROGRAMS
4—OTHER

CARD 7

1—NOT AT ALL
2—VAGUELY RECALL
3—CLEARLY RECALL

CARD 8

1-DISPOSE OF BRUSHES AND ROLLERS IN RUBBISH
2-TURPS / WATER, THEN POUR DOWN SINK
3-TURPS / WATER, THEN POUR DOWN OUTSIDE DRAIN
4-TURPS / WATER, THEN DISPOSE OF IN GARDEN OR YARD
5-OTHER

CARD 9

1-didn't look
2-barely looked
3-made moderate effort
4-had to search extensively

CARD 10

--ONLINE
--NEWS ADS
--RADIO ADS
--BROCHURES
--CONTACTED LOCAL COUNCIL OFFICIALS
--OTHER

CARD 11

--LABEL
--WEB PAGE
--AD IN NEWSPAPER
--FLYERS IN MAIL
--ANNOUNCEMENTS OF RADIO
--POINT OF SALE BROCHURES

CARD 12

Appendix G: Domestic Paint Consumer Survey

M F

*Actual survey was designed to fit on one A4 page

1. Have you ever bought paint?

   -Yes -No [skip to 5]

2. Are you purchasing paint for personal use or for your business as a trade painter?

   -Personal -Trade

3. *Card 1:* Before purchasing, did you have an idea of how much paint you would need for your specific job?

   1-no idea 2-some idea
   3-knew very well

4. *Card 2:* To what extent did the information provided on the label influence your purchasing decision?

   1-didn't influenced me at all
   2-looked for certain info only
   3-the info was very important in purchasing decision

5. *Card 3:* Are you aware of any hazards related to improper disposal of paints?

   1-not aware of any
   2-aware of a few
   3-aware of several

6. *Card 4:* With your last painting job, how well did you read the label instructions before starting?

   1-haven't painted [skip to 8]
   2-didn't read [skip to 8]
   3-skimmed over them
   4-read very carefully

7. *Card 5:* How easy or difficult were they to follow?

   1-very easy 2-moderately hard
   3-very difficult

8. Do you have leftover paint in your home currently?

   -Yes -No [skip to 10]

9. *Card 6:* How many cans do you have stored?

   a-[1-5] b-[6-10]
   c-[11-15] d-[16+]

10. *Card 7:* Can you recall any brochures, labels, or other sources providing information on paint disposal?

    1-not at all 2-vaguely recall
    3-clearly recall [follow]
    Can you name what you specifically recall?

    _____

11. Have you disposed of paint in the past five years?

-Yes -No [skip to 17]

What type of paint did you dispose of? _____

12. *Card 9:* If it was acrylic (latex) paint, how did you dispose of it?

1-Disposed of it in can with regular rubbish
2-Poured it down the sink/drain
3-Dried out & disposed of it with regular rubbish
4-Through hazardous waste collection programs
5-Other_____

13. *Card 9:* If it was oil paint, how did you dispose of it?

1-Disposed of it in can with regular rubbish
2-Poured it down the sink/drain
3-Dried out & disposed of it with regular rubbish
4-Through hazardous waste collection programs
5-
Other_____

14. *Card 10:* If you had to dispose of spray packs, how did you do it?

1-Disposed of it in can with regular rubbish
2-Empty all it's contents and disposed of it with rubbish
3-Through hazardous waste collection programs
4-Other_____

15. *Card 10b:* Which best describes how you clean brushes and rollers after painting?

1-Dispose of brushes and rollers in rubbish
2-Clean brushes, rollers in turpentine then pour down sink
3-Clean in turpentine, then pour down outside drain
4-Clean in turps then dispose of in garden or yard
5-Other

16. *Card 11:* To what extent did you look for information on how to dispose of excess paint?

1-didn't look [skip to 16]
2-barely had to look
3-took moderate effort
4-had to search extensively

17. *Card 12:* How did you go about finding that information?

1-Online
2-Newspaper Advertisements
3-Radio Advertisements
4-Brochures
5-Contacted local Council officials
6-Other _____

18. On a scale of 1-4 with 1 being not familiar at all and 4 being very familiar, to what extent are you familiar with programs geared towards paint disposal (not including recycling) in your area?

1 2 3 4

19. On the same scale of 1-4, to what extent are you familiar with programs geared towards paint recycling in your area?

    1 2 3 4

20. On the scale of 1-4 with 1 being not at all and 4 being strongly agree, to what extent do you agree with the following statement: I prefer paint that provides specific information on how to properly handle and dispose of paint on its label.

    1 2 3 4

21. On the scale of 1-4, how helpful would it be to you to have would additional information on how to dispose of paint?

    1 2 3 4

22. From 1-4, how much influence on your actual actions would more informative material about proper handling of paint have?

    1 2 3 4

23. *Card 13:* Of the following publicity methods, please rate the top two choices you think would be most useful to you.

