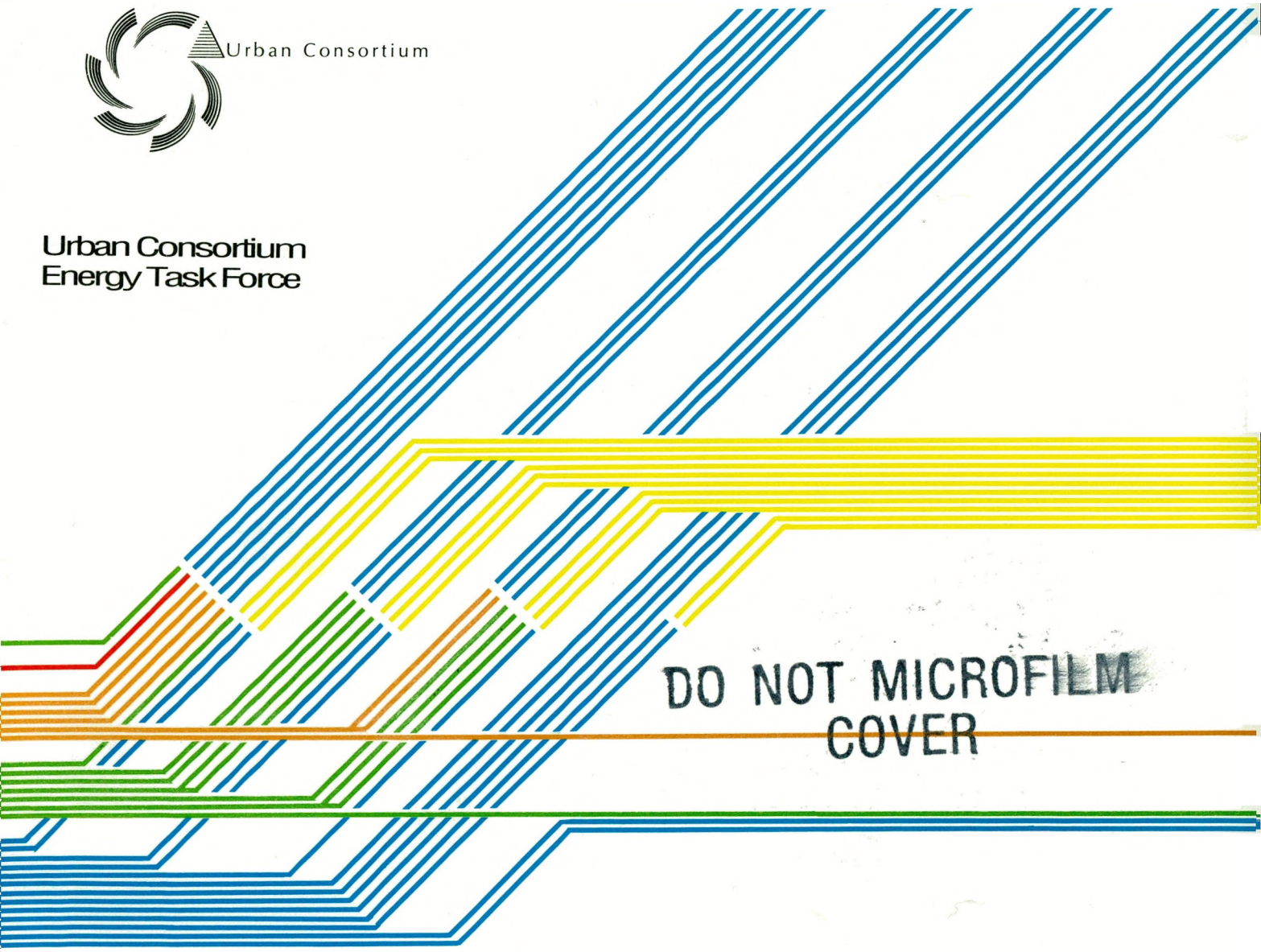
EVALUATION AND COMPARISON OF SELECTED HOUSEHOLD HAZARDOUS WASTE COLLECTION FACILITIES



Urban Consortium

Urban Consortium
Energy Task Force

City of Seattle
Office for Long-range Planning

Urban Consortium for Technology Initiatives

THE ENERGY TASK FORCE OF THE URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES

The Urban Consortium for Technology Initiatives (UC) is composed of over forty of the largest cities and urban counties by population in the United States. The Consortium provides a unique forum to define urban problems common to its member governments and to develop, apply, transfer and commercialize technologies and innovative management techniques to address those problems.

With staff, management and business services provided by Public Technology, Inc., the Urban Consortium carries out its work through special projects and Task Forces that focus on specific functional areas of local government management. The UC Energy Task Force is the nation's most extensive cooperative local government program to improve energy management and technology applications in cities and urban counties. Its membership is composed of local government officials from twenty of America's largest urban centers.

The members of the UC Energy Task Force define annual work programs to meet three specific objectives:

- o definition of critical urban energy problems;
- o development of technologies and management practices to resolve these problems; and
- o transfer of resulting solutions to Urban Consortium and other local governments.

Proposals to meet the specific objectives of these annual work programs are solicited from the full UC membership. Projects based on these proposals are then selected by the Energy Task Force for direct conduct and management by staff of city and county governments. Projects selected for each year's program are organized in thematic units to assure effective management and ongoing peer-to-peer experience exchange, with results documented at the end of each program year.

This approach for the definition of priorities and the selection, conduct and documentation of applied research projects by staff from participating local governments is a unique strength of the UC Energy Task Force -- a "user-driven" focus to assure that projects conducted by city and county staff will produce results that effectively meet energy management needs critical to local governments.

PUBLIC TECHNOLOGY, INC. (PTI)

Public Technology, Inc. (PTI), is the research development and commercialization arm of the National League of Cities and ICMA, and a non-profit association of local governments dedicated to improving services and increasing efficiency through the use of technology and management systems.

PTI works with and supports its members in solving widespread and urgent problems facing local governments. This support is handled through a four-tier, interconnected series of service centers, which provide state-of-the-art information, electronic and personal networking with local governments and technical specialists, direct consultation and training with PTI staff experts, and practical research.

To ensure that its programs and research have the widest possible benefit, PTI is guided by a strategic plan that emphasizes partnerships with private industry, expertise in multi-disciplinary technologies, training in the art of change management, and participation in the international arena of local government to further the search for technological and management solutions.

Member cities and counties provide PTI's core financial support. Grants and contracts from foundations, Federal agencies, and corporations also support PTI activities.

PTI's activities are carried out from offices located in Washington, D.C. and Long Beach, California. International coordination is handled through an affiliate in London, England. PTI was founded in 1971 by the major associations of state and local governments.

Costis Toregas, President

The research and studies described in this report were made possible by grants from the Community Energy Program of the Office of Buildings and Community Systems of the United States Department of Energy through the Energy Task Force of the Urban Consortium for Technology Initiatives.

DOE/IR/05106--T138

DE91 013433

May 1990

EVALUATION AND COMPARISON OF SELECTED HOUSEHOLD HAZARDOUS WASTE COLLECTION FACILITIES

Energy Task Force
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for Technology Initiatives

City of Seattle
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PREFACE

The Urban Consortium for Technology Initiatives (UC) is composed of over forty of the largest cities and urban counties by population in the United States. The Consortium provides a unique forum to define urban problems common to its member governments and to develop, apply, transfer and commercialize technologies and innovative management techniques to address those problems.

The Urban Consortium conducts its work program under the guidance of Task Forces structured according to the functions and concerns of local governments. The Energy Task Force, with a membership of municipal managers and technical professional from the Consortium jurisdictions, has sponsored over one hundred energy management and technology projects in thirty-two Consortium member jurisdictions since 1978.

To develop in-house energy expertise, individual projects sponsored by the Task Force are managed and conducted by the staff of participating city and county governments. Projects with similar subjects are organized into "units" of five to nine projects each, with each unit managed by a selected Task Force member. A description of the units and projects included in the Tenth Year (1988-89) Energy Task Force Program follows:

UNIT -- ELECTRICITY MANAGEMENT

Local governments recognize that high energy costs can place severe burdens on residents and constrain growth for both energy-intensive industries and the vital small business sector that provides the majority of today's employment opportunities. Maintaining a stable, secure and reasonably priced supply of electric energy will require strategies that include support for decentralized "small" power production, better demand management, and improved energy use efficiency. Successful implementation of such strategies will require close coordination with the utility industry and should address topics in areas of institutional relations, source flexibility and demand side management. The Tenth Year unit consisted of eight projects and are as follows:

- Chicago, Illinois -- Phased Implementation of Alternative Technologies through the Development of Energy Markets
- Columbus, Ohio -- Electricity Demand Impacts of Indoor Air Quality Standards
- Houston, Texas -- Wastewater Treatment Process Energy Optimization
- Kansas City, Missouri -- Modernization of Lighting in a Municipal Auditorium
- New York, New York -- Strategies to Reduce Electricity Cost in New Commercial Construction
- St. Louis, Missouri -- Reducing Electricity Demand through Energy Efficient Construction
- Albuquerque & Chicago -- Municipal Electric Utility Franchising Conference (Technology Transfer)
- Montgomery County, MD -- Second National Conference on Energy Efficient Cooling (Technology Transfer)

UNIT -- WASTE-TO-ENERGY

Improving the effectiveness of waste management continues today as one of the most crucial challenges facing urban governments -- a challenge that increasingly seeks solutions that can capture the potential for waste materials as continually "renewable" energy resources. To realize this energy recovery potential, it is essential to increase local capabilities for the application of commercialized technologies, to prove and improve emerging technologies, and to develop innovative management techniques that can support effective and environmentally safe recovery of energy from waste. Emphases should be placed on specific applications and technologies, well designed methods for cost and risk management, and improved means to generate both institutional and public support for implementation. The Tenth Year unit consisted of seven projects and are as follows:

- Hennepin County, Minnesota -- Household Hazardous Waste Processing
- Memphis, Tennessee -- Biogas Recovery from a Sludge Storage Lagoon
- Montgomery County, Maryland -- Yardwaste Recycling: Methods and Pilot Evaluation
- Philadelphia, Pennsylvania -- A Policy Planning Model for Integrated Waste Management
- Seattle, Washington -- Household Hazardous Waste Collection and Paint Recycling
- St. Louis, Missouri -- Feasibility Assessment of Waste-to-Energy for District Cooling (Technology Transfer)

- Public Technology, Inc. -- Risk Communication and the Role of Technical Experts in Waste Combustion Decisions (Technology Transfer)

UNIT -- RENEWABLE ENERGY

Widely supported during the oil price shocks of the late 1970's, research, development and use of renewable energy resources in the U.S. lost their substantial momentum when oil prices dropped during the 1980's. Broadly defined, "renewable" resources include both recurring alternate supplies (solar, biomass, wind) as well as techniques to reduce demand for conventional non-renewable energy resources. Effective strategies that can increase the use of recurring alternate resources while improving sound management for non-recurring resources are essential to prepare for the nation's next decade. Emphases should be placed on the synthesis of energy concerns with broader local interests in economic development, cost management and environmental quality to develop truly sustainable urban areas as the century nears its end. The Tenth Year unit consisted of five projects and are as follows:

- San Jose, California -- The Sustainable City
- Portland, Oregon -- The Sustainable City
- San Francisco, California -- The Sustainable City
- New Orleans, Louisiana -- Space Heater Conversion to Hydro-heat Forced Air Systems in the Rehabilitation of Residential Units
- New Orleans, Louisiana -- Impacts of Residential Conservation Programs on Low and Moderate Income Households (Technology Transfer)

ALTERNATIVE VEHICLE FUELS UNIT

Alternative vehicular fuels offer the very strong potential to aid in the reduction of U.S. dependence on foreign oil supplies with the concomitant benefit of decreased air pollution in urban areas. Local governments can play an instrumental role in realizing this potential through practical applied research and highly visible demonstrations for alternative fuel and technology options. Projects within this topic area should place a strong emphasis on teaming and partnership activities among cities and counties, utilities and other relevant private sector organizations with matching interests. Key elements addressed in this effort should include: markets and applications for alternate fueled vehicles; appropriate technologies, infrastructure and training; means to treat institutional barriers; and assessments of environmental effects. The Tenth Year unit consisted of nine projects and are as follows:

- Albuquerque, New Mexico -- Electric and CNG Vehicles in Municipal Duty Cycles
- Broward County, Florida -- Dual Fuel Conversion Demonstration
- Chicago, Illinois -- Northern Illinois Clean Fuel Consortium
- Denver, Colorado -- Air Quality Impacts from Alternative Vehicle Fuels and Urban Design
- Detroit, Michigan -- Fleet Assessment for Light Alternative Fuel Vehicles
- New York, New York -- Alternative Transportation Fuels: Infrastructure Issues
- Pittsburgh, Pennsylvania -- CNG as an Alternative Vehicle Fuel
- Oklahoma City, Oklahoma -- Diesel Truck Conversion to Compressed Natural Gas (Technology Transfer)
- Phoenix, Arizona -- Analysis of Programmatic Fleet Conversion to Ethanol Fuel Blends (Technology Transfer)

Reports from each of these projects are specifically designed to aid the transfer of proven experience to other local governments. Readers interested in obtaining any of these reports or further information about the Energy Task Force and the Urban Consortium should contact:

Energy Program
Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, DC 20004

REPORT AND INFORMATION SOURCE

Additional copies of this report, "Evaluation and Comparison of Selected Household Hazardous Waste Collection Facilities" are available from:

Publications Office
Public Technology, Inc.
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004

For additional information on the conduct of the work described in this report or for other energy management efforts sponsored by the City of Seattle, please contact:

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DG-89/313
12-90/150

ACKNOWLEDGEMENTS

Funding for this project came from the Energy Task Force of the Urban Consortium and the City of Seattle.

The authors would like to thank: Leanne Wooden and Vicky Beaumont of the Seattle South Transfer Station; Jim McMahon, Town of Southold, New York; Geoffery Ethelston, City of Bellevue, Washington; Bill Englander, City of Bellingham, Washington; Henry Draper, King County Solid Waste; Maggie Johnson, Sanitary Fill Company; and Judy Orttung, San Bernardino County, California for their valuable contributions to this report.

This report was prepared by Martha Burke, Joseph A. Brogan and Lisa M. Sepanski, City of Seattle Office for Long-range Planning. Staff support was provided by Bonita Chinn and Bill Elmelund.

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CONTENTS

FIGURES

Page

TABLES

Page

APPENDIX

CHAPTER 1: OVERVIEW

ABSTRACT

In 1988 the City of Seattle's Office for Long-range Planning and the Solid Waste Utility implemented a permanent household hazardous waste collection program in an effort to decrease hazardous waste disposal in municipal solid and liquid waste streams. A detailed description of this program may be found in "Household Hazardous Waste: Implementation of a Permanent Collection Facility", published by the Urban Consortium Energy Task Force.

An integral part of Seattle's Household Hazardous Waste collection effort is a three part evaluation strategy that includes:

- An assessment of the effectiveness of the permanent facility.
- A comparison of the City's facility with other HHW collection programs.
- A user survey to evaluate customer satisfaction and compare the Seattle and King County collection approaches.

This evaluation strategy was conducted during Year 10 of the Urban Consortium Energy Task Force, and it's results are documented in this report.

Seven different collection programs were compared during the evaluation. On a cost per gallon basis, the Seattle Program and the King County Wastemobile were the

lowest cost collection programs. The wastemobile served the most people, over 6,000 in six months, and collected the most waste, over 66,000 gallons.

Seattle's HHW collection facility at the South Transfer Station served 2,174 people in 1989, with only one minor spill. The HHW facility was operated at a temporary location at the south transfer station during this project. The design for the permanent facility, has been modified to include more space for storage of drums, and space for testing of unknowns.

A user survey conducted at the STS facility and selected mobile collection center (Wastemobile) sites indicated that Wastemobile users were satisfied with the service offered by that facility. Customers were well satisfied with the location, service and days and hours of operation. STS Facility users were somewhat less satisfied. Publicity definitely affected usage at both facilities. Newspaper articles were especially effective for the Wastemobile. Referrals by transfer station personnel were the most common source of information for the STS Facility, followed by phone inquiries. Flyers or utility billings were also a significant source of clients.

PROJECT PURPOSE

Over the past several years, an increasing number of communities have taken steps to inform the public about the effects of improperly disposed HHW. In some cases local governments regulate the disposal of HHW, and local agencies are responsible for providing HHW education, collection and disposal options. Collection programs have increased in sophistication from one-day collection events to permanent and mobile collection facilities. The experience of HHW collection programs already in operation can provide valuable information to other jurisdictions planning HHW collection programs.

This report provides communities with information on the design and operation of collection facilities, on the quantities of waste collected and program costs, on the use of publicity and the effect on participation levels, and on customer satisfaction. It examines seven different collection facilities; four in Washington State, two in California, one in New York, and the two King County facilities.

REPORT ORGANIZATION

Chapter 2 provides background information regarding HHW management in King County, Washington. Included in this chapter is a summary of the Seattle-King County Hazardous Waste Management Plan. Descriptions of HHW permanent collection facilities and comparisons of cost, quantity of waste collected and participation data are contained in Chapter 3. Chapter 4 examines issues at the STS Facility that were touched upon in the initial evaluation, including worker training, level of staffing, the waste disposal contract and proposed structural modifications to the facility. Chapter 5 discusses the most effective publicity strategies and the level of customer satisfaction with service.

CHAPTER 2: BACKGROUND

HOUSEHOLD HAZARDOUS WASTE MANAGEMENT IN KING COUNTY, WASHINGTON

An increasing number of household products on the market contain chemical constituents that, if handled carelessly, could be harmful to both human health and the environment. Many people are not aware that everyday household products (such as paint thinners, used motor oil, garden pesticides, and oven cleaners) are hazardous, and when no longer needed or wanted, must be disposed of in a safe and responsible manner. In a public opinion survey conducted in King County in the summer of 1988, 52 percent of the respondents could not identify any products they would consider hazardous, yet 90 percent reported having such products in their home. (Local Hazardous Waste Management Plan, 1989).