    Label_____
    Web page_____
    Ad in newspaper_____
    Flyers in mail_____
    Announcements on radio_____
    Point-of-sale Brochures_____

24. Can you think of anything else that would assist you in the paint disposal process? _____

For Statistical Purposes Only

1. Age: [<18] [19-29] [30-45] [46-62] [63+]

2. Household Income:

[Less than $25,000]
[$25,001 to $45,000]
[$45,001 to $75,000]
[Above $75,001]

3. Highest level of education completed:

[Secondary or less]

[Some Tertiary/Business School/Vocational Training]

[Undergraduate]

[Post Graduate]

WPI SSL

Appendix H: Disposal Survey

M F

*Actual survey was designed to fit on one A4 page

1. Have you ever bought paint?

   -Yes -No [skip to 4]

2. Are you purchasing paint for personal use or for your business as a trade painter?

   -Personal -Trade

3. *Card I:* Before purchasing, did you have an idea of how much paint you would need for your specific job?

   1-no idea 2-some idea
   3-knew very well

4. *Card 2:* To what extent did the information provided on the label influence your purchasing decision?

   1-didn't influence me at all
   2-looked for certain info only (including brand spec)
   3-majority of info was very important

5. *Card 3:* If you have applied paint, how well did you read the label instructions first?

   1-haven't applied [skip to 6]
   2-didn't read [skip to 6]
   3-skimmed them over
   4-read very carefully

6. *Card 4:* How easy or difficult were they to follow?

   1-very easy
   2-moderately hard
   3-very difficult

7. On a scale of 1-4 with 1 being not at all and 4 being strongly agree, to what extent do you agree with the following statement: I prefer paint that provides specific information on how to properly handle and dispose of paint on its label.

   1 2 3 4

8. Have you disposed of paint in the last 5 years, but not including today?

   -Yes -No [skip to 11]

9. *Card 5:* If it was acrylic (water-base) paint, how did you dispose of it?

   1-Disposed of it in can with regular rubbish
   2-Poured it down the sink/drain
   3-Dried out & disposed of it with regular rubbish
   4-Through hazardous waste collection programs
   5-Other_____

10. *Card 6:* If it was solvent-based (oil) paint, how did you dispose of it?

    1-Disposed of it in can with regular rubbish
    2-Poured it down the sink/drain
    3-Dried out & disposed of it with regular rubbish
    4-Through hazardous waste collection programs
    5-Other_____

11. *Card 7:* If you had to dispose of spray packs, how did you do it?

    1-Disposed of it in can with regular rubbish
    2-Empty all its contents and disposed of it with rubbish
    3-Through hazardous waste collection programs
    4-Other_____

12. Are you disposing of acrylic (water-based) paint today?

    -Yes -No

13. Are you disposing of oil (solvent-based) paint today?

    -Yes -No

14. *Card 8: Can* you recall any brochures, labels, or other sources providing information on paint disposal?

    1-not at all 2-vaguely recall
    3-clearly recall

    Can you name what you specifically recall?_____

15. *Card 9:* Which best describes how you clean brushes and rollers after painting (with oil or with acrylic)?

    1-Dispose of brushes and rollers in rubbish
    2-Turps / Water, then pour down sink
    3-Turps / Water, then pour down outside drain
    4-Turps / Water, then dispose of in garden or yard
    5-Other

16. *Card 10:* To what extent did you look for information on how to dispose of excess paint?

    1-didn't look [skip to 16]
    2-barely looked
    3-made moderate effort
    4-had to search extensively

17. *Card 11:* Of the following methods please rate from 1-4 the top two methods that were most helpful to you in searching for disposal information.

    1-Online_____
    2 - News Ads _____
    3-Radio Ads_____
    4 - Brochures_____
    5-Contacted local Council officials_____
    6-Other _____

18. On a scale of 1-4 with 1 being not familiar at all and 4 being very familiar, to what extent do you feel you are familiar with programs geared towards paint disposal (not including recycling) in your area ?

    1 2 3 4

19. On the same scale of 1-4, to what extent are you familiar with programs geared towards paint recycling in your area?

1 2 3 4

20. On the same scale of 1-4 with 1 being not aware at all and 4 being very aware, to what extent are you aware of any hazards that may be related to improper disposal of paints?

1 2 3 4

21. On the scale of 1-4 , how helpful would it be to you to have would additional information on how to dispose of paint?

1 2 3 4

22. *Card 12:* Of the following publicity methods, please rate the top two choices you think would be useful to you.

Label_____
Web page_____
Ad in newspaper_____
Flyers in mail_____
Announcements on radio_____
Point-of-sale Brochures_____

23. Can you think of anything else that would assist you in the paint disposal process?

For Statistical Purposes Only

1. **Age:** [<18] [19-29] [30-45] [46-62] [63+]

2. **Household Income**:

[Less than $25,000]

[$25,001 to $45,000]

[$45,001 to $75,000]

[Above $75,001]

3. **Highest level of education completed:**

[Secondary or less]

[Some Tertiary/Business School/Vocational Training]

[Undergraduate]

[Post Graduate

WPI SSL

Appendix I: Cover Letter to EcoRecycle

Lorraine Kibbis
EcoRecycle
Level 2, 478 Albert St.
East Melbourne, VIC 3002
9639 3322

Tuesday March 27, 2001

Dear Ms. Kibbis:

We are students from Worcester Polytechnic Institute (WPI), a university in Massachusetts. We are currently working on an educational project with WPI under the direction of Professor Holly Ault. Ken Lofhelm, Principal Materials Scientist of the Scientific Services Laboratory in Port Melbourne, is sponsoring our project. The goal of our project is to evaluate the level of knowledge the consumer has regarding paint usage and disposal and suggest methods for increasing public education. Our efforts are in partial fulfilment of the degree requirements of WPI. As this is a third party study, we have no affiliation with the paint manufacturing industry.

Our methodology for this study will include two surveys. The first survey consists of interviewing paint consumers at retail paint store locations, while the second survey would be of patrons of the chemical collection days. The retail survey is structured to evaluate the consumers knowledge of usage, hazards, and disposal, while the waste disposal survey is geared towards discovering the consumer's motivation for proper disposal of paint in addition to finding out what publicity tactics were most effective in attracting their participation.

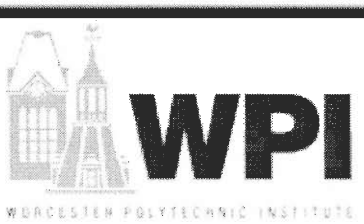
In order to assess the public's awareness, we would like to conduct a brief survey of the patrons utilising EcoRecycle's household chemical collection days at the Maroondah City Council sites in Croydon on April 7th. The survey will be voluntary and takes approximately 4-5 minutes to complete. The patrons confidentiality will be assured. Attached is a copy of the chemical collection day survey. We hope that the outcome of our work may provide consumers with an extended knowledge of services available to them and information about paint through the production and distribution of educational material.

This study aims to assist future consumers and users of paint in its proper handling in order to protect both environmental and personal health. We greatly appreciate your time and assistance with this study and would be most willing to share with you our results. A formal invitation will be extended to you to attend the final presentation of our findings. If you have any further questions or concerns, please feel free to contact us at our SSL office, phone # (03) 9248-4900 ext. 4944 or e-mail us at forensic@wpi.edu.

Sincerely,

Steve Christopher
Heather Wadlinger
Pamela Graybeal

Appendix J: Cover Letter to Paint Stores



Thursday March 22, 2001

Dear Manager:

We are students from Worcester Polytechnic Institute (WPI), a university in Massachusetts. We are currently conducting a research study sponsored by the Scientific Services Laboratory in Port Melbourne under Ken Lofhelm, Principal Materials Scientist. The educational project is in collaboration with WPI under the direction of Professor Holly Ault. The goal of our project is to evaluate the level of knowledge the consumer has regarding paint usage and disposal and suggest methods for increasing public education. Our efforts are in partial fulfilment of the degree requirements of WPI. This letter is to follow up the call that was made earlier to your facility.

Our methodology for this study will include two surveys. The first survey consists of interviewing paint consumers at retail paint store locations, while the second survey will be of patrons of the chemical collection days. The retail survey is structured to evaluate the consumers' knowledge of usage, hazards, and disposal, while the waste disposal survey was created to discern the consumers' motivation for proper disposal of paint. Furthermore, the survey will help us to discern what publicity tactics are most effective in attracting their participation in specialised waste collection.

In order to assess the public's awareness, we would like to conduct a brief survey of the patrons utilising your retail facilities for one morning or afternoon. The survey will be voluntary, takes approximately 3-5 minutes to complete, and will be offered to the consumer as they leave the store (near the store's exit). The consumers' confidentiality will be assured. Attached is a copy of the retail survey.

This study aims to assist future consumers and users of paint in its proper handling in order to protect both environmental and personal health. We hope that the outcome of our work will provide consumers with an extended knowledge of services available to them and information about paint through the production and distribution of educational material. Not only will an outcome of the survey be better customer service, but the consumer will have greater knowledge in maintaining healthy practices and protection of the environment.

We greatly appreciate your time and assistance with this study and are seeking your permission to stand near the store exit to administer the survey to customers as they are leaving. We would be most willing to share with you our results. If you have any further questions or concerns, please feel free to contact us at our SSL office, phone # (03) 9248-4900 ext. 4944 or e-mail us at forensic@wpi.edu. You may contact our sponsor, Ken Lofhelm of SSL, at (03) 9248-4900 ext. 4902. Thank you so much for your involvement.

Sincerely,

Steve Christopher
Heather Wadlinger
Pamela Graybeal

Appendix K: Distribution Letter

April 19, 2001

Dear Marketing Manager:

The Scientific Services Laboratory (SSL) in Port Melbourne, Victoria has recently sponsored a research project to evaluate the level of consumer awareness regarding paint usage, disposal, and hazards. SSL manages the Australian Paint Approval Scheme (APAS), and is a business unit of the Australian Government Analytical Laboratories (AGAL).

Monash University conducted a study in 1997 that found that 75-80% of domestic paint in Melbourne ends up in landfills from improper disposal. The need to increase the awareness the public has of proper paint disposal methods is evident. Additionally, SSL's recent survey revealed that consumers would find more information on paint disposal helpful. When asked how helpful additional information on disposal methods would be, consumer responses averaged 3.2 on a scale of 1-4 with 4 being very helpful.

In response to these results, SSL has designed and produced an informative point of sale brochure for distribution at all paint retail locations across Australia. SSL hopes that by distributing this brochure, the usage of proper clean-up and disposal methods will be significantly increased, protecting the health and safety of both the environment and of paint consumers.

SSL is now in the process of making this informative point-of-sale brochure available for national distribution. We would like to extend its availability to your company and clients, free of charge. It is our hope that you will take advantage of this opportunity to provide the public with this extra service, thus enhancing consumer awareness and promoting consumer responsibility. We suggest that each retail outlet be advised to either dispense the brochure to each customer that is purchasing paint, or place the brochures at a highly visible location, such as on display near the cash register.