King County is located in the northwestern part of Washington State, between Puget Sound on the west and the Cascade Mountains to the east (Figure 2-1). Half of King County's 2140 square miles are federal or commercial forest land. King County has a population of approximately 1.4 million people, comprising 31 percent of the state's population. Seattle is the County's urban center, with a population of 500,000 people (Local Hazardous Waste Management Plan, 1989).

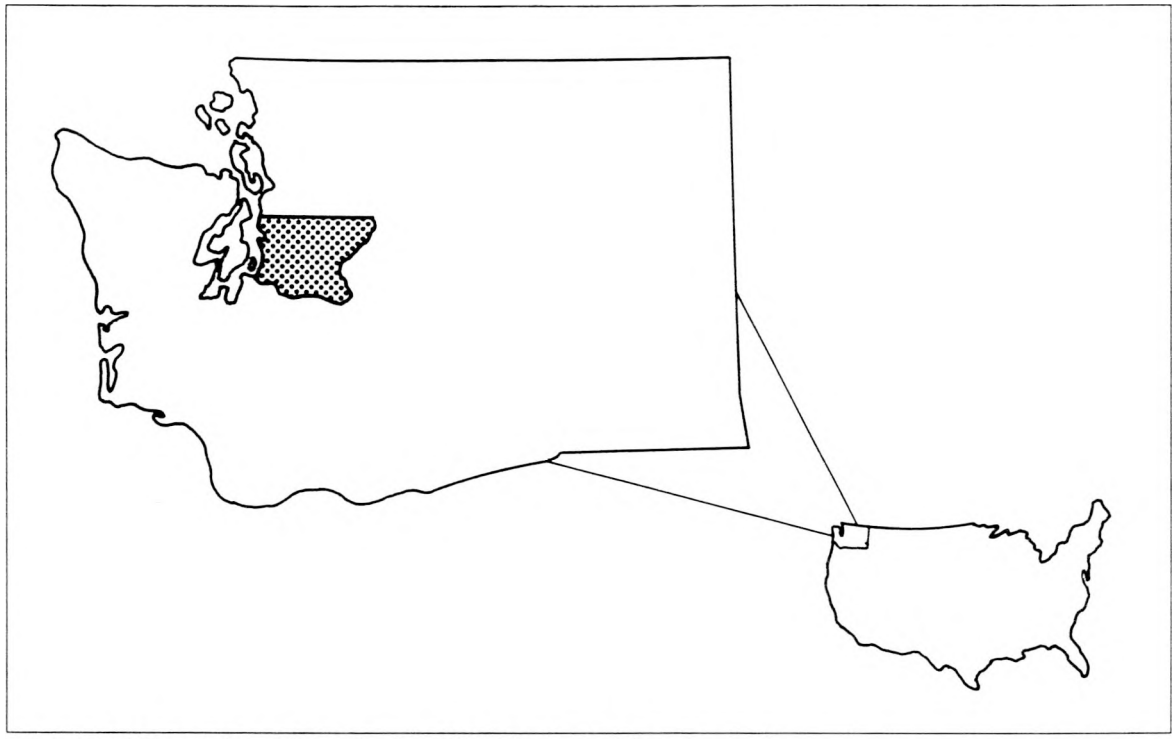

Figure 2-1: King County in Washington State

Until the last several years, few disposal options for household hazardous waste (HHW) have been available to citizens in King County. HHW has commonly been disposed of in the garbage can, down the drain, and onto the ground. In 1989, it was estimated that 6,300 tons of household hazards wastes were disposed of in municipal waste streams in King County (Issue Paper, 1988). 5,400 tons of this waste was disposed of in the solid waste stream, and 900 tons was disposed of down the drain[1]. The amount of waste that was dumped onto the ground and into the environment is unknown.

The cumulative effect of the disposal of small amounts of HHW can cause a variety of environmental problems. Disposal of HHW into the solid or liquid waste streams can cause: contamination of leachate and groundwater if disposed in a landfill;

[1]It is estimated that household hazardous wastes are generated at the rate of 1% by weight of the municipal solid waste stream, and of that, 80% is disposed of in the solid waste stream and 20% in the liquid waste stream (Issue Paper, 1988).

accidental injuries to solid waste or sewer workers; slowing or disruption of sewage treatment processes; damage to sewer or storm drain pipes; damage to septic tank systems or percolation through the drain fields causing groundwater contamination. HHW is commonly stored for years in basements and garages, increasing the risk of accidental poisonings or fires.

Even though large quantities of HHW are still being managed improperly, more people in King County are becoming aware of the problems posed by HHW. This is due, in part, to several highly publicized household hazardous waste collection events. In fact, the nation's first household hazardous waste Round-up was conducted in King County in 1982. Several Round-ups have been conducted since then, the most successful one attracting more than 5,500 households in just one day. A pre- and post-Round-up telephone survey of county residents showed that there was a significant increase in the number of respondents who could identify a HHW. The negative responses dropped from 48 percent before the Round-up to 22 percent after the event (Zehner, 1988).

As the public became more informed, it was evident that the periodic, labor intensive Round-up events did not provide an adequate disposal option for HHW. Many residents were not willing to wait for another Round-up event to dispose of the wastes, and it was realized that a long term solution was necessary.

LOCAL GOVERNMENT INVOLVEMENT IN HOUSEHOLD HAZARDOUS WASTE MANAGEMENT

Under the 1985 Washington State Hazardous Waste Management Act, local governments were required to develop plans to manage small quantities of hazardous waste. In King County, five agencies working cooperatively developed the Seattle-King County Hazardous Waste Management Plan, which was published in August, 1989.

Elements of the plan include:

- Education and waste reduction programs
- Development of collection and disposal options
- Compliance programs for business generators of small quantities of hazardous wastes

The plan recommends that a network of collection facilities be established throughout King County. Implementation of several HHW collection programs has already been started by local agencies, even before the final plan adoption.

In 1988, the City of Seattle set up a dedicated household hazardous waste collection facility (STS Facility) at the City of Seattle South Transfer Station. The project was funded in part by the Urban Consortium Year Nine Grant. Project implementation involved site and facility design, purchase of equipment, disposal contract negotiation, hiring and training of staff, development of waste handling protocols, standard operating procedures and publicity. As the STS Facility continues to operate, it provides valuable information about the composition of HHW, disposal costs and recycling opportunities that may be used in planning and implementing other elements of the plan.

A second HHW collection facility was developed by the King County Solid Waste Division and began operation in October, 1989. This facility differs from the STS Facility in that it is a mobile facility and does not store waste on-site. The "Wastemobile" travels around to communities in King County, sets up and collects HHW for two weeks, then moves on to another neighborhood. All communities in King County are expected to be serviced by the Wastemobile two times a year.

The Local Hazardous Waste Management Plan recommends up to six permanent collection facilities and two mobile facilities be developed in King County by 1994. In order to monitor how well the programs are being implemented and whether the objectives of the plan are being met, an evaluation component is included in the plan.

Based on the evaluation, revisions to the programs and schedules may be necessary within the first five year planning period.

The STS Facility was initially evaluated after the first four months of operation. The results were published in the report "Hazardous Waste: Implementation of a Permanent Collection Facility" (City of Seattle Office for Long-range Planning, 1989). The report described the implementation of the project, operation of the facility, provided preliminary findings concerning the users of the facility, the waste collected and costs as well as an initial comparison with Round-ups. It also explored some of the remaining issues and future plans for the facility.

This report expands upon that evaluation and makes comparisons between Seattle's STS Facility and other collection programs. In addition, a user survey was conducted at the STS and the Wastemobile facilities to determine the level of satisfaction with the collection service, and the public's response to different publicity methods used with each of the collection programs.

CHAPTER 3: DESCRIPTIONS AND COMPARISONS OF SELECTED HOUSEHOLD HAZARDOUS WASTE PERMANENT COLLECTION FACILITIES

INTRODUCTION

One objective of this project is to expand the original evaluation of the STS facility by comparing it to other collection programs. Detailed descriptions of HHW collection efforts in Washington, California and New York will be provided, with particular attention paid to the quantity of waste collected, participation levels and program cost.

The various collection programs will be compared using cost/gallon and cost/user measurements, and general conclusions drawn with respect to program efficiency and overall service delivery. The results of this comparison are intended to serve as a resource for jurisdictions planning similar HHW collection programs.

SECTION I. DESCRIPTIONS OF SELECTED HOUSEHOLD HAZARDOUS WASTE PERMANENT COLLECTION FACILITIES

Seattle, Washington

I. General Information In November, 1988, the City of Seattle received a grant from the Urban Consortium to develop a demonstration project for the collection of

household hazardous waste. On October 25, 1988 the STS Facility became a permanent service for the residents of Seattle. The facility is now operating with funding from the City of Seattle Solid Waste Utility. City residents are charged $5.00 for the use of the transfer station and collection facility, while non-City residents are charged $27.00 for the use of the facility.

II. Site and Facility Design and Operations The collection facility is located at a temporary site within the transfer station until a permanent site can be completed. The storage container will remain at the temporary site through mid 1990.

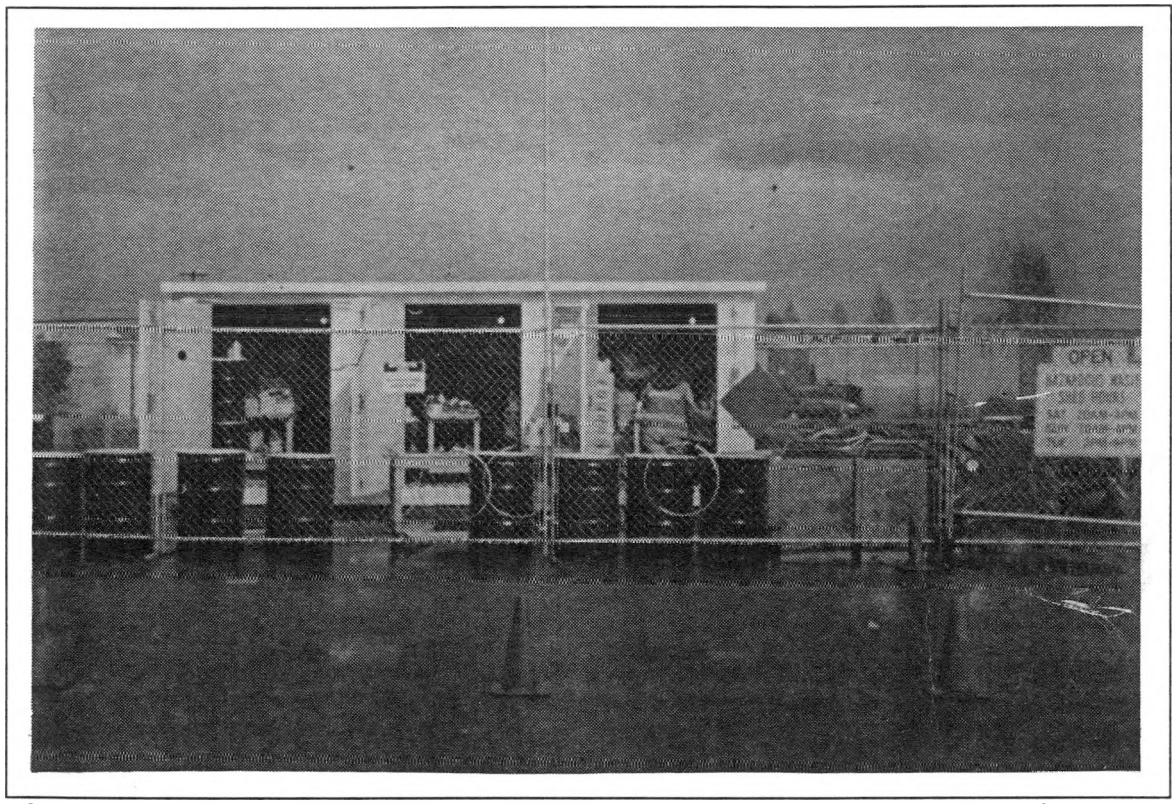

Figure 3-1: Seattle South Transfer Station Household Hazardous Waste Collection Facility.

The City purchased a 8' x 23' prefabricated hazardous materials storage container, capable of storing up to twenty-four 55-gallon drums. The storage container has three separate containment bays each allowing for storage of eight 55-gallon drums. The wastes are segregated into the following storage bays: 1) Flammables Room - paints, chlorinated solvents and nonchlorinated solvents; 2) Poisons Room - pesticides, heavy metals and water reactives, and; 3) Corrosives Room - acids, bases and oxidizers. The facility is equipped with a ventilation system to provide six air changes per hour within

12 inches of the floor. There is also a 4-inch sump for spill containment, an automatic dry chemical fire fighting system and explosion proof lighting fixtures. An eyewash and safety shower are located on an outside wall of the shed.

Unidentifiable wastes are tested using a chemical identification kit. These wastes are stored in drums outside the shed until they can be classified. Testing at the temporary site is conducted outdoors within the fenced-in area of the facility. The storage container is surrounded by a 15' buffer zone which must be kept free of flammable or combustible materials. This area is enclosed by a 6' lockable chain link fence.

Two employees from the Solid Waste Utility staff the facility on a full-time basis. These employees receive, sort, pack and test waste that is collected. Wastes are packed into 55-gallon drums.

Waste disposal is contracted to a licensed Treatment, Storage, and Disposal Facility (TSDF). The facility's waste is segregated by type according to categories established by the TSDF.

Prior to waste pick-up, the following information must be recorded for all lab packed poisons and loose packed mixed materials such as corrosives and solvents: a) chemical composition and/or trade name for each waste item; b) size of each container; c) approximate amount of waste in each container and; d) description of any other unusual circumstances. A record of the number of containers by size in each drum is required for loose packed paints and aerosol paints.

The TSDF reviews this information, and verifies that the company will accept items on the list. To schedule a pick-up, the number of drums of each waste type must be verbally communicated by the STS personnel. The turnaround time for the verification and pick-up process varies by waste type: pesticides and poisons average two weeks; corrosives average one and a half weeks; solvents average three to four days; paints can usually be picked up the next day.

III. Quantity of Waste Collected During calender year 1989, approximately 27,413 gallons of household hazardous waste were collected. 14,683 gallons of used oil and 1,874 vehicle batteries were collected at the transfer station itself. The used oil and battery collection activities have been going on for several years as part of the Utility's recycling program. There is no charge for recycling at the Transfer Station. Table 3-1 provides a breakdown of the total quantity of waste collected by waste stream for the period January, 1989 - December, 1989.

Table 3-1

City of Seattle STS Facility

Quantity of Waste Collected by Waste Stream

1989

(actual gallons)

Waste Type	Total Volume
Latex Paint	4,074
Oil Base Paint	1,390
Paint Related	1,586
Oil*	14,683
Corrosives	705
Solvents	1,262
Aerosols (solvents and pesticides)	75
Poisons/Pesticides	786
Dioxin Containing materials	136
Flammable Solids	507
Car Batteries* (1 battery = 1 gallon)	1,874
Other (creosote, heavy metal liquids)	335
* Collected at the Transfer Station Tipping Shed.	27,413

Used oil collection is contracted to a company specializing in used oil recycling. Vehicle batteries are picked up free of charge by a battery recycler.

Recycling Program: Latex paint comprised 38 percent of the total waste collected at the STS facility. 878 gallons of this paint were used in a demonstration paint recycling project. The recycled product is a painter's grade interior latex paint. The

paint was successfully field tested and the City plans to further explore an on-going latex paint recycling program.

IV. Participation For the first five months of 1989, the facility was open three days a week for a total of 22 hours. The average number of users was 9.5 per day. During the summer months, June through September, the operating hours were increased to 42 hours a week, Saturday through Tuesday. The site averaged 4 to 11.5 customers per day. After September, operating hours were decreased to eight per day, with an average of 11 users per day. However, the number of users per hour remained almost the same - around 1.3 users per hour. Participation levels for the STS Facility are shown in Table 3-2.

Table 3-2
City of Seattle STS Facility
Participation
1989

Month	Days and Hours of Operation	Number of Users	Average # of Users/Day
January - May	Sat, Sun 10 a.m. - 6 p.m. Mon 2 p.m. - 8 p.m.	621	9.5
June - September	Sat, Sun, Mon 8 a.m. - 6 p.m. Tues 8 a.m. - 8 p.m.	975	14
October - December	Sat, Sun, Mon, Tues 9 a.m. - 5 p.m.	578	11
TOTAL:		2,174	11.5

V. Publicity The STS facility has been publicized through several channels. In 1989, the Solid Waste Utility concentrated its efforts on utility bill inserts. All city residents receive a combined utility bill (water, sewer, and garbage) once every two months. An insert, entitled "Don't Let Household Hazardous Waste Drive you Batty" was developed by the Solid Waste Utility and mailed with the September/October 1989 utility bill. This educational flyer was designed to inform customers about the types of HHW, proper disposal, alternative products and ways to reduce the use of hazardous products. Another insert in the utility bills gave general information about the STS Facility's days and hours of operation. The Utility also placed stickers on residential garbage cans instructing residents not to dispose of HHW with their regular trash. The sticker also provided the phone number of the Seattle-King County Health Department's Hazards Line, a hotline available to provide information and answers to questions regarding HHW and HHW disposal services. In 1989, the facility was also mentioned in press releases and newspaper articles. Table 5-2 lists the publicity efforts for 1989. Publicity expenditures for the year totaled $7,440.