In order to obtain copies of these free brochures for distribution, please send an e-mail to **ssl@agal.gov.au** and specify the number of brochures you would like to have to distribute to your various retail outlets nationally. Simply include "Paint Disposal Brochure" in the subject heading, and in the body, state the number of brochures that you would like to receive, as well as a receiving address. A copy of the brochure is enclosed for review.

Thank you for your time.

Sincerely,

Ken Lofhelm
Principal Materials Scientist, Scientific Services Laboratory

Enclosure

Appendix L: Article for SSL Newsletter

Paint Clean-up and Disposal Brochure Available

In order to extend its services provided to the general public, the Scientific Services Laboratory (SSL) of Port Melbourne has recently published a brochure including tips on how to properly clean-up and dispose of paint. The brochure is designed to increase the incidence of proper usage and disposal methods for paint in hopes of protecting the health and safety of the environment and its inhabitants.

Results of a recent study conducted at SSL by Worcester Polytechnic Institute students revealed that there is a definite need and consumer desire for accessible information concerning the clean-up and disposal of paint. In response to the findings, a point-of-sale brochure was designed. The brochure provides information for the following areas:

- Environmental hazards
- Handling of wash water
- Tips for dealing with left-over paint (focusing on waste minimisation)
- Disposal information for acrylic, oil, and spray packs
- Additional contact information

The brochure is available, free of charge, to paint suppliers, manufacturers, and other interested bodies for distribution at paint retail locations. It is also available for distribution to the public through councils upon inquiry about paint disposal.

To obtain copies of 'Painting: Tips for Responsible Clean-Up and Disposal':
Contact Ken Lofhelm by writing to 177 Salmon St., Port Melbourne, VIC 3207, calling (03) 9248-4902, or via e-mail at ssl@agal.gov.au. Include in the subject heading "Paint Disposal Brochure." Provide the quantity of brochures desired as well as the receiving address.

Appendix M: Letter and Article for MAPS

April 30, 2001

Maps Group Ltd.
First floor, The Glasshouse,
290 Burwood Road, Hawthorn
Victoria 3122

Dear Ms. Elmslie:

The Scientific Services Laboratory (SSL) in Port Melbourne, Victoria, is interested in publishing an article in the MAPS group magazine because they have extended their services to encompass the general public.

SSL manages the Australian Paint Approval Scheme (APAS), and is a business unit of the Australian Government Analytical Laboratories (AGAL). SSL has recently sponsored a research project to evaluate the level of consumer awareness regarding domestic paint usage, disposal, and hazards.

Monash University conducted a study in 1997 that found that 75-80% of domestic paint in Melbourne ends up in landfills from improper disposal. The need to increase the awareness the public has of proper paint disposal methods is evident. Additionally, SSL's recent survey revealed that consumers would find more information on paint disposal helpful. When asked how helpful additional information on disposal methods would be, consumer responses averaged 3.2 on a scale of 1-4 with 4 being very helpful.

In response to these and other results, SSL has designed and produced an informative point-of-sale brochure for distribution at all paint retail locations across Australia. SSL hopes that by distributing this brochure, the usage of proper clean-up and disposal methods will be significantly increased, protecting the health and safety of both the environment and of paint consumers.

SSL is now in the process of making this informative point-of-sale brochure available for national distribution, free of charge. The brochure is being offered specifically to paint manufacturers to be distributed at paint retail locations. Additionally, SSL felt that distribution of the brochures by local councils would further assist paint users. It is our hope that many different organisations will take advantage of this opportunity to provide the public with this extra service, thus enhancing consumer awareness and promoting consumer responsibility.

We believe that the MAPS magazine will prove to be an effective method for communicating and extending SSL's services to interested parties. We have attached a sample article and brochure to the end of the document for you to review. If you have any questions or comments, please contact Ken Lofhelm at the SSL at (03) 9248 4900 or e-mail ken.lofhelm@agal.gov.au.

Thank you for your time.
Sincerely,

Stephen Christopher, Pam Graybeal, and Heather Wadlinger
SSL/Worcester Polytechnic Institute

Paint Clean-up and Disposal Brochure Available

A recent study conducted in March 2001 in Melbourne revealed that 91% of people have excess paint stored in their homes. This prevalent situation emphasises the need Australia has to explore waste minimisation. The study also confirmed that paint waste is frequently disposed using improper methods such as pouring paint down the sink or drain, or simply throwing the liquid waste into the rubbish. These actions increase incidence of groundwater contamination. The study revealed that 37% of acrylic paints and 50% of oil paints are disposed of incorrectly.

Finding that there is a need for public education and a desire from consumers for accessible information concerning the clean-up and disposal of paint, the Scientific Services Laboratory (SSL) in Port Melbourne has responded by extending their services to the general public. SSL manages the Australian Paint Approval Scheme (APAS), and is a business unit of the Australian Government Analytical Laboratories (AGAL).

In response to these and other results, SSL has designed and produced an informative point-of-sale brochure for distribution. The brochure is tailored to domestic paint consumers needs as found in the study. It is designed to increase the incidence of proper usage and disposal methods for paint in hopes of protecting the health and safety of the environment and its inhabitants.