VI. Program Costs The STS Facility began operation in October, 1988. The total cost for the expanded permanent facility is $260,372. This figure includes purchase of an additional storage container, additional design work, construction of a bermed concrete slab and roof, and installation of special drainage provisions. When annualized at 13 percent for twenty years, this gives an annual facilities cost of $16,991. Disposal costs include transportation, disposal, drums, absorbent and plastic liners. The 1989 costs include site design for the "permanent" site at the South Transfer Station, annualized costs of durable equipment and operating costs. Table 3-3 provides a breakdown of the facility's capital and operating costs for the period January to December, 1989.

VII. Related Issues Worker Health and Safety: Staff at the HHW collection facility are issued personal protective equipment including organic vapor and acid gas respirators. Employees were also provided with respirator fit instruction.

The Solid Waste Utility requested a consultative visit by the Washington State Department of Labor and Industries to review chemical handling practices at the STS Facility. Labor and Industries recommended that although the shed was ventilated and the air changes per hour were well within the necessary range, packing and handling of wastes was best suited to outdoor areas.

Table 3-3

City of Seattle STS Facility

Capital and Operating Expenses

1989

Category	Cost
Equipment and Supplies	10,500
Training	1,160
Publicity	7,440
Personnel	80,706
Project Coordination	1,589
Waste Disposal	85,644
Waste Recycling (used oil)	1,468
Capital Costs Depreciated	16,991
Total	$205,498

Training: Staff for the HHW collection facility were successfully recruited from existing transfer station personnel. A hazardous material handling course was developed and administered by the City's TSD contractor. Employees received training in emergency response, spill response training, and general operating procedures. Staff also attended a hazardous material handling course at a nearby vocational learning center. Training was also provided in HazCat analysis (waste identification) and respirator usage. The collection facility workers also received certification through an OSHA Hazardous Waste Handling Course.

VIII. Future Plans In order to decrease the possibility of employee exposures, as well as increase storage capacity, the facility design for the permanent site was modified. An additional storage shed will be placed at the permanent site location.

This shed will only store flammables, and will be equipped with a ventilation system providing 22 air changes per hour versus the six changes per hour at the original storage shed.

A roof will be constructed over the area between the two storage sheds to provide protection from the weather. All packing of HHW will occur outdoors in this area. In addition, a separate trailer will house a breakroom for employees and a separate lab equipped with a sink, fume hood and equipment for testing unknowns. Construction of the permanent site is scheduled to be completed by the summer of 1990.

San Francisco, California

I. General Information On January 21, 1988, Sanitary Fill Company (SFC), in conjunction with the City and County of San Francisco, opened the Household Hazardous Waste Collection Facility (HHWCF). The facility operated for its first year as a research pilot project under a variance granted by the California Department of Health Services. In January of 1989, the facility became a permanent service for San Francisco residents.

The HHWCF is located at the San Francisco Solid Waste Transfer and Recycling Center, where Sanitary Fill Company processes the city's solid waste. The facility is open to residents Thursday through Saturday from 8:00 AM to 4:00 PM, and is free of charge. The program is funded by a $.05 per month increase in refuse collection fees per household.

SFC purchased a pre-existing 40'x90' metal building and redesigned the structure to specific safety and operating standards for eventual permitting as a Treatment, Storage and Disposal Facility. The facility includes an explosion proof lighting system, separate containment bays, a backwash system to prevent loss of water to the facility, false floors and a sump pump to contain spills, and two safety shower and eyewash units. A separate room is available for processing unknown wastes. The building allows for the storage of up to eighty 55 gallon drums.

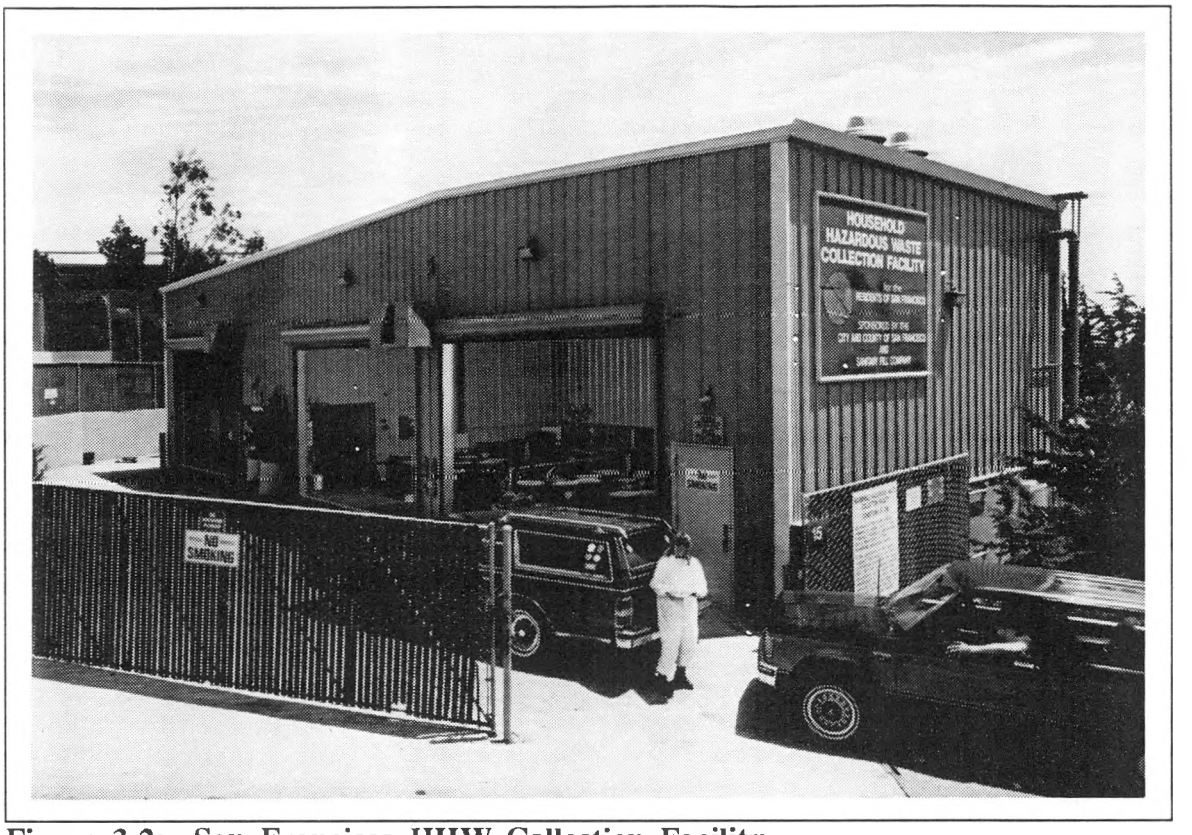

Figure 3-2: San Francisco HHW Collection Facility.

The HHWCF is staffed by four full-time employees. Two environmental compliance program specialists are in charge of classifying and packaging wastes received at the facility. Two technicians are trained to receive wastes from facility patrons.

Sanitary Fill is responsible for payment of disposal and transportation costs (recovered through the rate base); facility maintenance; hiring and training of personnel; data collection; and any corrective actions. SFC also performs routine inspections of the facility, equipment and operations, collects information about facility operations, and makes changes in operating procedures when necessary.

The City of San Francisco selects the hazardous waste haulers; arranges for ultimate disposal of all waste; signs hazardous waste manifests; and provides educational materials to the public. The City also analyzes data generated by the facility and inspects the facility for compliance with all applicable laws and regulations.

The City and SFC share the following responsibilities: planning, design, emergency response, waste minimization and facility publicity.

II. Quantities of Waste Collected In the first twelve months of operation, SFC collected approximately 19,965 actual gallons of waste. Table 3-4 presents a distribution of waste collected by waste stream, for 1988.

All of the oil products, antifreeze and car batteries collected at the facility are sent for recycling. Oil-base paints and solvents are sent for blending into a fuel for energy recovery. Corrosives and oxidizers are sent for treatment, and aerosols, poisons and flammable solids were incinerated.

Recycling Program: In April of 1988, the HHWCF began recycling latex paint. During the last half of the facility's first year, 660 gallons of latex paint were recycled. In the first half of year two, 990 gallons were shipped for recycling, a fifty percent increase. The paint is reprocessed and returned as beige paint, packaged in 5-gallon containers. SFC donates the paint to community groups, churches, theaters, and rehabilitation centers.

Any unopened and/or still usable paint and household products that are received at the facility are collected in the HHWCF Recycle Bin. Facility users and employees are invited to take products from the bin for reuse, free of charge. In a six-month period, approximately 100 gallons of non-paint products were "disposed of" through the Recycle Bin.

III. Participation Since the facility opened in January of 1988, participation has risen considerably. During the first six months of operation, 1,377 persons used the facility. In the first half of year two, participation rose to 2,294. Over an eighteen-month period, the facility averaged approximately 25 users per day. Table 3-5 provides a breakdown of participation levels for the first eighteen months of service.

IV. Publicity The City of San Francisco operates a hazardous waste hotline which provides callers with general information regarding waste accepted, facility location and hours of operation. The number for the Hotline was placed in the Pacific Bell Yellow Pages.

Utility bill inserts (water, garbage, property tax) are the primary publicity tool for the HHW program. The facility was mentioned in eight articles in local newspapers during the first twelve months of operation. World Waste, Sunset, and Waste Age magazines also published articles on the facility. Bi-lingual ads about the HHWCF appeared in Spanish and Chinese newspapers. Local radio stations continue to provide public service announcements mentioning the facility.

Table 3-4

San Francisco HHWCF

Quantity of Waste Collected By Waste Stream

1988

(actual gallons)

Waste Type	Total Volume
Flammable Solids	699
Organic Poisons	313
Inorganic Bases	244
Aerosols	165
Organic Bases	144
Dioxin Precursors	144
Household Cleaners	130
Inorganic Acids	102
Neutral Oxidizers	33
Organic Acids	23
Inorganic Poisons	10
Heavy Metals	1
Organic Peroxides	1
Batteries (1 gallon each)	192
Oil Base Paint (Bulked)	4,744
Water Base Paint (Bulked)	3,850
Solvent, Thinners (Bulked)	1,576
Antifreeze (Bulked)	48
Sulphur (Bulked)	41
Used Oil (Bulked)	7,525
Total	19,965

Table 3-5

San Francisco HHWCF

Participation

January, 1988 to July, 1989

Month	Days of Operation	Number of People	No of People/Day
1-6	78	1,377	18
7-12	75	1,842	25
13-18	75	2,294	31
TOTAL	228	5,513	Avg. 24.6

New facility participants receive magnets which advertise the program and an informational brochure entitled "Garbage Cans and Garbage Can'ts". The total publicity budget for the facility in 1990 is approximately $37,000.

Public Education: The City of San Francisco has taken responsibility for implementing the public education program for the HHWCF. Both City staff and SFC staff have made presentations to local neighborhood associations, trade associations, Chamber of Commerce, Sierra Club, the San Francisco Lung Association, and others. These presentations instruct audiences on the proper disposal of hazardous waste and alternatives to hazardous household products. In addition, the City sponsors recycling education in San Francisco schools.

V. Program Cost The total budget for San Francisco's HHWCF is approximately $576,000 a year. Operating supplies, disposal and transportation costs comprise 50% of the total budget. Thirty-four percent of the budget goes towards salaries, and the remaining 16% to overhead.

VI. Related Issues Worker Health and Safety: In March of 1989, Sanitary Fill arranged for an independent consulting company to conduct a safety audit of the facility. The audit focused on: 1) solvent exposure during paint and solvent consolidation; 2) asbestos exposure during repackaging; and 3) general compliance with OSHA standards. Industrial hygienists also performed respirator suitability evaluation and fit testing. The results of both the paint/solvent consolidation and asbestos repackaging monitoring revealed that employee exposure was well below permissible levels. In the first eighteen months of operation, no reportable release of hazardous material occurred.

Training: All HHWCF employees working in the facility have completed the 40-hour training program mandated by OSHA. SFC employees participate in evacuation drills to prepare for larger-scale emergencies. Personnel receive in-house training as well as attend classes and conferences offered locally. In-house training has included such subjects as CPR/First Aid, waste manifest and shipping paper preparation, consequences of exposure to asbestos and infectious waste, contractual and legal obligations motivating the HHWCF program, HAZCAT analysis, and training for SFC's own Waste Identification and Characterization Test (WICT) procedures. (The WICT method determines the chemical content of a compound and assigns the correct hazard class for shipment.)

VII. Future Plans Local officials estimate that Small Quantity Generators (SQGs) account for nearly 60 percent of the City's hazardous waste. SFC management is attempting to expand the HHWCF to service SQGs. SFC has drafted a RCRA Part B permit application to store and treat SQG waste at the HHWCF.

Bellingham, Washington

I. General Information Since 1984, Whatcom County residents have been able to make an appointment to drop off their household hazardous wastes at the City of Bellingham's Public Works Shop. The HHW program is sponsored by the City of Bellingham Public Works Department, with in-kind support provided by the Whatcom County Health Department. Funding for the HHW Facility comes from the City's solid

waste, water and sewer rates. This service is provided free of charge to Whatcom County's 122,000 residents.

The City owns the site, and the Health Department receives most telephone calls and meets people at the facility during regular business hours. An 8' x 10' prefabricated aluminum storage shed was purchased for the program. The shed rests on a cement slab, and is surrounded by a curb which serves as a berm. Waste is initially segregated into large plastic bins by waste type. Up to ten 55-gallon drums may be stored inside the shed at one time.

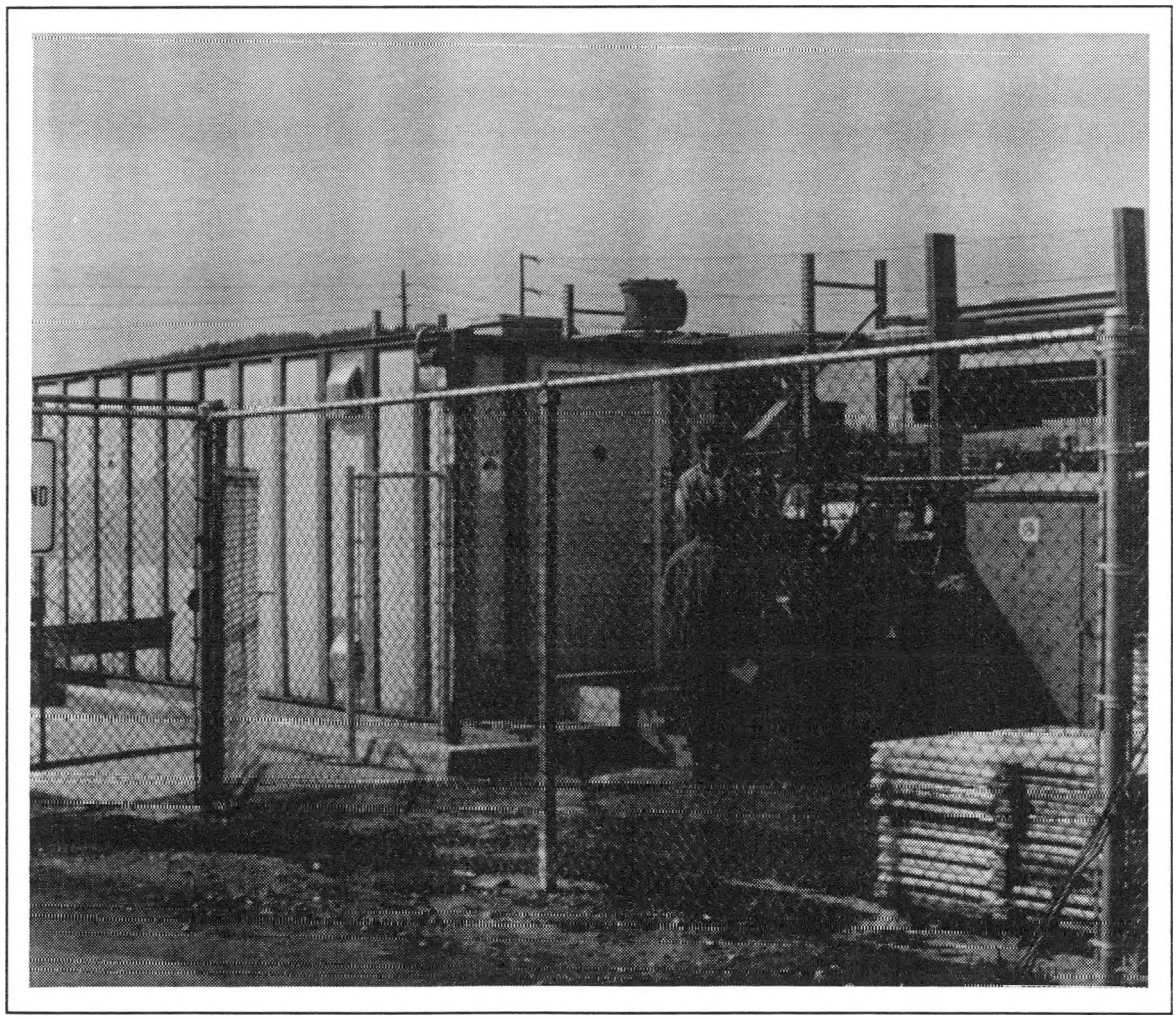

Figure 3-3: Bellingham HHW Collection Facility.

Three separate contractors handle the facility's waste. American Antifreeze Disposal Inc. picks up 55-gallon drums of antifreeze and returns empty drums for an

$88 fee; currently the pick-up service and disposal charges are donated as a public service. Chemical Processors, Inc. picks up waste fuels for $150 a drum, and paints and solvents for $110 a drum. The City is charged $20/inch of sludge and $77 per hour for transportation. The waste is processed at Chempro's Georgetown Facility. Pesticides, corrosives and oxidizers are handled by Chemical Waste Management, Inc. The City is charged $160 for each labpacked 55 gallon drum, plus transportation costs of $90 - $150 per drum depending on the number of drums shipped.