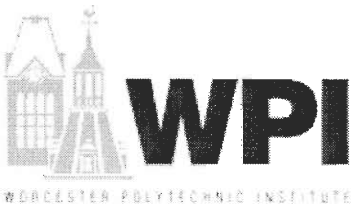
The brochure provides information in the following areas:

- Environmental hazards
- Handling of wash water
- Tips for dealing with left-over paint (focusing on waste minimisation)
- Disposal information for acrylic, oil, and spray packs
- Additional contact information

SSL is now in the process of making this informative point-of-sale brochure available for national distribution, free of charge. The brochure is being offered to paint manufacturers to be distributed at paint retail locations as well as to paint suppliers directly. Additionally, SSL felt that distribution of the brochures by local councils, environmental authorities, and other interested bodies would further assist paint users. It is our hope that many different organisations will take advantage of this opportunity to provide the public with this extra service, thus enhancing consumer awareness and promoting consumer responsibility.

To obtain copies of 'Painting: Tips for Responsible Clean-Up and Disposal':
Contact Ken Lofhelm by writing to 177 Salmon St., Port Melbourne, VIC 3207, calling (03) 9248-4902, or via e-mail at ssl@agal.gov.au. Include in the subject heading "Paint Disposal Brochure." Provide the quantity of brochures desired as well as the receiving address.

Appendix N: Thank You Letter for Paint Stores



Tuesday March 27, 2001

Dear Bristol Employees and Manager:

We would like to thank you for your time and cooperation. It was a pleasure meeting and working with everyone at the store, and your hospitality was greatly appreciated. We hope that the outcome of our study increases consumer awareness of proper handling of paint, in addition to assisting paint retailers as well. Your assistance contributed greatly to our study, and we would be more than willing to share with you the final results of our study upon its completion. Please let us know if you are interested in the results by calling us at 03 9248-4900 ext. 4944, faxing us at 03 9646-516, or via e-mail at forensic@wpi.edu. Our project should be completed by April 29, 2001. Thank you again for all of your support.

Sincerely,

Stephen Christopher
Pamela Graybeal
Heather Wadlinger

Appendix O: Industrial Waste Minimisation

On the industrial level, there are several programs, worldwide, whose goals are to manufacture products while generating the least amount of waste possible. One of these American programs, located in New Jersey, is called The Hazardous Waste Advisement Program (HWAP) of the Division of Hazardous Waste Management, NJDEPE. The program is responsible for waste minimisation and program implementation. HWAP, with the help of the US EPA, conducted a project entitled Assessment of Reduction and Recycling Opportunities for Hazardous Waste (ARROW). Recommendations from this assessment include such measures as distillation of solvents from equipment washings and recovery of solids by flocculation (Ulbrect, 1992). Waste water and solvents from washing could also be used in the manufacture of new similar coloured paints.

Appendix P: Summary Report

CONSUMER AWARENESS OF

DOMESTIC PAINT USE AND DISPOSAL

Summary Report

An Interactive Qualifying Project
of
WORCESTER POLYTECHNIC INSTITUTE

by

Stephen J. Christopher
Pamela M. Graybeal
Heather A. Wadlinger

May 1, 2001

Sponsor: The Scientific Services Laboratory
Ken Lofhelm, Principal Materials Scientist

Advisor: Professor Holly Ault
Co-advisor: Professor Jonathan Barnett

I. Study Objectives and Approach

Research Objectives:

The issues involved with domestic paint use and disposal are of great importance, since painting is one of the most prevalent methods used to protect and beautify a majority of homes around the world. When paint is improperly used, it may pose many threats to the user's health and safety. In addition, proper disposal is vital to protecting the environment in which we live. The main goal of this study was to evaluate the public's awareness regarding paint use and disposal, and based upon those findings, produce a means by which to increase the incidence of proper usage and disposal of paint by domestic users. Domestic paint consumers' perception and awareness of personal and environmental hazards related to paint usage and disposal were explored and analysed in Melbourne, Victoria. The study was sponsored by the Scientific Services Laboratory (SSL), which is an Australian government laboratory that conducts independent testing of various products, including paint. The study was conducted in Port Melbourne, and focused on determining and developing the best method (such as literature, labels, or other informative tools) to inform the public of hazards and proper techniques associated with the usage and disposal of paint and related products.

Methodology:

In order to facilitate SSL's goal of extending their services from paint manufacturing clients to the general public, three students from Worcester Polytechnic Institute administered two survey interview sessions in Melbourne that assessed the level of knowledge concerning paint use and disposal that current paint consumers have. The first session of survey interviews targeted consumers at five paint retail stores around Melbourne based on their geographic location (in North, South, East, West, and Central Regions) as well as customer influx. The second survey interview session was conducted at Croydon's (a suburb of Melbourne) household chemical collection day sponsored by EcoRecycle, Victoria. The data collected from these surveys was used to assess public interpretations, knowledge, and concerns about the environmental, health, and safety problems related to the use and disposal of paint products. The surveys also revealed the participants' actions regarding the handling of paint.

The researchers also conducted forty-four interviews with representatives of many groups that dealt with paint handling issues in some way. The interviews included different paint suppliers, paint manufacturers, waste management companies, chemical collection companies, state paint user groups, and environmental conservation groups. These interviews helped the researchers gain a more thorough and comprehensive perspective of the current domestic paint situation.