II. Quantities of Waste Collected In 1989, the HHW facility collected approximately 636 gallons of household hazardous waste. Table 3-6 provides a breakdown of waste types and quantities.

Table 3-6

City of Bellingham

Quantity of Waste Collected by Waste Stream

1989

(actual gallons)

Waste Type	Total Volume in Gallons
ORM - A	133
Poison B	200
ORM - E	67
Oxidizers	67
Flammable Liquids	110
Antifreeze	59
Total:	636

Oil and latex paint are not accepted at the facility. The program also collects household batteries for a battery recycling program.

III. Publicity When the facility opened in 1984, the City initiated a series of quarterly press releases. The press releases advertised the facility and provided instructions to the public on the types of waste accepted. The City purchased space in the classified section of the Bellingham Herald, the local newspaper. Ads were placed in other sections of the paper as well.

A brochure entitled "What You Should Know About Household Hazardous Waste" was developed to help promote the facility and educate the public about household hazardous waste. The brochure was inserted in the Bellingham Herald and distributed in student packets during visits to area schools by the City's contractor.

In 1990, the program's publicity budget increased to approximately $2,400. The City plans to spend $1,200 on brochures and $400 on newspaper ads for the coming year. In 1990, five ads will appear under several headings in the Yellow Pages at a cost of $800.

In 1989, it was estimated that less than 1 percent of the county population participated in the program (less than 10 participants per week).

IV. Program Costs In 1989, operating costs for the facility totaled $11,300. Capital outlays for the same year totalled $1,050. Table 3-7 provides a breakdown of both operating and capital expenditures for 1989.

V. Future Plans The City has recently poured the foundation for a new, larger HHW collection facility. The new structure is a modified shipping container, capable of storing up to twenty 55-gallon drums. It will be operational in spring of 1990. Regular hours for the facility will also be established in addition to the appointment system.

Southold, New York

I. General Information Southold is a small agricultural community of approximately 20,000 located in Eastern Long Island. In June of 1988, the Town of Southold received two grants from the New York State Department of Environmental Conservation (DEC) to operate a household hazardous waste (HHW) collection program at the Southold Town Landfill.

Table 3-7

City of Bellingham

Capital and Operating Expenses

1989

(Cost figures are estimates)

Capital	Cost
Planning	600
Building	50
Durable Equipment	400
Total	$1,050

Operating	Cost
Profile Fees	150
Supplies	1,000
Training	0
Salaries	8,000
Disposal	1,500
Transportation	650
Total	$11,300

1989 Total Operating and Capital:	$12,350

II. Site and Facility Design and Operation The HHW Collection Center is housed within the main tipping facility. Southold residents using the tipping facility may either bring their wastes over to the waste segregation table, or have a Town employee unload the waste from their vehicle. The facility is open seven days, 7 AM to 5 PM.

A 15' x 9' metal prefabricated storage facility houses the wastes. Town workers sort and pack wastes before placing the drums in the shed. Southold has contracted with a single hauler, Chemical Pollution Control (CPC), to transport and dispose of all wastes. CPC charges $190 per drum for the disposal of flammable solids and liquids, $540 per drum for poisons, and $540 per drum for compressed gas. Southold pays a flat rate of $500 for the transportation of the wastes. All wastes are either incinerated or landfilled in a secure hazardous waste landfill in Buffalo, New York. The Collection Center does not accept latex paint.

III. Quantity of Waste Collected The Collection Center filled approximately seventy 55-gallon drums between January, 1989 and October, 1989. The majority of the waste collected was categorized as home maintenance products. Table 3-8 provides an estimate of the quantity of waste collected by waste category.

IV. Participation The Collection Center is used most often on Saturdays and Sundays. However, seasonal peaking occurs during spring and fall months. During these months, residents regularly clean out their homes in preparation for the upcoming season. A significant percentage of the participants at the Collection Centers are senior citizens.

V. Publicity The Collection Center is publicized through the media, schools, and at the tipping facility. During the Spring and Fall months, press releases are distributed to major and local newspapers. Brochures and posters are placed within the tipping facility, reminding residents of the collection service. Posters and brochures are also distributed to schools in the Southold area. A recent household battery collection contest in area schools resulted in the collection of eight 55-gallon drums of household batteries.

VI. Program Costs Total costs (capital and operating) for the Collection Center in 1989 were approximately $30,000.

King County, Washington

I. General Information On September 28, 1989, King County began a twenty-seven month mobile HHW collection program. Chemical Processors, Inc. (Chempro) was contracted to provide this service to county residents at numerous locations over the two-year period.

Table 3-8

Town of Southold, New York

Quantity of Waste Collected by Waste Stream

1989

(Actual Gallons)

Waste Type	Total Volume
Oil Base Paint	364
Paint Related	210
Flammable Liquids	60
Flammable Solids	30
Poison Liquids	45
Compressed Gas	60
HH Batteries	165
Aerosols	60
Acid Liquids	30
Alkali Liquids	15
Total:	1,039

The Wastemobile is designed to move from site to site. It stays in one city for two weeks, then moves on to the next location. No wastes are stored overnight.

II. Site and Facility Design and Operation The mobile unit (Wastemobile) operation includes two waste unloading lanes, a waste processing area, a mini HazCat Lab, a staff trailer, an equipment van, and a waste hauling trailer. Chempro personnel lab pack and bulk all wastes on-site. The operating schedule for the Wastemobile is Thursday and Friday, 12 PM - 7 PM and Saturday, 10 AM - 5 PM. On Thursdays and Fridays the facility is staffed by a Site Supervisor/Chemist and two Hazardous Waste Technicians. On Saturdays the mobile facility is staffed by a Site Supervisor, a Hazardous Waste Specialist, and three Hazardous Waste Technicians.

Chempro is responsible for daily operations at the collection facility, site identification, publicity, public education, waste packing, transportation and disposal of all hazardous materials collected. The County's project manager is responsible for overseeing all aspects of the program including budgeting, scheduling and communication with all parties involved in the contract.

Figure 3-4: King County Wastemobile.

III. Quantity of Waste Collected In the six months of operation, the Wastemobile collected 66,059 gallons of HHW. Table 3-9 provides a breakdown of the waste collected by waste stream for the period September 28, 1989 - March 24,1990.

Table 3-9

King County Wastemobile

Quantity of Waste Collected by Waste Stream

September 28, 1989 - March 24, 1990

Type/Pack	Quarter Four Actual Gallons	Quarter One Actual Gallons	6 Month Total
Latex Paint (Bulked)	3,952	3,287	7,239
Pesticides (Labpacked)	1,560	1,462	3,022
Oil Base Paint (Loosepacked)	6,142	6,606	12,748
Acids (Labpacked)	734	713	1,447
Bases (Labpacked)	756	636	1,392
Aerosol Paint	275	310	586
Aerosol Pesticide (Loosepacked)	36	42	78
Automotive Oils (Bulked)	4,619	4,211	8,830
Solvents (Bulked)	1,740	1,491	3,231
Antifreeze (Bulked)	292	355	647
Auto Batteries	12,088	13,560	25,648
Oxidizers (Labpacked)	130	202	332
Other	279	309	588
Pentachlorophenol	120	151	271
			66,059

Bulked 55-gallon drums in pounds = 10 lbs per gallon
Loosepacked 55-gallon drums in pounds = 8 lbs per gallon
Labpacked 55-gallon drums in pounds = 7.5 lbs per gallon
"Other" 55-gallon drums in pounds = 8 lbs per gallon
Auto Batteries are equated to 1 gallon of actual waste

IV. Participation A total of 6,111 vehicles were serviced at the wastemobile during the six month period. Table 3-10 provides a breakdown of participants for each site.

Table 3-10
King County Wastemobile
Participation
September 28, 1989 - March 24, 1990

Site	Participants
Vashon	360
Federal Way	461
Kent	606
Shoreline	650
Kenmore	463
Redmond	388
Bellevue	652
Issaquah	491
Mercer Island	875
Renton	442
SeaTac City	350
Maple Valley	373
6 Month Total	6,111

V. Publicity A subcontractor, Metrocenter YMCA, was hired to develop and implement the publicity program for the Wastemobile. The main publicity channels included flyer distribution and press releases (See Table 5-3, page 5-10). The emphasis

in this publicity campaign was to alert residents to scheduled Wastemobile stops in their communities.

Flyers were distributed through several mechanisms. Children in area elementary schools were given flyers to take home to their parents. Flyers were also distributed through stores willing to take the flyers. Water/Sewer Districts and Fire District offices advertised the Wastemobile by: placing flyers on public counters, placing notices on bills, mailing flyers with bills, mailing flyers directly to their customers, and distributing flyers through public education programs.

Incorporated cities that hosted the Wastemobile participated in publicity efforts by mailing out information to their residents through newsletters and distributing flyers at municipal service counters. The City of Redmond ran a message on its municipal cable television channel announcing the scheduled Wastemobile visit. News releases were distributed to local newspapers, the Seattle Times and the Post-Intelligencer. Publicity for the Kent site included a public service announcement on radio and coverage in the Boeing News.

Chempro is responsible for organizing and conducting the public education program for the Wastemobile. Chempro's goal is to conduct 120 workshops over a 27-month period. These workshops will cover several topics including: alternatives to the use of hazardous materials, alternatives to pesticide use in gardens and lawns, and a "Do-It-Yourself Household Hazardous Waste Audit". Three workshops will accompany each two-week collection event. The workshops are designed to take about an hour, and will be fit, when possible, into the programs of existing organizations. The full scale workshop program is set to begin in summer of 1990.

VI. Program Costs The total cost of the program for the six month period is given in Table 3-11.

VII. Future Plans Unanticipated high levels of public participation in the first six months of operation have led to a budget overrun of nearly $323,000. This was due entirely to added disposal costs and was not operational in nature. Project managers are re-examining staffing levels and contract estimates for the spring and summer months.

King County is also evaluating the usefulness of some of the Wastemobile publicity efforts. A number of participants commented that seeing the Wastemobile

Table 3-11

King County Wastemobile

Capital and Operating Expenses

September 28, 1989 - March 24, 1990

	Cost
Disposal	309,461
Labor	98,880
Equipment	22,512
Public Involvement*	27,200
Total	458,053

* Includes material development, site acquisition and publicity.

was their only source of information. In the future, more emphasis will be placed on making the Wastemobile more visible.

The County is also analyzing future options for collection of HHW. Management is currently evaluating collection options including the purchase and in-house operation of a mobile facility, contracting out only portions of the service, and continuing full service through a contractor.

San Bernardino County, California

I. General Information In 1984, the San Bernardino County Department of Environmental Health Services (DEHS) received a grant from the California State Water Resources Control Board to establish pilot programs for the collection of

household hazardous waste. Later that year, DEHS established two "on-going" HHW collection programs. Due to the success of these facilities, DEHS added four additional sites in 1987. In 1989, the County operated five permanent collection centers and sponsored nine Roundups in area cities.

II. Site and Facility Design and Operation The County's collection centers are located at community fire stations, and City and County service yards. The central site, a permitted TSDF, is located in a fenced-off area at the County Agricultural Commissioner's Office in the City of San Bernardino. The Barstow, Rancho Cucamonga and Victorville sites are located at neighborhood fire stations. The Redlands site is located within a 100' x 200' walled-in area in a City yard.

Each site utilizes an 8' x 8' x 22' modified steel rolloff container. The central site in San Bernardino consists of two of these containers. The containers at the central site are divided into two sections by a wall separating acids and oxidizers, and flammables, bases and poisons. The satellite sites utilize a six-inch steel beam to act as a berm and segregate incompatible wastes. Each container is able to hold up to 30 drums.

The central facility is open Monday through Friday, 8:00 AM to 5:00 PM. The Barstow, Rancho Cucamonga, and Redlands sites are open only on Saturdays and the Victorville site is open on Sunday.

The central site is staffed by technical and professional employees of the DEHS. County staff also is responsible for manifests, training, supplies and equipment for all five collection centers. The satellite sites are staffed by firefighters, many of whom are trained members of an emergency response team.

Receptionists at each collection center immediately notify trained personnel whenever someone brings waste to be disposed. The citizen is usually directed to bring the waste to the storage shed, where the waste is unloaded and lab-packed on-site. The collection centers accept all non-commercial wastes. Program planners believe that turning away certain wastes is counter-productive and even more dangerous because of the environmental risks of improper disposal.

Area cities and fire districts donate their labor to the permanent collection program. The program is currently funded by a $.25 cent per ton add-on to the tipping fee at the County's landfills.

III. Quantity of Waste Collected Seventy-seven percent of the waste collected is recycled or reused, and the remainder is sent to a hazardous waste landfill. Table 3-12 provides a breakdown of the total quantity of waste collected in San Bernardino County in 1989.

Table 3-12

San Bernardino

Quantity of Waste Collected by Waste Stream

Permanent and Round-up Programs

1989

(actual gallons)

Waste Type	Total Quantity
Flammable Liquids	825
Poisons	525
Corrosives	255
Oxidizers	30
Latex Paint	2,028
Oil Base Paint	3,900
Oil Base Paint with PCBs	1,092
Waste Oil	19,200
Car Batteries (1 battery = 1 gallon)	388
Other Batteries	85
Mercury	7
Total	28,335

The collection programs also received some explosives and pressurized cylinders which were disposed of through special services. The permanent facilities are now beginning to collect anti-freeze for an anti-freeze recycling program.

IV. Participation San Bernardino is in the process of compiling participation numbers, but these are not currently available.

V. Publicity Publicity for the collection centers and round-ups included press releases, public service announcements on radio and television, flyers, brochures, articles in organizational newsletters and presentations at community meetings. Approximately $16,400 was spent on publicity in 1989.

VI. Program Costs The total budget for the permanent sites and round-ups for fiscal year 1988 - 1989 was approximately $406,000. Table 3-13 provides a cost breakdown.

Table 3-13

San Bernardino

Operating Expenses

Permanent and Round-up Programs

Fiscal 1988 - 1989

Expenditure Category	Cost
Disposal*	$114,301
Education/Publicity	$ 16,327
Salaries**	$256,716
Other/overhead	$ 18,512
TOTAL	$405,856

* Includes transportation, drums, supplies, disposal and lab testing.

**Includes salaries and benefits of one FTE for the central site, 3 PT County employees who provide training and oversite for the satellite sites and County staff working at Round-ups.

VII. Training DEHS has developed a mandatory training program for all collection center personnel. The training includes:

- emergency procedures, including the use of an eye wash, shower, fire extinguisher, and spill containment materials;
- basic methods of accident prevention;
- record keeping procedures and forms, with emphasis on the importance of completeness and accuracy of records;
- waste categorization;
- operating procedures, and
- information regarding the Federal requirements for lab-packing.

DEHS staff categorize all unknown materials and check drum logs weekly to assure wastes are segregated properly. DEHS staff are available for emergency consultation 24 hours a day, seven days a week.

VIII. Future Plans Partly in response to recent state legislation, DEHS plans to place collection facilities at all of the landfills in San Bernardino County.

Bellevue, Washington

I. General Information On April 1, 1989, the City of Bellevue began a six-month trial collection program for household hazardous wastes. Eastside Disposal Service, Bellevue's contractor for municipal solid waste, provided this service to City residents on the first and third Saturday of each month from 9:00 AM to 3:30 PM. at the City's Municipal Service Center Parking Lot.

Eastside Disposal, in conjunction with Northwest Enviroservice Inc.(NWES), a licensed TSDF, provided all labor, materials, facilities and equipment at no cost to the City. The City was responsible for all disposal costs over the six-month period. The program was funded by a one percent increase to solid waste collection rates.

Site design was similar to that of a Roundup. A tent was placed over a base of PVC sheeting. On-site staff varied from 6 to 8 persons, including a qualified chemist and trained hazardous waste technicians. No commercial wastes, empty containers,

explosives, radioactive materials or containers larger than 5 gallons were accepted. Participants were required to show proof of Bellevue residence.

II. Quantities of Waste Collected This program collected 14,284 gallons of liquid waste and 10,552 pounds of solid waste during the six-month period. A total of 604 fifty-five gallon drums were shipped off-site. Table 3-14 provides a breakdown of the quantity of waste collected by waste stream for the period April, 1989 to September, 1989.

Table 3-14

City of Bellevue

Quantity of Waste Collected by Waste Stream

April, 1989 to September, 1989

(Actual gallons)

Waste Type	Total Volumes Gallons
Paint/Paint Related	8,516
Oil	2,025
Corrosives/Cleaners	218
Solvents	605
Aerosols	505
Poisons/Pesticides	1,270
Oxidizers	17
Dioxin Bearing Products	235
Antifreeze	130
Asbestos	13
Car Batteries	954
PCB Waste	1
Total in Actual Gallons:	14,489

III. Participation A total of 1,326 vehicles were serviced at the Collection Center during the six-month period. Participation fluctuated from a low of 67 vehicles per week to a high of 236. Table 3-15 provides participation data for the six month program.

Table 3-15

City of Bellevue

Participation

April, 1989 to September, 1989

Month	Number of Vehicles
April	206
May	236
June	303
July	144
August	186
September	251
Total:	1,326

IV. Publicity Bellevue decided to conduct only a modest publicity campaign, in part, because of concerns over level of participation and potential cost overruns.

NWES produced two informational brochures which were distributed through a general mailing and a utility bill insert mailing. In addition, NWES handed out information at the site regarding alternatives to hazardous household products. Two articles describing the collection service appeared in the Journal American, a local Bellevue newspaper. The City mentioned the Collection Center in it's "It's Your City" newsletter, with distribution to all Bellevue residents.

The Bellevue program was mentioned in an extensive publicity campaign carried out for the 1989 King County June Roundup. The color brochure developed for the

Roundup included information on Collection Center hours and location. This probably affected the level of participation in June.