II. Results and Conclusions

One hundred and ninety two surveys were collected and analysed. The survey sample population included 25% trade painters and 75% domestic paint consumers. The sample's demographic results were as expected, with the age, household income, and education levels consistent with the demographic data for Melbourne. Results indicated that of all the people surveyed at the retail locations, 91% currently had excess paint stored in their homes. This emphasises the prevalence of the current waste minimisation problem in the Australian paint industry. The retail survey also revealed that 21% of people surveyed were not aware of any of the hazards associated with the various aspects of handling paint, while an additional 51% were aware of only a few hazards. The surveys also investigated current usage and disposal methods employed by domestic paint users, and found that improper disposal methods, such as pouring paint down the sink or drain, or placing liquid paint directly into the rubbish, were being used quite frequently. Other pertinent survey results are illustrated below:

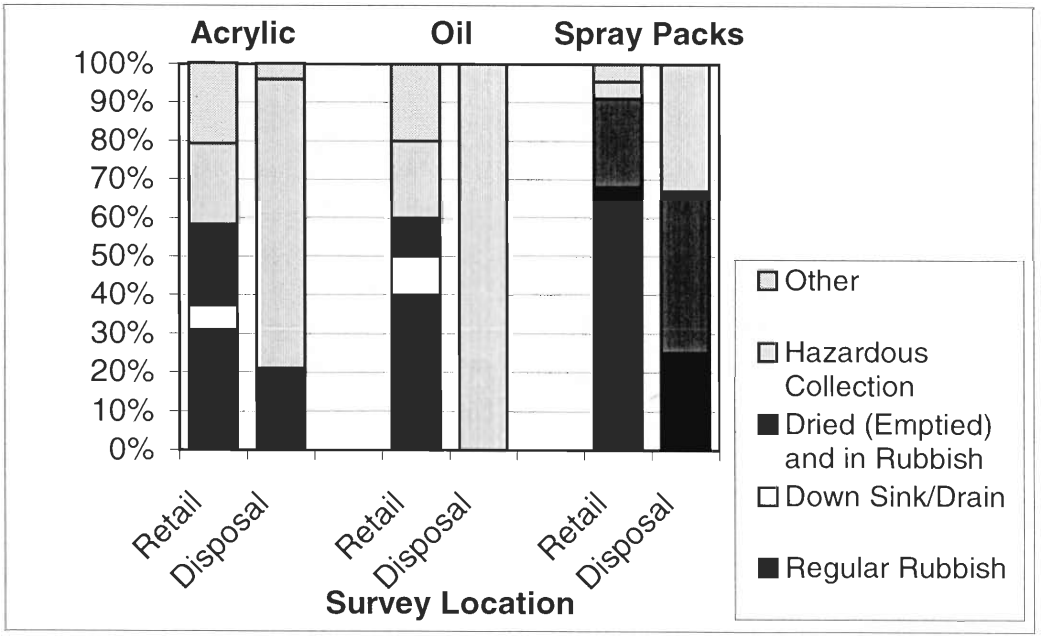
Cleaning Brushes and Rollers:

- Twenty-four percent of all people surveyed are disposing of the water and/or turps that they clean their brushes with improperly. This includes introducing paint wastes directly into the water system, either by pouring it down the inside or outside drain.

Current Consumer Paint Disposal Methods:

- The following chart shows the paint disposal methods used by survey participants who disposed of paint in the past five years.

Figure 1: Paint Disposal Methods

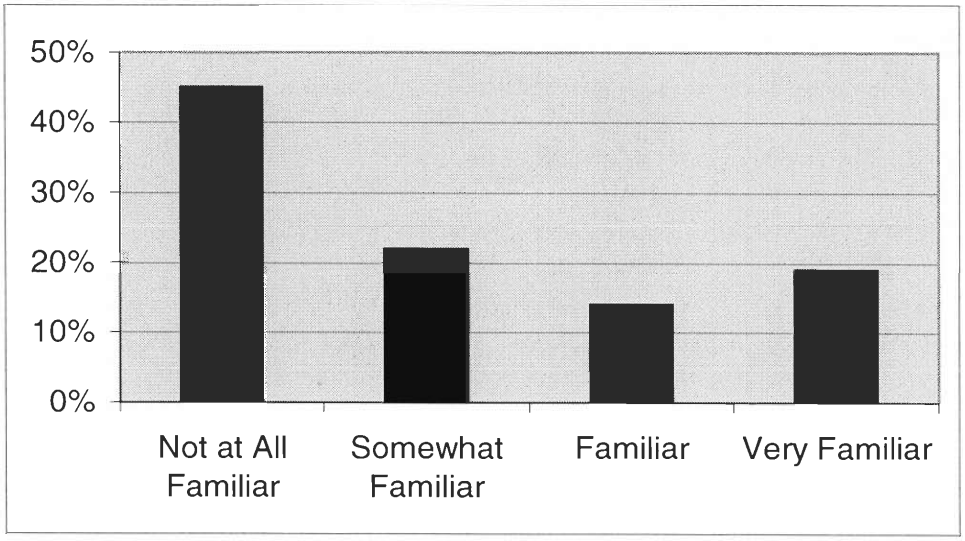


Consumer Knowledge:

- On a scale of 1-4 with 1 being not at all familiar and 4 being very familiar, to what extent are you familiar with programs geared towards paint disposal in your area?

The average was 2.1 on a scale of 1-4. The standard deviation was 1.2.