V. Program Cost The City of Bellevue was responsible for paying all disposal costs. NWES shipped 604 drums off-site, for a total cost of $75,000 to the City. Contract management and publicity was an additional $5500. The total cost to the City of Bellevue for the six-month contract was $80,500. Labor, materials, facilities and equipment were donated by NWES.

VI. Related Issues Training: The contractor established a training program for Collection Center personnel. Personnel were trained in use of personal protective equipment, emergency spill and accident response, loading/unloading procedures, and defensive driving and accident prevention. This training program met the requirements of the Occupational Safety and Health Administration and the Washington State Department of Labor.

Inspections: The City and NWES agreed to develop and follow a written inspection schedule to monitor site operations. NWES recorded all observations in site operation logs which were available for inspection by City officials.

VII. Future Plans The City is currently reviewing future options for a permanent solution to household hazardous waste collection. City officials are analyzing the level of service provided by the King County Wastemobile, in an effort to assess whether more services are needed.

SECTION II. COMPARISON AND DISCUSSION OF SELECTED HOUSEHOLD HAZARDOUS WASTE PROGRAMS

Methodology/Assumptions

This section examines and compares facility size, population served, number of staff, hours of operation per week, quantity of waste collected and cost/gallon and cost/user measurements in an effort to identify important lessons learned regarding the operational aspects of running a collection program.

Two forms of measurement were developed for use in the comparison section of this report: cost/gallon and cost/user. The cost/gallon measurement reflects a

standardized measurement of waste in gallons using the following conversions and assumptions:

Labpacked 55-gallon drums = 15 gallons of actual waste
Loosepacked 55-gallon drums = 22 gallons of actual waste
Bulked 55-gallon drums = 52 gallons of actual waste
Labpacked 55-gallon drums reported in pounds = 7.5 pounds per gallon
Loosepacked 55-gallon drums reported in pounds = 8 pounds per gallon
Bulked 55-gallon drums reported in pounds = 10 pounds per gallon
Car batteries were equated to 1 gallon of actual waste
(See Appendix for waste quantities as originally reported by all jurisdictions)

Cost/gallon figures for all seven facilities were derived by dividing the total cost of the program by the total number of gallons collected. (See Table 3-16)

Cost/user data was also developed for each facility. In each case, the total cost of the program was divided by the total number of participants, resulting in a cost/user figure. (See Table 3-16)

Findings

The City of Bellevue's six month trial collection program was a definite success. Approximately 14,500 gallons of waste were collected in only 78 hours of operation at a cost/gallon of $5.56. Relatively low cost/gallon and cost/user figures were due to the special agreement reached between the City of Bellevue and NWES, in which NWES provided all labor, materials, facilities and equipment at no charge (See Table 3-17).

The temporary nature of this service may help to explain its success. Residents were given an incentive to clean out their homes and dispose of the waste in the limited time available. Bellevue had over 17 users per hour coming to the facility.

King County's Wastemobile has provided many useful lessons for jurisdictions considering mobile unit collections. The Wastemobile experience indicates that a fairly well advertised collection event of short duration will draw up to 160 vehicles a day, necessitating between 6-8 hazardous waste technicians. The Wastemobile was able to

Table 3-16
HHW Collection Program Matrix

Sponsor -- Date Established	Data Reported	Population of Service Area	Number of Users	Facility Description	Number of Staff	Total Cost	Quantity of Waste Collected (Actual Gallons)	Hours of Operation per Week	Cost per Gallon	Cost per User
City of Seattle STS Facility 10/88	January-December, 1989	500,000	2,174	8'x 13' Prefabricated HHW Storage Container	2 FTE	$205,498	27,413	25-42 Seasonal Variations	$7.50	$94.53
City and County of San Francisco 1/88	January-December, 1988	720,000	3,219	40'x 90' Modified Building	4 FTE	$595,000	19,965	24	$29.80	$184.84
City of Bellingham and Whatcom County	January-December, 1989	122,000	210	8'x 10' Prefabricated Aluminum Storage Shed	2 PT	$12,350	636	By Appointment (limited operation in 1989)	$19.42	$58.80
Town of Southold, New York 6/88	January-December, 1989	20,000	Not Available	15'x 9' Prefabricated Metal Storage Shed	1 PT	$30,000	1,039	70	$28.87	Not Available
King County, Washington 9/89	Sept. 28, 1989 - March 24, 1990	1,460,000	6,111	2 Waste Unloading Lanes with a Waste Processing Area	6-8 FTE	$458,053	66,059	21	$6.93	$74.96
San Bernardino County DEHS, California 1985	July, 1988 - June, 1989	1,250,000	Not Available	8'x 22' Modified Rolloff Dumpsters	Site #1: 2 FTE Sites 2-5: 1 PTE	$405,856	28,335 Permanent Sites and Round-ups	Site #1: 45 Sites 2-5: Avg. 4.75	$14.32	Not Available
City of Bellevue, Washington 4/89	April 1, 1989 - Sept. 16, 1989	85,180	1,326	Round-up Type Set-up	6-8 FTE	$80,500	14,489	6.5 Every other week	$5.56	$60.70

Table 3-17

Major Budget Expenditures

(Percentage of Total Budget)

Sponsor	Category	
	Disposal/Operating Supplies	Labor
City of Bellingham and Whatcom County, Washington	26.7%	64.7%
San Bernardino County, California	28.2%	63.3%
Seattle, Washington	46.8%	39.2%
City and County of San Francisco, California	50.0%	34.0%
Town of Southold, New York	NA	NA
King County, Washington	72.5%	21.6%
City of Bellevue, Washington	100.0%	--

collect over 66,000 gallons of waste from King County residents in only six months. An ambitious publicity campaign helped to attract over 6,000 users to the Wastemobile, yet many users learned of the Wastemobile because of highly visible locations, something to keep in mind when siting a HHW collection program.

The Wastemobile's comparatively low cost/gallon and cost/user figures can be partially attributed to high levels of participation over a short period of time. Over 11 users visited the mobile facility every hour, bringing an average of 10.8 gallons of waste each. Periods of inactivity sometimes encountered at permanent sites, were few

in number at the Wastemobile. Costs per user and per gallon were relatively low because of higher productivity. While it appears that mobile collection programs are more efficient than permanent sites on an hourly basis, it is important to consider the year-round convenience of a stationary, permanent facility when planning for HHW collection.

Seattle's STS Facility offered a permanent service to Seattle's residents at a favorable cost of $7.50 a gallon. Each visitor to the STS Facility brought an average of 12.6 gallons of waste, the largest average quantity across the seven facilities. However, the $94.53 cost/user figure illustrates the effect of a modest publicity effort. Although a large quantity of waste is collected on an individual basis, additional resources are necessary to increase overall participation. The STS facility had approximately 1.3 users per hour, although figures for 1990 indicate this number is increasing.

The San Bernardino HHW collection program saves a considerable amount of money and time by utilizing a system whereby area cities and special districts donate labor and a site to the permanent collection program. However, when the total cost of permanent sites and round-ups is added together, oversight and labor account for approximately 64% of total expenditures (See Table 3-17). A refinement of labor and oversight costs and/or increased publicity should help decrease San Bernardino's $14.32 cost/gallon ratio. Cost/user information could not be developed given existing data.

The City of Bellingham's $19.42 cost/gallon is somewhat inflated due to limited operation of the collection program in 1989. The collection service was discontinued for a short period of time while the structure received a major overhaul. A total of 210 users each brought an average of 3.0 gallons of waste to the facility. Cost/gallon and cost/user measurements reflect the fact that the facility is underutilized at the present time. Bellingham officials have made plans to increase publicity expenditures in 1990 and expect participation to slowly rise.

The Bellingham facility is also unique because it is the only facility analyzed that operated on an appointment only basis. Program managers outlined the pros and cons of this arrangement. First, Health Department agents receiving the calls were able to screen out ineligible patrons or wastes, and redirect the caller to an appropriate disposal arrangement. Second, callers also received information that directed them to use up the waste or pass it on to someone who could. Disadvantages of the appointment only

arrangement included "no shows" at the time of the appointment. The obvious result was loss of staff time. Secondly, several callers were asked to call back with a list of their wastes, and few called back with the information. The additional effort required by potential users reduced participation.

The Town of Southold, New York has located its collection area within a large transfer station complex. This appears to create several functional advantages for both patrons and workers. Patrons who bring municipal waste to the transfer station may park their car and rid themselves of refuse and HHW at the same time. The patron may simply carry their waste over to a special table set up near the unloading area. The program also saves time and money by not assigning permanent staff to carry out the unloading task. However, if a patron wishes to have their waste unloaded by a Town employee, one is available to assist.

Southold's relatively high cost per gallon figure, $28.87, may be attributed to the higher cost of HHW removal services in the metropolitan New York area. Southold's disposal and transportation rates are consistently higher than most other rates in the Northwest and California. This service also appears to be somewhat underutilized, and an increase in publicity effort would help balance out operating costs with waste collected. Cost/user data was not available.

Relatively high cost/gallon and cost/user figures in San Francisco (Table 3-17) may be explained by several factors. Approximately $300,000 is spent annually for disposal and operating supplies for the program. Although the facility had 1/3 more users (an average of 2.6/hour) than the Seattle STS Facility over a twelve month period, on average each user brought nearly 1/2 as much waste as Seattle users. Project managers have also embarked on an ambitious, yet costly publicity campaign, investing $37,000 in reaching San Francisco's 720,000 residents. This data reflects an increasingly popular, yet expensive program.

Publicity

Facility sponsors must consider many important factors early in the planning process. Publicity is a key factor in every HHW collection program. A successful publicity campaign helps to ensure community participation and education regarding HHW.

Articles and ads in major and local newspapers and utility bill inserts were the most common forms of publicity used by the seven programs examined. In addition to these channels, the City of San Francisco's publicity program includes bilingual advertisements, yellow page ads and advertisements on bus signs. The City of Bellingham has also produced a 15 page color brochure which is inserted in student packets during waste reduction and recycling presentations to area schools. Illustrations and characters within the brochure target younger audiences and provide clear, concise instruction regarding HHW disposal.

The publicity program for King County's Wastemobile also targeted retail establishments that were willing to provide either space for a sign or distribution of flyers. Posters advertising the Wastemobile were also developed and distributed to stores, community centers, and city offices.

Many programs are continuing to experiment with different publicity channels in an effort to determine the most effective publicity strategies. Several facilities are re-evaluating the effectiveness of flyers carried home by school children. It is believed that this strategy is somewhat less cost-effective than other forms of flyer distribution.

Timely ads and articles in newspapers and direct mailings can also increase participation in local HHW collections.

Training

Staff at all HHW collection operations must have certain skills and abilities to safely and effectively carry out their responsibilities.

Training at most facilities was done by means of outside course work, in-house seminars and on-the-job training. Most staff have been trained to use emergency response equipment, such as fire extinguishers, and personal safety equipment, such as respirators.

Several facilities which test unknowns on-site have provided waste segregation training such as Haz Cat training to facility staff. It appears that collection programs should provide the following minimum level of training:

1. Training in emergency procedures, including the use of an eye wash, shower, fire extinguisher, and spill containment.

2. Training in waste categorization.
3. Training in waste packing.
4. Training in accident prevention.
5. Refresher training.

Operational Efficiency: Contracts

Most HHW collection programs appear to be paying for waste disposal on a cost per drum basis. TSD's have established rates for labpacks, loosepacks, and bulked material, in addition to separate rates for different waste profiles. The City of Seattle was the only city in which charges were based on gallons collected.

The City has determined that a flat charge per drum ignores the fact that loosepack 55 gallon drums contain varying quantities of waste. This reasoning suggests that other jurisdictions paying on a per drum basis may be charged one set rate for inconsistent waste quantities. Seattle decided to remove this apparent inefficiency by amending their contract to base disposal costs on volume of waste, rather than per drum of waste.

When considering a switch to a per volume of waste rate structure, it is important to develop a sound methodology for measuring or estimating actual waste quantities. The City of Seattle multiplys the total volume of each container collected by a standard volume estimation of .75%. The City is currently reviewing this figure in an effort to more accurately estimate waste volumes (see Chapter 4).

It was not surprising to discover inconsistencies between jurisdictions regarding the charges for identical waste profiles, transportation, and profile approval fees. Transportation fees can be quoted on a case by case basis, hourly basis, or applied as a flat rate for each pick-up. It is difficult to determine which method is most cost effective. Flat rate charges for contracts varied from $95 per pickup to $500 per pickup. The City of Bellingham pays one of its contractors for transportation on a per ton basis. Price variations due to geographic location and, for flat rate and hourly comparisons, distance to a TSD, must be considered when assessing transportation rate shedules.

Waste profile approval, and new waste profile approval fees also varied from jurisdiction to jurisdiction. In one instance, the charge per drum of labpacked oxidizers

ranged from $62.50 to $175 a drum across three contracts (See Table 3-18). Disposal charges for bulked latex paint ranged from $110.79 at Seattle's STS Facility to $286.00 at the King County Wastemobile. In addition, fees for the approval of new waste profiles were $75, $150, and $250 across three different contracts.

Table 3-18

HHW Collection Facility Disposal Rates

(55 gallon drums)

Facility	Waste Profile		
	Bulked Latex Paint	Lab Packed Oxidizers	Loose Packed Chlorinated Solvents
Bellingham	---*	$160	---
Seattle	$111	---	$108
Bellevue	---	$62.50	$125
King County	$286	---	$146
San Francisco	$165	$175	---

*Waste was packed differently

Similarities across the contracts examined were procedural in nature. Waste pick-ups for most of the permanent facilities are contingent on submittal and approval of waste profile information prior to any action on behalf of the TSD. In the instances examined, this communication takes the form of a waste profile sheet with an attached letter of verification of reported contents. Approval by the TSD is usually communicated over the phone to the sponsoring agency.

CHAPTER 4: THE SEATTLE SOUTH TRANSFER STATION HOUSEHOLD HAZARDOUS WASTE FACILITY

The City of Seattle's Office for Long-range Planning and Solid Waste Utility decided to design, construct, operate and evaluate a dedicated household hazardous waste collection facility in order to decrease the amount of HHW disposed in the solid and liquid waste stream. The South Transfer Station Facility (STS Facility) was constructed and has been in operation since October, 1988. In 1989, over 2100 customers used the facility to dispose of their household hazardous waste, diverting over 27,000 gallons of waste from the landfill, sewers and the environment, at a cost of $205,000.

Information on waste quantities, the number of participants, referral sources, and disposal costs have been collected at the facility, since it was opened. The collected data was used to evaluate the facility after six months of operation. The initial evaluation was presented in the Year Nine Urban Consortium Report, "Household Hazardous Waste: Implementation of a Permanent Collection Facility." The report contains information on site selection and design, equipment purchases, disposal contract negotiations, staff hiring and training, waste segregation schemes and operating procedures.

This evaluation expands upon the previous work and provides a more extensive assessment using data collected during 18 months of operation. This chapter examines the concerns that were previously identified and recommends other revisions and modifications that could increase the facility's efficiency.

SITE AND FACILITY DESIGN

Temporary Location of HHW Collection Facility

The South Transfer Station (STS) was chosen as the HHW collection site for several reasons: first, there were no property acquisition costs; second, the program

would take advantage of existing staff and management; and third, household hazardous waste was already being brought to the transfer station and could easily be diverted to the HHW collection facility if it was at the same location.

Initial site preparation and construction of the HHW collection facility was to be part of a larger project to reconfigure the transfer station to accommodate the widening of an adjacent roadway. The reconfiguration of the transfer station was delayed by prolonged contract negotiations on the roadway project, and a decision was made to open the HHW collection facility at a temporary location at the transfer station until the permanent site could be constructed. After several months of operation at the temporary site, a number of problems were identified that could be remedied by modifications to the site design. The final design of the permanent facility is presented in Figure 4.1. The required changes made it necessary to obtain a building permit, further delaying the project.

The City planned to finance a portion of the permanent HHW collection facility with grant funds from the Washington State Department of Ecology. Before the grant contract could be signed, the Department requested that several additional changes be made to the site plan. This delayed the construction of the permanent site by several additional months.

When the decision was made to use the temporary site, it was not foreseen that the project would be delayed for this length of time. As a result, the STS Facility continued to operate at the temporary location through 1989. The delay, however, gave program managers the opportunity to identify several problems that were corrected by revising the plans for the permanent facility. The following section outlines the revisions that were made to the site design.

Permanent Location of the STS Facility and Revisions to the Site Design

After several months of operation at the temporary site, several unanticipated waste handling and storage requirements were identified that created a need for additional storage space. Waste disposal was contracted to a licensed Treatment, Storage and Disposal Facility (TSDF) that was responsible for picking up the drummed HHW, and transporting it to the facility for treatment and disposal. STS Facility staff were responsible for sorting, packing and manifesting the HHW according to a pre-set segregation scheme developed by the program planners and TSDF staff.

Although household hazardous wastes are categorically exempt from state and federal regulations, the waste segregation scheme was designed to take these regulations into account, to ensure that wastes would be handled in a manner minimizing the risk of accidents, exposures and improper disposal. All wastes are separated into Department of Transportation hazard classes, manifested and transported in accordance with hazardous waste regulations. Because of the relatively small amounts and the wide variety of wastes received at the facility, classifying them according to hazard class proved to be difficult. In addition, federal regulations regarding the ultimate disposal of hazardous wastes changed over time, and procedural modifications were required. Because of these changes the number of waste categories requiring storage in separate drums increased over time from an initial 18 to 34 waste categories. Storage of these additional drums required a large amount of floor space.

In addition full, packed drums had to be stored on-site at the facility for long periods of time while the TSDF verified that they could accept the drums. The TSDF was provided with information about the size of each container, the chemical composition and the amount of waste in each container, in a "drum log" delivered by STS Facility staff. The TSDF used the drum logs to verify that wastes were packed in the appropriate drums and that the contents of the drums could be accepted for ultimate disposal. In addition, for lab-packed poisons, the TSDF required that the facility staff write the appropriate poison number on each container and list all numbers on the tally. The turn-around time for the verification and pick-up process took longer than was originally anticipated, and the full, packed drums had to remain stored at the STS Facility. The verification time for pesticides and poisons wastes took an average of two weeks, corrosives had an average verification time of one and a half weeks, solvents averaged three to four days, and paints were usually picked up the next day. These procedures required a large amount of storage space.

The need for additional storage space was resolved by ordering a second hazardous materials storage container for the permanent collection facility location. The two containers have the capacity to house a maximum of 48 drums. However, the amount of time that it takes the TSDF to pick up the full, drummed wastes needs to be addressed.

Currently, the staff accepts "unknowns"; unlabeled items that people bring in, that have to be tested to determine the appropriate waste disposal category. The staff were trained to use a chemical testing kit to make the initial waste category

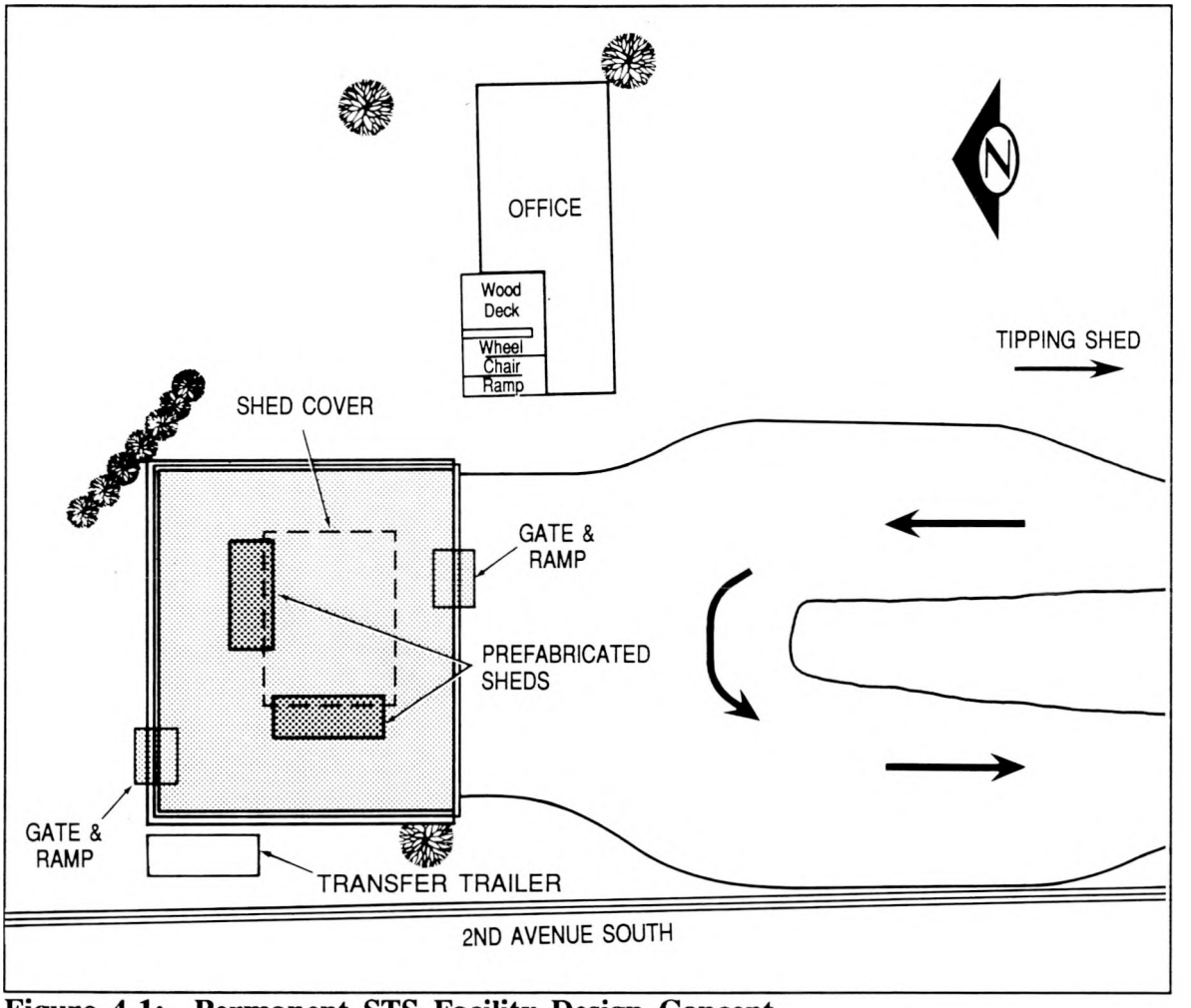

Figure 4-1: Permanent STS Facility Design Concept

determination. The testing was conducted outdoors, within the fenced area of the facility. Given the adverse weather conditions in Seattle, this was not an optimum situation during the fall and winter months. The problem has been addressed by ordering a three room trailer for the permanent site, with a separate lab with a fume hood, sinks and equipment for testing unknowns. Meanwhile, however, there is a backlog of unknowns on-site.

The design for the permanent site also includes a drainage catch basin, a lighted, covered work area, a possible site for used oil collection, and a three vehicle unloading area.

WASTE HANDLING AND DISPOSAL

Waste Disposal Contract

The original waste disposal contract was an addendum to an existing City of Seattle contract. Under the contract addendum, waste treatment and disposal costs were assessed by drum and type of waste; however, waste volumes were estimated for record keeping purposes. The system devised to estimate the volume of waste in each drum was as follows: the size and volume of each individual container of HHW was recorded and tallied, then the cumulative volume was multiplied by 0.75, to represent that each container was approximately three-quarters full.

The majority of the wastes collected at the STS Facility are "loose-packed" into drums, which means the wastes are placed into drums lined with absorbent material, in their original container. Experience has shown that there is a large variation in the volume of waste contained within each loose-packed drum. The waste disposal contract was designed to price the disposal by drum, regardless of the volume of waste contained within each drum.

Realizing that it would be more accurate to base the disposal costs on volume rather than by drum, the waste disposal contract addendum was revised in April, 1989. The volume of waste was estimated using the 0.75 formula. A comparison of the disposal cost per gallon of waste (Table 4-1) shows a significant difference in disposal costs for the two costing methods.

Problems with this arrangement are now evident as well. The system devised to estimate the waste volumes in each drum was found to give high estimates of the waste volumes. In a recent project, drums of loose-packed latex paint were bulked into 55 gallon drums. It was found that the average loose-packed 55 gallon drum of paint actually contains approximately 12.2 gallons of paint, as opposed to the 0.75 formula which gives an average of 22 gallons per 55 gallon drum. This would indicate that, at least for drums of loose-packed latex paint, the City is paying more for waste disposal than the actual volumes of waste would necessitate.

Table 4-1

Waste Disposal Costs per Gallon[1]

Waste Category	Original Contract Jan - May 1989	Amended Contract June - Dec 1989
Latex Paint[2]	$15.94	$6.77
Oil Base Paint	15.98	7.32
Paint Related	15.98	7.16
Corrosives	5.98	2.93
Solvents	8.25	3.79
Aerosols	23.67	14.64
Poisons/Pesticides	10.18	8.59
Dioxin-containing Material	14.14	6.04
Flammable Solids	10.08	3.55
Other	10.75	4.12
Average Cost per Gallon	$13.08	$6.49

[1] Disposal costs per waste type / total gallons per waste type. Paint and paint related were calculated at 12.2 gallons per loose-packed drum.

[2] Does not include the volumes of waste collected for the Paint Recycling Project

Other Waste Handling Procedures

Used oil and vehicle batteries are collected at the South Transfer Station and are recycled. Used motor oil is collected in two 250 gallon tanks and is recycled by a company specializing in used oil recycling. Prior to pick up by the recycler, each tank is tested for PCBs. The standard test runs about $18.00 per tank. If the oil was found to contain PCBs, it would be disposed of at a TSDF as a hazardous waste. To date, no oil collected at the south transfer station has been contaminated.

Vehicle batteries are collected at the transfer station and picked up free of charge by a battery recycler.

A large volume of the waste collected at the STS Facility is paint. Latex paint comprises over 32% of the volume of waste collected excluding oil, and makes up a significant portion of the disposal costs. Currently, paint is loose-packed at the facility, and disposal costs are based on estimates of the waste volumes. An alternative to loose-packing latex paint would be to "bulk", or pour the paint directly into drums. Bulking the paints gives an accurate measure of the volume of waste and would reduce the disposal costs, but increases labor costs to prepare for disposal.

As a part of the Urban Consortium Year Ten project, the Paint Recycling Program is investigating cost-effective alternatives to hazardous waste landfilling of latex and solvent-based paints. The project is evaluating the effectiveness of recycling latex paint, as well as conducting a chemical analysis of paint that cannot be recycled to determine if it can be disposed of as a solid waste. However, new proposed federal regulations that further limit the amount of mercury in interior latex paint may make it more difficult to recycle this waste. The levels of mercury in the recycled paint are higher than the proposed standard.

Alternatives to waste disposal could be explored at the STS Facility. Many of the materials received at the facility are unused products that could be used by others. A "materials exchange" could be set up at the facility, so that customers could take home products they might use. San Francisco operates this type of program at their HHW collection facility. Unused products in good condition are placed in "recycle bins". The facility customers and employees are allowed to take these products for reuse, free of charge. In six months, approximately 100 gallons of unused products were "recycled" at no cost. This disposal alternative could be investigated further at the STS Facility.

Problematic Wastes

Unknown wastes: Wastes that have no identifying features are tested at the STS Facility using a chemical analysis kit called the "HazCat Kit". The HazCat Kit is a spill identification tool that quickly identifies hazardous chemicals and uses expensive "dragger tubes" to do the testing. The staff at the STS facility have been trained to do the same type of preliminary identification tests using less expensive materials and equipment. However, a backlog of unknowns has developed because the site has an

inadequate testing area. At the temporary site there was no lab space for testing. Unknowns had to be tested outside or carted up to a room in the tipping shed. This was awkward and resulted in delays in testing unknowns. The permanent site has been modified to include a separate trailer equipped with a lab and a small office. This facility will help to speed the analysis of unknowns.

Dioxin-containing wastes: Wastes such as pentacholorphenol wood treating products and 2,4,5-T herbicides, are collected at the STS Facility. The hazardous waste landfill, used by the TSDF, has a special exemption permitting disposal of dioxin-containing wastes of household origin. Wastes containing dioxins collected at the STS Facility are transported to the hazardous waste landfill for disposal.

Radioactive Wastes: One incident has occurred in which the STS Facility accepted a small vial of uranal nitrate. The TSDF would not accept the chemical because they considered it a "radioactive" waste. The waste was disposed with similar wastes generated by the City of Seattle Parks Department.

Commercial Wastes: Approximately 34 commercial businesses have attempted to dispose of their wastes at the STS Facility and have been referred to a TSDF.

STAFFING ISSUES

Level of Staffing

The facility has been operating with two full time staff. This level of staffing was considered necessary to operate the STS Facility at the current level. The facility was open for 1624 hours during 189 days in 1989. Over 20% of the staff time associated with operating the facility was overtime hours. Most of the overtime was accrued during the high volume months in the summer. In several instances, because of sick leave or vacation, the HHW collection facility was staffed with only one employee, and less pressing work, such as testing the unknowns, was left until more help was available.

Worker Training

All staff at the STS Facility were provided with 20 hours of classroom training in hazardous materials handling and 16 hours of on-site training at the STS Facility,

in addition to other training events listed in Table 4-2. Since no training courses existed for household hazardous waste collection facilities, a special course was designed by the TSDF staff and the program managers. The training contract with the TSDF included a provision for additional technical assistance from the TSDF if needed. During the first month of operation, the technical experts were called for assistance with lab packing procedures. This service cost an additional $48.00 an hour.

Table 4-2

Training Events

October 1988 - December 1989

Number of Staff	Course or Event	Hours	Cost
20	Hazardous materials handling course (TSD facility course)	20	$ 9,860
5	On-site training	16	310
5	Respirator fit test and training	10	390
2	HazCat Kit training and travel	16	930
5	Round-Up training	10	0
2	Renton Vocational Tech - Hazardous Materials Handler Course	16	60
2	OSHA Hazardous Waste Handler Certification Course	40	1,100
TOTAL			$ 12,650

The waste handling and packing requirements for HHW were being developed at the same time as the hazardous material handling course was being prepared, and several elements were overlooked. Staff recommended that the course be revised to provide more instruction on waste packing and manifesting and to provide additional on-site training with an experienced staff person at the STS Facility.

Worker Safety

Staff at the HHW collection facility were issued personal protective equipment (PPE), including organic vapor and acid gas respirators. Employees were provided with respirator fit testing and have received emergency and spill response training.

Even though the respirators were fit tested, employees complained of breakthrough of chemical odors, sometimes in as little as 15 minutes, while they were working in the hazardous materials storage rooms. The Department of Labor and Industries was requested to conduct a consultative visit to review the chemical handling practices at the HHW collection site. Although the units are ventilated and the air changes per hour were well within the standards required by occupational safety and health codes, the storage facility contained a mixture of unknown chemicals, in unknown concentrations. Because the combinations of chemicals in each of the storage rooms change weekly, it was impossible to characterize the average exposure conditions in each of the storage units. The Department of Labor and Industries recommended that all packing and handling of materials be conducted outdoors.

The permanent facility design was modified in order to limit employee exposure to these materials. A second hazardous materials storage container was ordered for the permanent collection facility location. The container was designed to store flammables only and was equipped with a ventilation system providing 22 air changes per hour versus the six changes per hour at the original storage shed. A lighted roof was designed to cover the area between the two storage sheds to provide protection from the weather, and all packing of the HHW will occur outdoors in this area. In addition, a separate trailer will house a breakroom for employees and a separate lab equipped with sink, fume hood and equipment for testing unknowns. A separate storage locker was ordered for storage of PPE at the collection site.

Spill Response

Only one spill incident has occurred at the HHW collection facility during it's first 12 months of operation. A glass jar of creosote broke on the pavement and mixed with rainwater. The spill was contained, collected by the facility staff and sent to the TSDF for disposal as a creosote/water mixture.

CONCLUSION

Because of various construction delays, HHW collection continued to be conducted at a temporary location during 1989.

The experience of operating the temporary site, however, has led to a number of modifications to the design for the permanent facility:

- a second hazardous materials storage container has been added to allow for additional drum storage;
- waste handling and packing will be conducted outdoors in the space between the two storage containers, under a lighted roof that will provide protection from the weather, to eliminate problems of employee exposure to chemical vapors;
- a three room trailer was ordered for use as a testing area for the "unknown" wastes, and for use as a storage area and break room;
- the unloading area was redesigned with additional space for unloading cars and a separate drainage system.

Waste segregation requirements imposed by the contractor have over time greatly increased the need for storage space at the facility. In addition, the method used for estimating volumes for costing purposes tends to overestimate volumes collected. In order to reduce the amount of wastes stored on-site at the facility, increase the efficiency of waste handling and disposal operations, and handle the waste in a cost effective manner, the contract for disposal will be renegotiated to effect the following changes:

- limit the number of waste categories that must be drummed separately, so that the number of open, half-empty drums stored at the facility are reduced;
- state all the waste manifesting, packing and handling requirements in the contract, and try to anticipate any future changes in regulations that might affect the waste handling requirements (such as land ban regulations);

- re-examine the procedures for estimating the volumes of waste per drum if disposal costs are charged by volume;
- report the waste volumes in pounds for solid wastes and gallons for liquid wastes;
- state the allowable response time for pick up of drummed wastes by the TSDF.

Other waste disposal options will also be explored. For example, contracting with several waste management firms may be a more efficient way to treat, recycle or dispose of individual waste streams. Program managers will continue to investigate alternatives such as paint recycling, solidification or possibly a "materials exchange" for wastes that may still be usable by others.

Even though the STS Facility was operating at a temporary site, it has been an unqualified success. The employees responsible for staffing the facility have become skilled and competent in waste handling and packing procedures. They have incorporated additional waste handling requirements into their workload and have taken advantage of training courses to improve operational efficiency. The Solid Waste Utility plans to provide additional training so that all staff have a minimum of 40 hours of training.

Partly as a result of the experience with the Seattle facility, and partly because more permanent collection facilities are planned in Washington State, the State Department of Ecology is developing guidelines for such facilities. The Seattle facility will meet those guidelines, but the effect on other communities considering permanent facilities will be to require more review, and perhaps tip their decision away from permanent facilities toward mobile units.

CHAPTER 5: USER RESPONSE TO THE SOUTH TRANSFER STATION FACILITY AND THE WASTEMOBILE

A random sample survey was conducted of the customers of the household hazardous waste collection facility at the South Transfer Station (STS Facility) and three Wastemobile Facility sites in King County, Washington. The survey was designed to determine the level of public response to publicity campaigns conducted for each program and the customers' level of satisfaction with each service. Supporting demographic data were also obtained. A copy of the survey forms used can be found in the Appendix.

Both collection facilities were designed to collect household hazardous waste (HHW) from residents in King County and both conducted a publicity campaign to advertise their services. However, the STS Facility is a stationary facility, located at a transfer station in South Seattle, and is open to customers year round; while the Wastemobile is a mobile facility that travels to communities within King County, sets up and collects HHW for a two week period, then moves on to another community.

Because of the distinct differences in the operation of the mobile and stationary collection facilities, their publicity strategies are different. Although both use flyers, newspaper articles and utility bill inserts, they target different audiences, and use different methods of distribution.

Since the Wastemobile is only in a community for a limited time, the publicity campaign targets the community by advertising heavily in a variety of media, for a short period of time. The goal of the campaign is to deliver at least one source of information to all residents in a community.