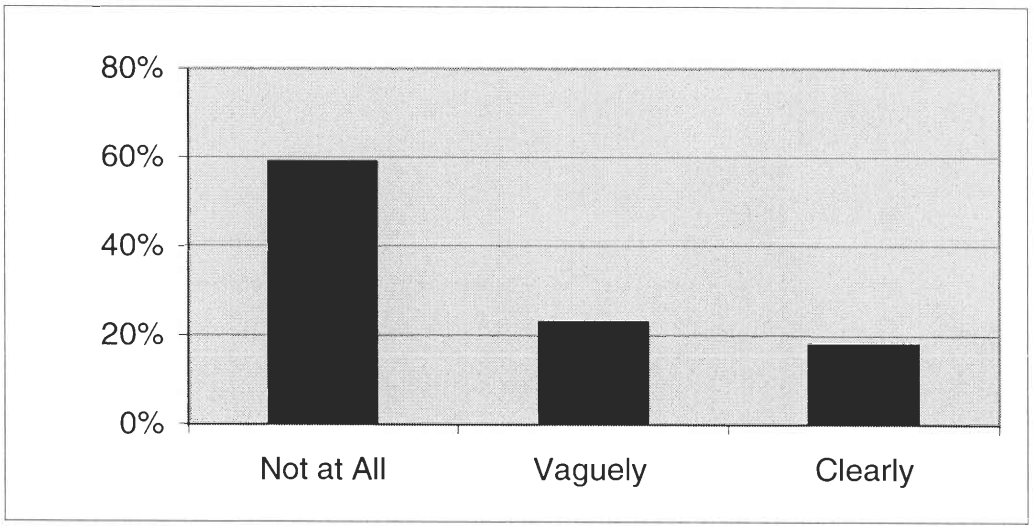
Figure 2: Familiarity With Disposal Programs



- Can you recall any brochures, labels, or other sources providing information on paint disposal?

The average was 1.7 on a scale of 1-3 with 1 being not at all and 3 being clearly recall. The standard deviation was 0.78.

Figure 3: Recollection of Disposal Information



Consumer Demand for Informative Resources:

- On a scale of 1-4, with 1 being not at all helpful and 4 being very helpful, how helpful would it be to you to have additional information on how to dispose of paint?

The average was 3.2 on a scale of 1-4. The standard deviation was 0.99.

Figure 3: Additional Disposal Information Would Be Helpful

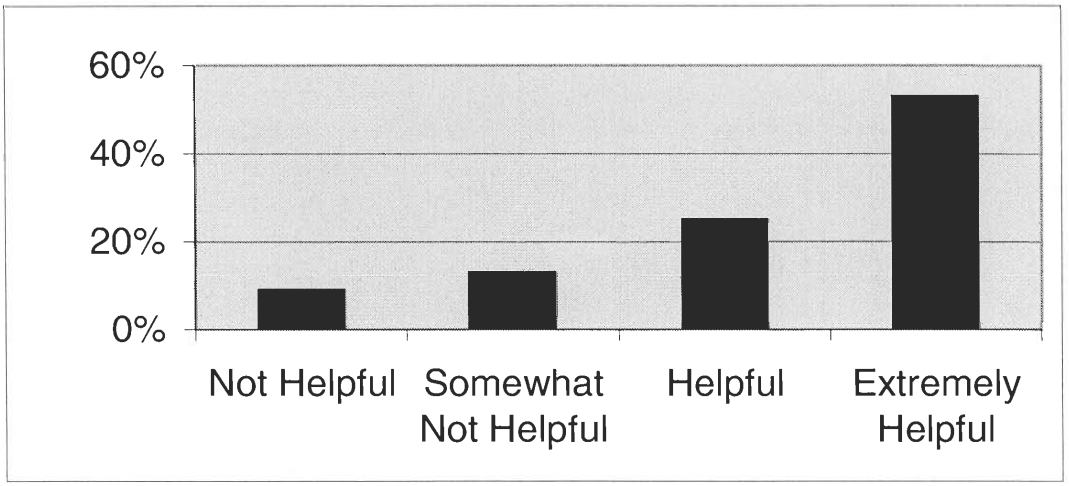
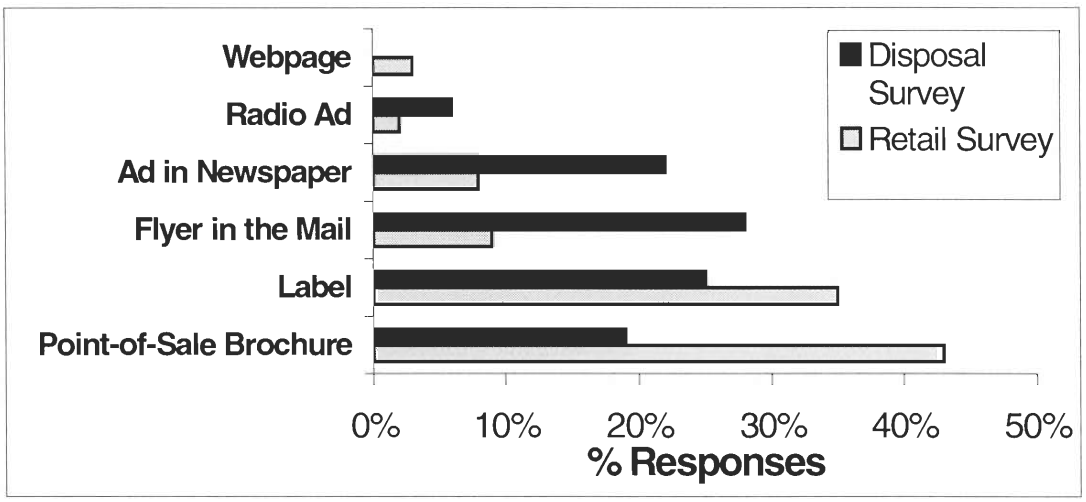