The STS Facility publicity campaign has been a broad-based effort, targeting all Seattle residential utility customers. The publicity efforts notify the potential user of the service, but do not relay the sense of urgency conveyed in the publicity for the Wastemobile. The STS Facility has also been able to take advantage of other

opportunities to promote usage of the facility. Transfer station personnel, for example, have served as a valuable information source to transfer station customers who would not otherwise have heard about the service.

In this chapter, the public's response to the various publicity approaches is examined and the effectiveness of the approaches are compared. The participation rates as a result of publicity strategies for the stationary and mobile facility are evaluated and discussed.

The number of people who use the collection facility is also dependent upon the perceived convenience of the collection facility. Both facilities are designed to offer quick, convenient, readily available service, but if the customer's perception of the facility is otherwise, he or she may be less inclined to use it. In the second part of this analysis, a user survey was employed to identify features that promote or discourage use of the facilities.

USER SURVEY

The user survey was conducted at the three Wastemobile Facility sites in Shoreline, Kenmore and Redmond, and at the stationary STS Facility in South Seattle (Figure 5-1). Users were asked to fill out a survey form while they waited for their wastes to be unloaded from the car. Table 5-1 summarizes the survey dates and response rate for each site.

Table 5-1

User Survey Participation for STS Facility and the Wastemobile Facility, 1989

Site	Survey Dates	Total Users	Total Respondents	Percent of Response
Shoreline	11/8-11/18	650	437	.67
Kenmore	11/30-12/9	463	437	.94
Redmond	12/14-12/23	388	368	.95
STS Facility	20 days, 11/89-12/89	250	125	.50

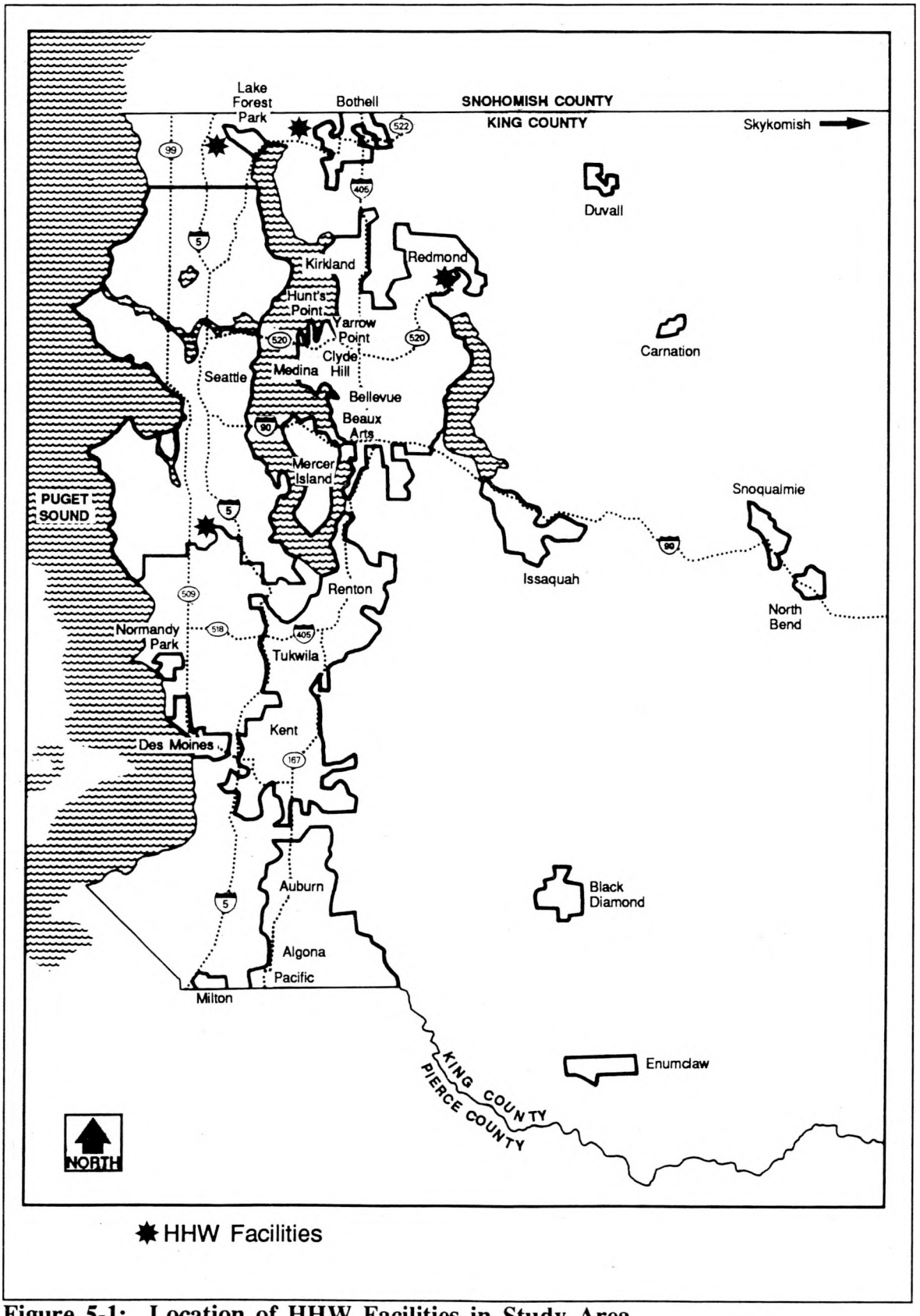

Figure 5-1: Location of HHW Facilities in Study Area

A survey form was counted if the date, zip code, and at least one question were completed on the form. Questions that were not answered were tallied as "no response". Survey data is presented in the Appendix.

The demographic information shows that both types of collection programs primarily attract residents from single family homes with incomes in the $26,000 to $40,000 range who are between the ages of 31 and 45. The level of education differed

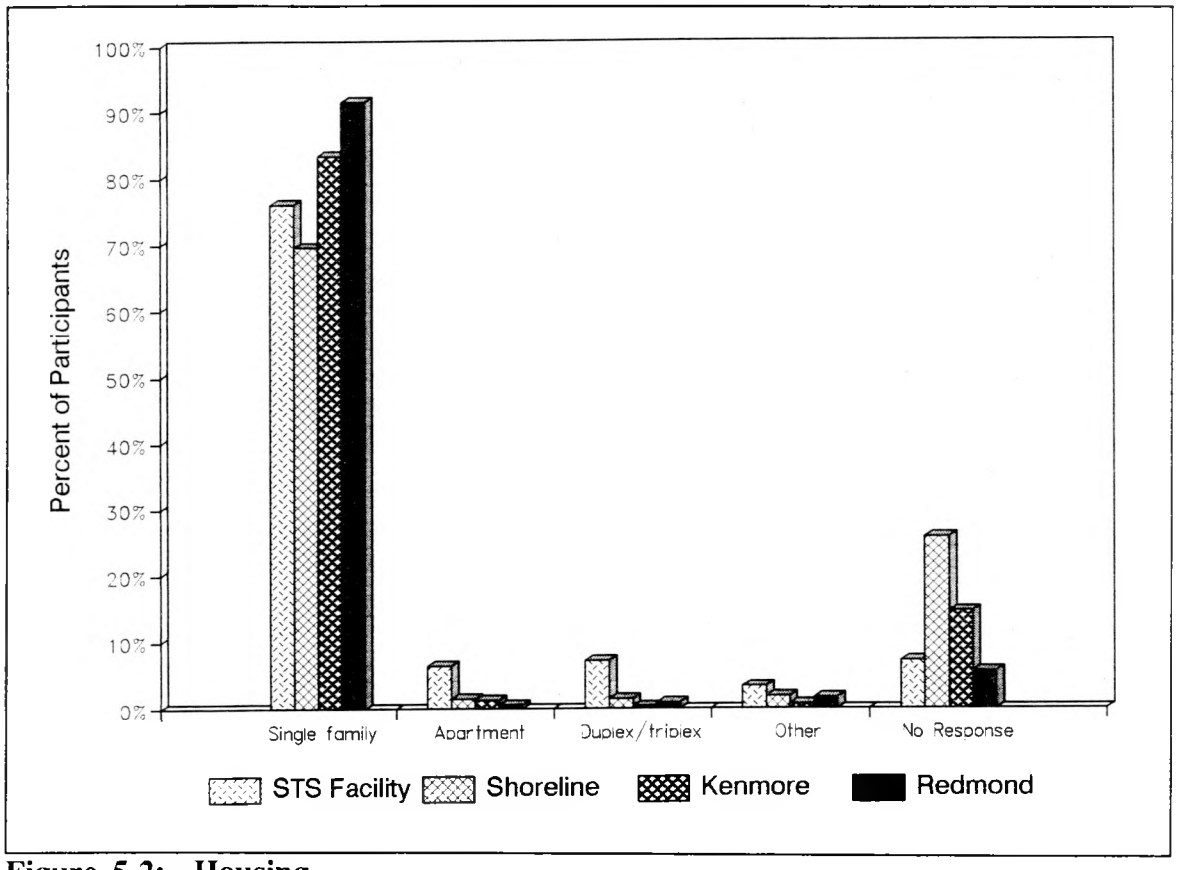

Figure 5-2: Housing

between the users at the STS Facility and the Wastemobile sites. The largest number of users at the STS Facility had "some college" education while the largest percentage of Wastmobile survey respondents had received a "graduate degree" (Figures 5-2 to 5-5)

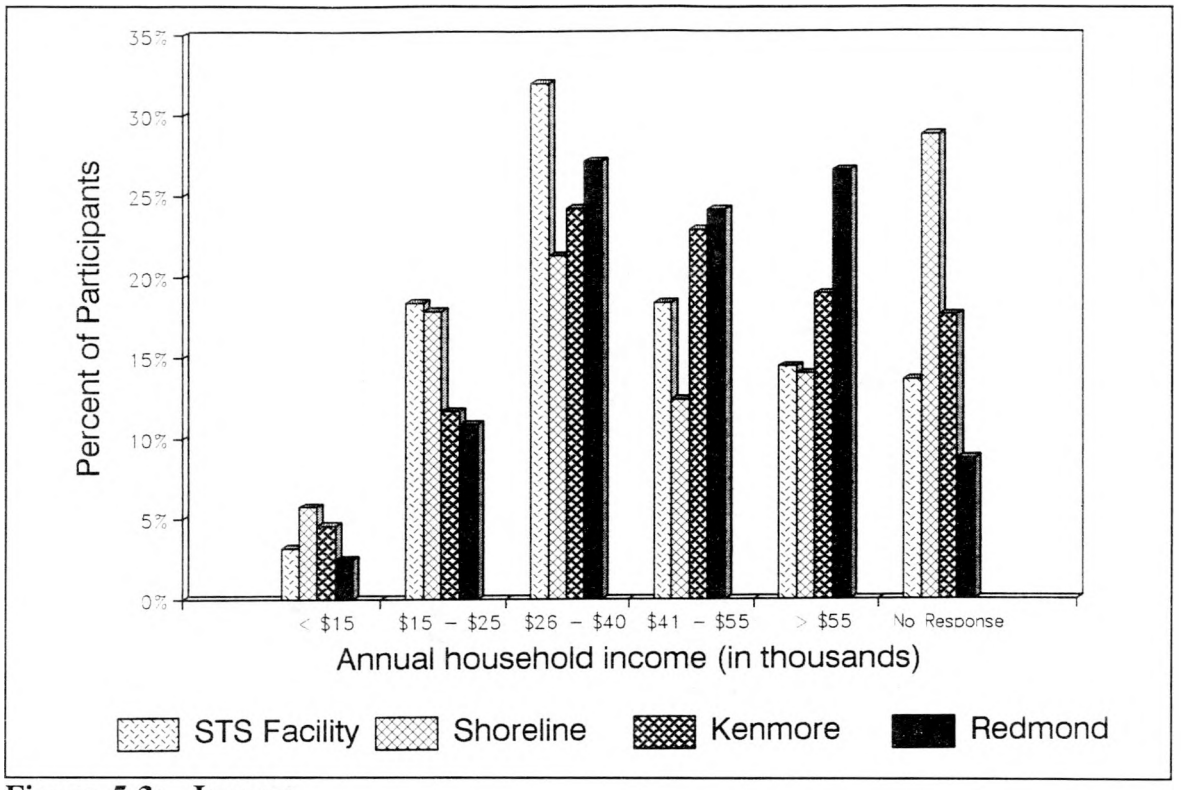

Figure 5-3: Income

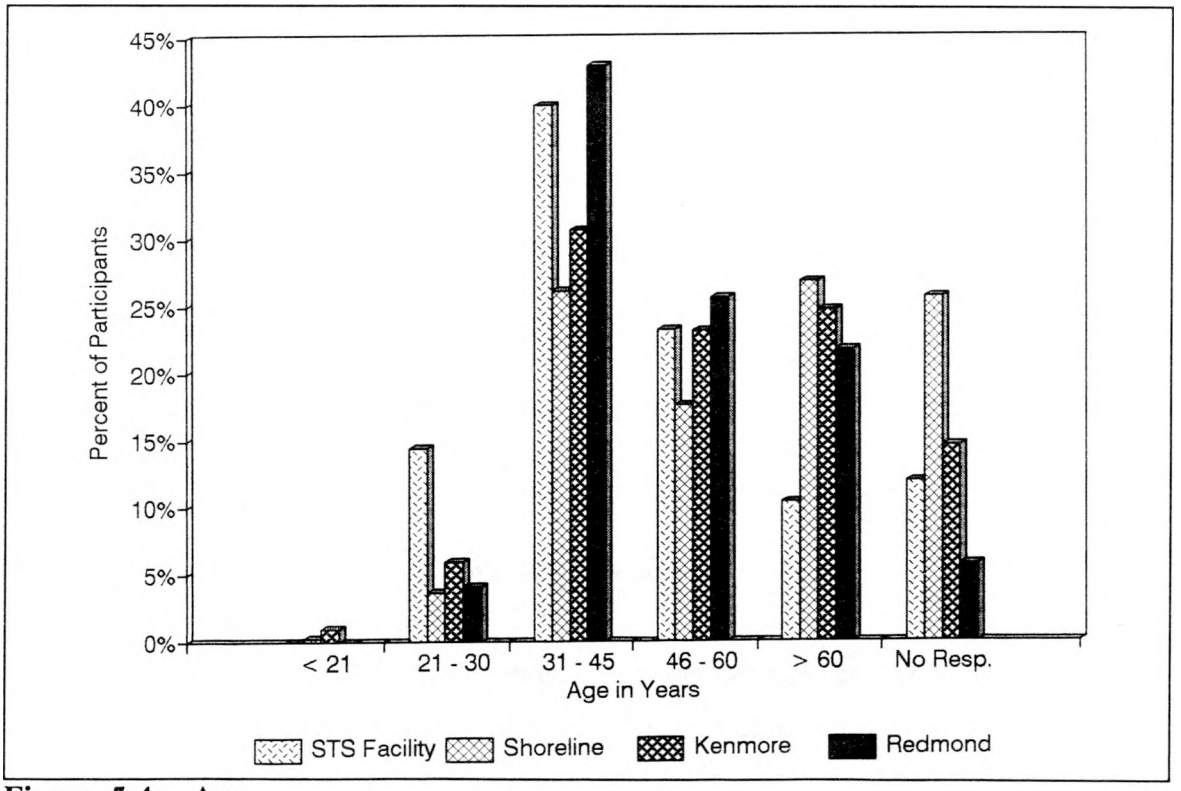

Figure 5-4: Age

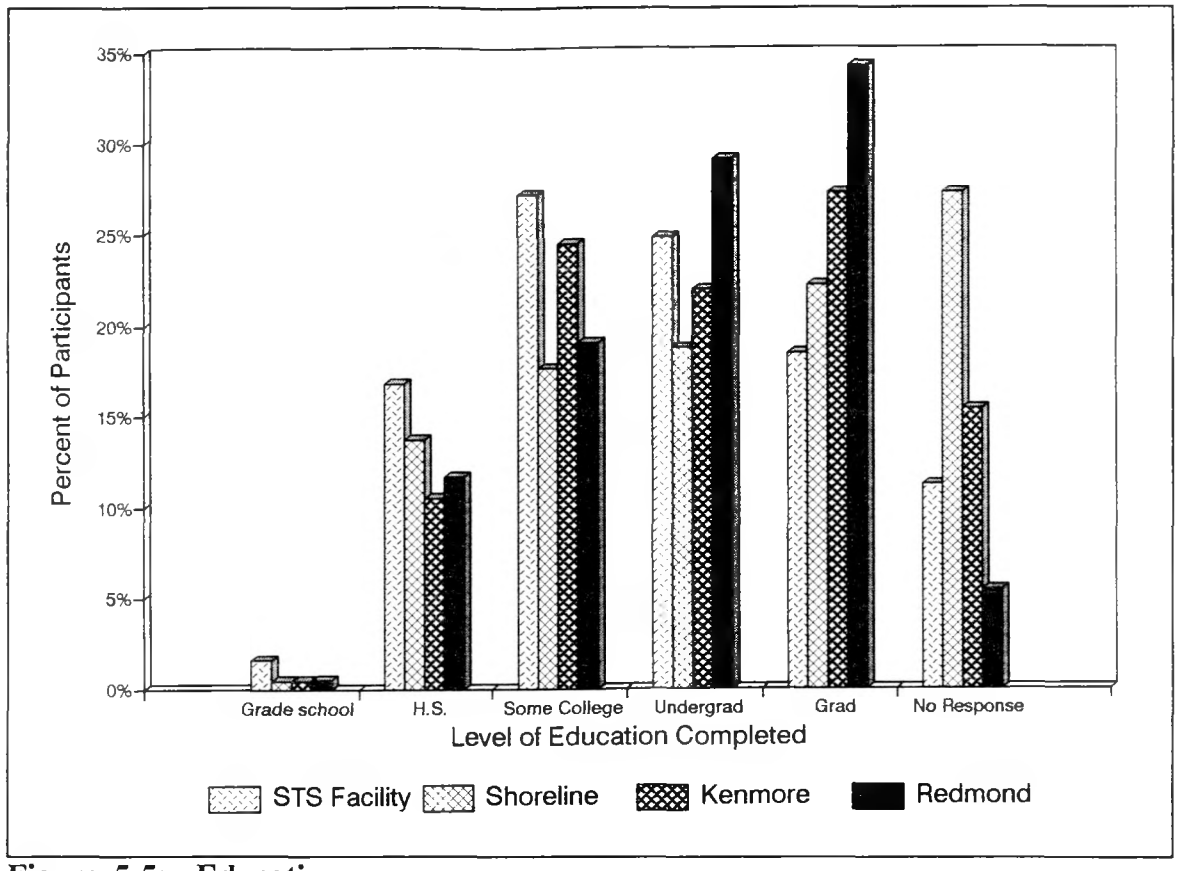

Figure 5-5: Education

PUBLICITY EVENTS

STS Collection Facility

The Solid Waste Utility limited publicity for the STS Collection Facility at first since it was anticipated that the facility would be moving shortly to its permanent location. A list of the events publicizing the facility is presented in Table 5-2. In the fall of 1988, the Solid Waste Utility distributed new garbage cans to residential customers. A label was affixed to each garbage can lid or messages were embossed on the lid, informing customers not to dispose of hazardous chemicals in the solid waste. It referred residents to the Seattle-King County Health Department Hazards Line for more information.