Figure 4: Consumer Publicity Preference Method from Both Surveys



Influence on Actions:

- A moderately strong, highly significant correlation[ϕ] (0.49 and 0.67, disposal and retail survey respectively) was found between people who preferred more specific information on the handling of paint and the influence more information would then have on their actions. **People who would like more information would be change their actions because of the information.**

[ϕ] Utilising the Spearman Rank Correlation Test

- When analysing the results of two different questions, asked on both surveys, comparing how helpful more information would be, with how much influence additional information would have on the actions of the respondent, a moderate correlation[φ] was seen (0.67 and 0.61, disposal and retail survey respectively). **People who reported that they would be helped by more disposal information also reported that they would modify their behaviour in accordance to that information.**

It was concluded from information gathered through research, interviews, and surveys that there was a need and consumer demand for increased (and easily accessible) information regarding paint usage and disposal, and that this information would influence future consumer action.

III. Creation of Educational Resource

The researchers intended to make appropriate information easily available to consumers, so that the proper methods may be known and applied more frequently. The feasibility of implementing a method to disseminate information to the paint consumer was evaluated, taking into consideration the responses obtained from interviews and surveys. The researchers concluded that the most feasible and effective short-term solution would be the production and distribution of an informative point-of-sale brochure. A brochure provides the appropriate amount of space for the information, does not rely manufacturers to make large adjustments, and is noticeable at the point of sale. Thus, the results obtained from the study enabled the researchers to address the question of what information needed to be conveyed to the public, and then what method would be the most effective dissemination tool.

The creation and distribution of the brochure was done with the aim to increase the incidence of proper usage and disposal of paint by domestic users throughout Australia. Distribution was targeted to paint retail outlets, paint manufacturers, local councils, and environmental groups. The brochures are currently being nationally distributed free of charge to domestic consumers by SSL.

IV. Future Recommendations

After research and collection of data, this study uncovered some short-comings within the programs dealing with current paint disposal programs in Australia. First of all, most homes have excess paint, and many of the home-owners do not know what steps to take to dispose of it properly. Also, it was found that even the methods of disposal that are considered "proper," still have several drawbacks. For instance, the method most commonly

[φ] Utilising the Spearman Rank Correlation Test

recommended for disposing of water-based paint is drying it out before disposing of the waste into a tip (landfill). However, this process still releases harmful VOCs into the atmosphere. Meanwhile, the collection of oil-based paint by chemical collectors is considered the only correct method, yet the collected paint is usually incinerated. And while this paint is used as an alternative fuel source, it still has drawbacks because industry is trying to move away from relying on solvent-based fuels. The disposal methods for both types of paint are far from ideal. Thus, it makes more sense to promote the usage of paint, or waste minimisation (which is already highly recommended in the hazardous waste hierarchy). Through encouraging waste minimsation, the amount of excess paint will be reduced, and what is left-over can be used for another job, in hopes of avoiding wasting the paint.

The production and distribution of the brochure aims to quickly reach and inform paint users across the nation of the recommended methods for cleaning-up and handling of excess of water and solvent-based paints. However, upon analysis of the overall paint disposal situation, a long-term solution to the problem of disposing of excess paint should focus on increasing manufacturer responsibility for the entire life cycle of their products. Ideally, the paint manufacturing industry will soon evolve, and begin accepting more responsibility for the entire life cycle of their paint. By making manufacturers more responsible for their product, even after it has been sold, it is more likely that the companies will find ways to use the reclaimed paint. This assumption is made because once the manufacturers are forced to accept unused paint, it is more likely in their best economic interest to utilise it rather than to dispose of it. As seen from Benjamin Moore & Co. Paints in the US, it is more cost-effective to use the paint than it is to pay to dispose of the hazardous material. So, while groups work to change the paint manufacturing industry to a more "cradle-to-grave" system, the brochure will hopefully take more immediate steps towards minimising waste and reducing improper clean-up and disposal of paint. The increased consumer awareness will hopefully help protect the health and safety of the environment and its inhabitants.

V. Obtaining Point-of-Sale Brochures

A copy of the point-of-sale brochure "Painting? Tips for Responsible Clean-up and Disposal" is included with this report. These brochures are currently being produced by SSL and are available, free of charge, for distribution to the general public. If your organisation is interested in obtaining a quantity of these brochures, contact Ken Lofhelm, the Australian Paint Approval Scheme's executive officer, on (03) 9248 4900, fax (03) 9646 5165, or e-mail ssl@agal.gov.au. If you send an email, use "Paint Disposal Brochure" as the subject, and specify the quantity of brochures desired and the receiving address in the body.

For further information on the study, please contact Heather Wadlinger (forensic@wpi.edu), Pam Graybeal (pamg@wpi.edu), or Stephen Christopher (schristo@wpi.edu).