Table 5-2

STS Facility Publicity

Date	Publicity	Content	Audience
Fall, 1988	SWU Newsletter "100% Recycling"	Mentions the STS Facility	Seattle residential utility customers
1988	Garbage Can Labels and Embossing	Labels warning customers not to dispose of HHW in the trash, call Hazard Line	Seattle residential utility customers
8/88	HHW Drop-off Facility Flyer	Advertised the STS Facility	Round-up participants
12/88	"What's New at the Transfer Station" Flyer	Paragraph about the STS Facility	Transfer Station users, libraries, community service centers, fairs and events
5/89	"Son of Paint" Newspaper article	Mentions STS Facility	Seattle Times newspaper readers
6/89	"Were you down in the dumps" Newspaper article	Article about the Round-up, refers people to the STS Facility	Seattle Times newspaper readers
7/89-8/89	"Transfer Station Tips" Flyer	Combined utility bill insert	Seattle residential utility customers
8/89	"Station Takes HHW" Newspaper article	Article featuring the STS Facility	Seattle Times newspaper readers
9/89-10/89	"Don't Let HHW Drive You Batty" Flyer	Combined utility bill insert	Seattle residential utility customers
9/89	Newspaper articles about siting North HHW Collection Facility	Mentions the STS Facility	Readers of Puget Consumer Cooperative, Washington Toxics Coalition, Audubon newsletters, local north end papers and journal

In October, 1988, King County held a one day HHW collection event, just prior to the opening of the STS Collection Facility. Flyers about the facility were distributed to Round-up participants. In November, flyers were distributed to selected libraries and community centers and the facility was mentioned at several public meetings held by the Solid Waste Utility to inform residents of billing and management changes at the Utility. The facility was briefly mentioned in the fall 1988, Solid Waste Utility's newsletter, "100% Recycled". In June, 1989, another HHW Round-up was held in King County. Newspaper articles about the event mentioned the STS Collection Facility as an alternate disposal option.

The first aggressive publicity effort was a notice developed by the Solid Waste Utility and mailed to residential utility customers within the City of Seattle in June/July, 1989. The brochure listed the HHW Collection Facility as one of five services offered at City transfer stations.

In August, 1989, an article appeared in the Seattle Times "Home Clinic" column featuring the STS Collection Facility. The article was written in response to a question by someone who had missed the HHW Round-up and wanted to know where to take his or her HHW for disposal.

In September, a second utility bill insert that dealt exclusively with the HHW facility was mailed out. Entitled "Don't Let Household Hazardous Waste Drive You Batty", it listed several common hazardous products, provided phone numbers for additional information; and described the STS Facility (Figure 5-6). Over 150,000 residential customers in the City of Seattle received the brochure in the combined utility bill.

In the fall and winter of 1989, the Solid Waste Utility was in the process of selecting a site for a second HHW collection facility in the North Seattle area. The STS Facility was mentioned in several newspapers and newsletters as an example of the type of facility the public could expect in this area.

Wastemobile Publicity

The primary publicity tools used at the Wastemobile sites were flyers and newspaper articles. The flyers presented information about the Wastemobile location, the types of waste to bring to the event, and the days and hours of operation (Figure

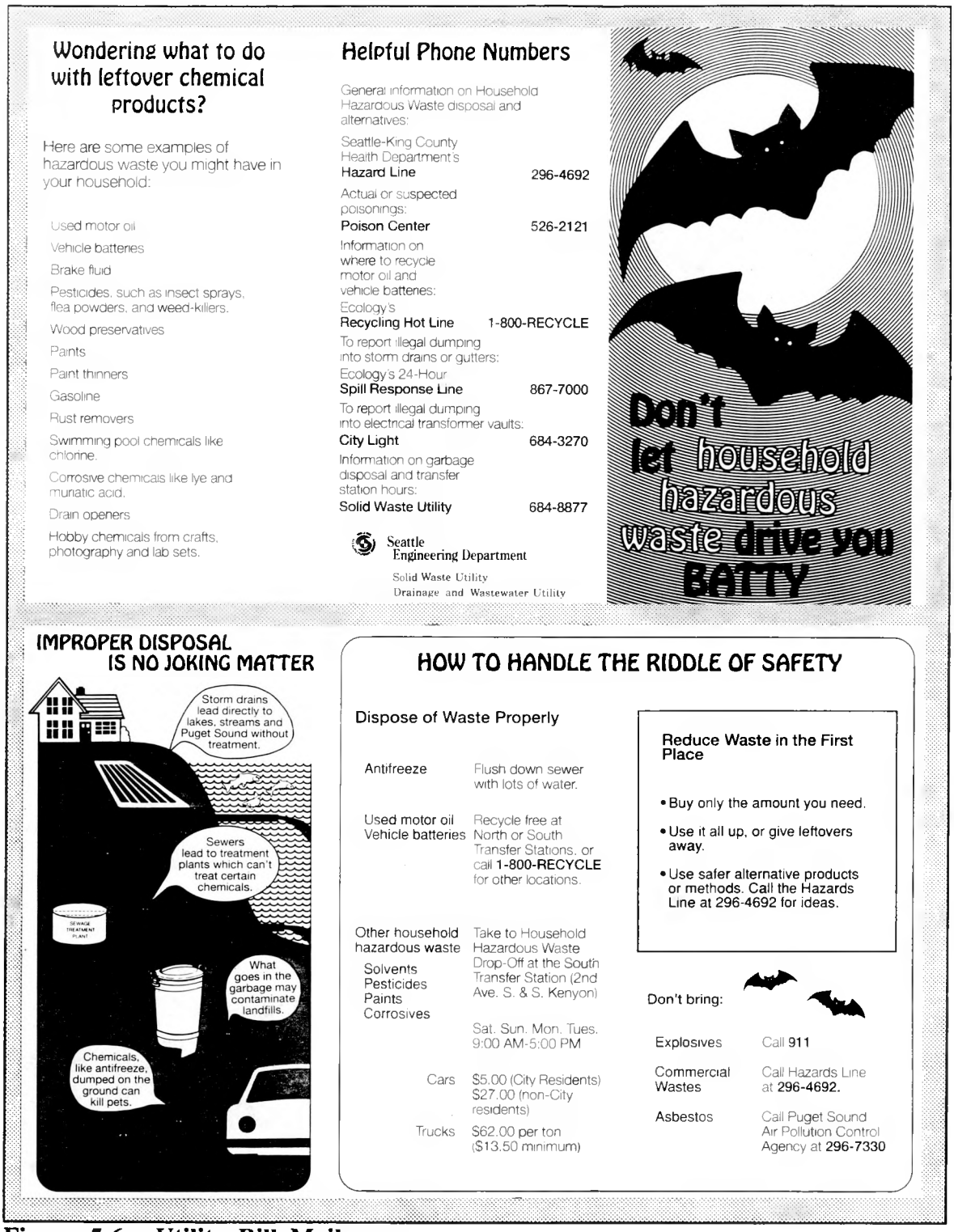

Figure 5-6: Utility Bill Mailers

5-7), and were distributed in the neighborhoods where the Wastemobile would be located. The local sewer district mailing list in each area was used to distribute

information through the mail. A summary of the publicity efforts for each of the three Wastemobile sites is presented in Table 5-3.

Table 5-3

Wastemobile Publicity

Site	Publicity	Distribution
Shoreline	8,000 flyers	Primary grade school children
	2,000 flyers	Retail store counters
	2,000 flyers	Water, Sewer and Fire District Offices
	Notice printed on utility bill	Ronald Sewer District customers
	Newspaper articles	Enterprise, Journal, North Seattle Times[1], Lake Forest Park Newsletter
Kenmore	20,000 flyers	Northeast Lake Washington Sewer District
	200 flyers	Fire District Office
	Newspaper articles	Enterprise, Journal American, North Seattle Times, Seattle Post Intelligencer and North Shore Citizen
Redmond	8,000 flyers	Primary grade school children
	250 flyers	Redmond Fire Department counters
	3,600 flyers	Redmond Public Utilities customers
	Newspaper articles	Eastside Times, Sammamish Valley News, Woodinville Weekly and Journal American
	Newsletters	PTA
	Meetings	Service groups
	TV	Redmond Municipal Channel

[1]The newspaper article in the Seattle Times did not list the days and hours of operation at the site, but referred the readers to the Hazards Line phone number for more information.

Department of Public Works

King County Solid Waste Division

HOUSEHOLD HAZARDOUS WASTEMOBILE

Keep your home and environment safe. Bring old and unwanted household hazardous waste products to King County's mobile collection. If you can't use up or recycle hazardous products:

Bring:	Pesticides	Cleaning products
	Oil-base paints	Motor oil (or call 1-800-RECYCLE)
	Thinners and Solvents	Latex paint (please try to use it up,
	Hobby chemicals	give it away or dry it out instead)

Don't bring: Explosives (call Bomb Squad, 911, as soon as possible to arrange disposal)
Wastes from businesses

Locations:	Shoreline, Bethel Lutheran Church N.E. 175th and 10th N.E.	Nov. 9, 10, 11, & 16, 17, 18
	Kenmore, Fire District 16 Headquarters N.E. 181st and 73rd N.E., rear parking lot off 181st	Nov. 30, Dec. 1, 2, & 7, 8, 9
	Redmond, Natl. Guard Armory N.E. 95th, east from 166th N.E.	Dec. 14, 15, 16, & 21, 22, 23

Times:	Thursdays	Noon to 7:00 p.m.
	Fridays	Noon to 7:00 p.m.
	Saturdays	10:00 a.m. to 5:00 p.m.

Keep products in original containers or label all products not in original containers. Store them so they don't tip over or leak during transportation. Keep away from children, pets, passenger compartment of vehicle. Separate paint from other materials. Handling hazardous materials requires care and time. Come during weekday hours to avoid delays.

Call the Hazards Line for more information: 296-4692

Figure 5-7: Publicity Flyers for the Wastemobile Sites.

EVALUATION OF PUBLICITY EVENTS

This evaluation compares the major publicity components used at the STS Facility with those used at the Wastemobile sites. The factors that influenced the number of participants are discussed and the effectiveness of the publicity methods in terms of response rate are reported.

The survey was used to track the source of referral to both collection services. It should be noted that responses to the questionnaire are based entirely on the users' recall of the event, and may not be entirely accurate. For instance, a user may have initially read about the facility in the newspaper, then called the Hazards Line for more information. The users may report either source, or remember the last source of information, the Hazards Line, and answer as such.

Table 5-4

STS Facility Referral Sources, 1989

Source of Information	Participants (Jan - June)	Percent	Participants (July - Dec)	Percent	Total	Percent
Phone Inquiries	188	22%*	262	20%*	450	21%*
Word of Mouth	119	14%	18	16%	337	15%
Newspaper	72	19%	119	9%	191	9%
STS/NTS Referral	316	37%	397	30%	713	33%
Flyer or Utility Bill Insert	21	2%	172	13%	193	9%
Other	131	15%	159	12%	290	13%
TOTAL	847	39%**	1327	61%**	2174	100%**

* Percent of column ** Percent of row

The publicity efforts drew 9% of the customers to the STS Facility. In general, 73% of STS Facility users received information from sources other than the focused efforts by the Solid Waste Utility or King County.

The STS Facility referral source information is presented in the Table 5-4. The information is divided into six month periods to illustrate the increase in the number of users before and after the publicity campaign conducted in July and September, 1989.

Wastemobile users most frequently cited newspapers and utility bill mailings as their sources of information. Approximately 78% of the users learned of the facility due to these targeted publicity efforts. The referral source information for the Wastemobile sites is presented in Table 5-5.

Table 5-5

Wastemobile Referral Sources by Site

Publicity Source	Shoreline	Kenmore	Redmond	Total	Percent
Phone Referrals (Hazards Line, Recycle Hotline, SWD)	31	35	40	106	8%
Word of Mouth	50	17	18	85	7%
Radio/TV	11	10	7	28	2%
Newspaper	212	143	194	549	44%
Flyer/Utility Bill Insert	66	221	105	392	32%
Drive By	57	1	0	58	5%
Other (meetings, work, etc.)	8	9	3	20	2%
Total survey respondents	435	436	367	1238	100%

Flyers and Utility Bill Mailings

The information collected at the STS Facility in 1989 provided a clear picture of where people learned of the HHW collection service. Figure 5-8 compares the number of participants reporting the various referral sources at the STS Facility.

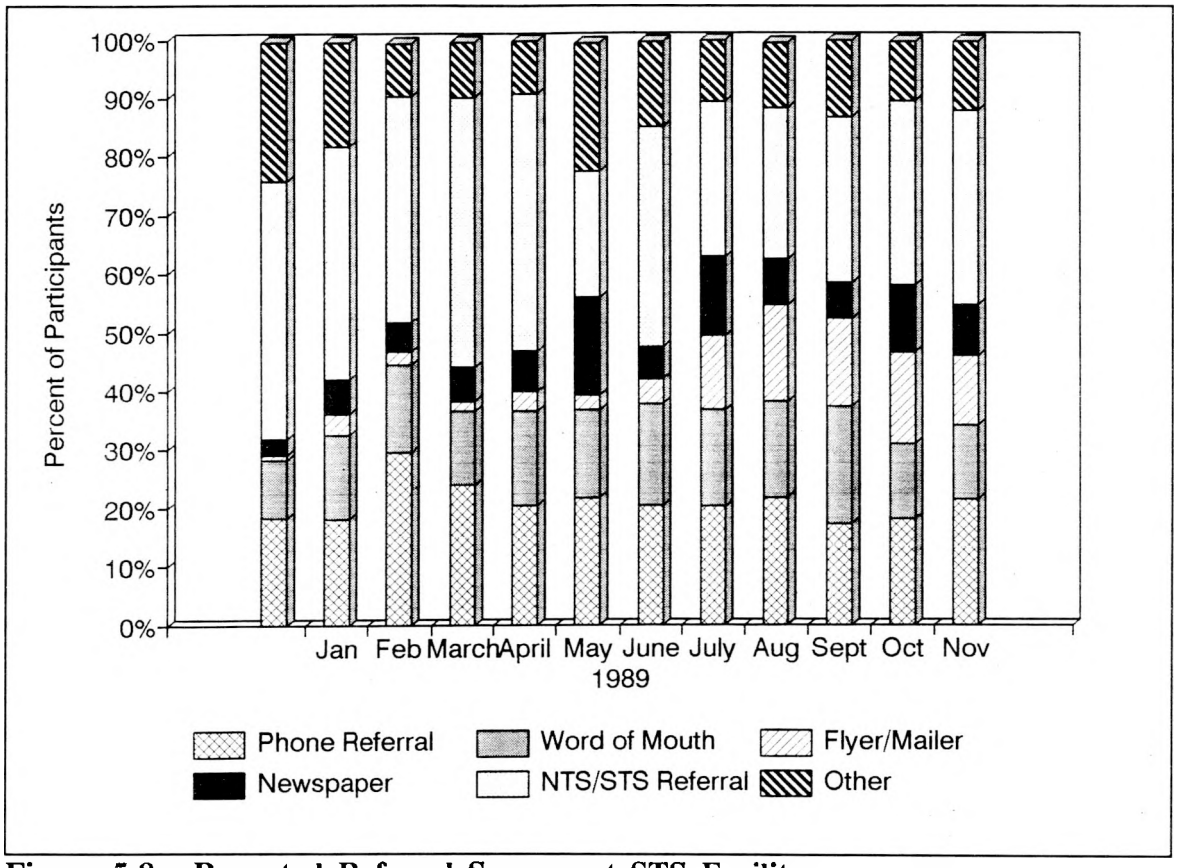

Figure 5-8: Reported Referral Sources at STS Facility

During 1989, 9% of the STS Facility customers reported hearing of the facility through advertisements sent out in flyers and mailings by the Solid Waste Utility. In the first half of 1989, after a very limited distribution of flyers at the South Transfer Station, only 2% reported flyers or utility bill mailings as their source of information. In the second half of 1989, after the two separate utility bill mailings, the percentage of respondents identifying flyers or utility bill mailings increased to 13%.

The number of users reporting utility bill mailings or flyers as their source of information, is shown month by month in Figure 5-9. In August, 12% of the customers reported utility bill mailings as the source of information drawing them to the STS Facility. In September, October and November, this number remained steady

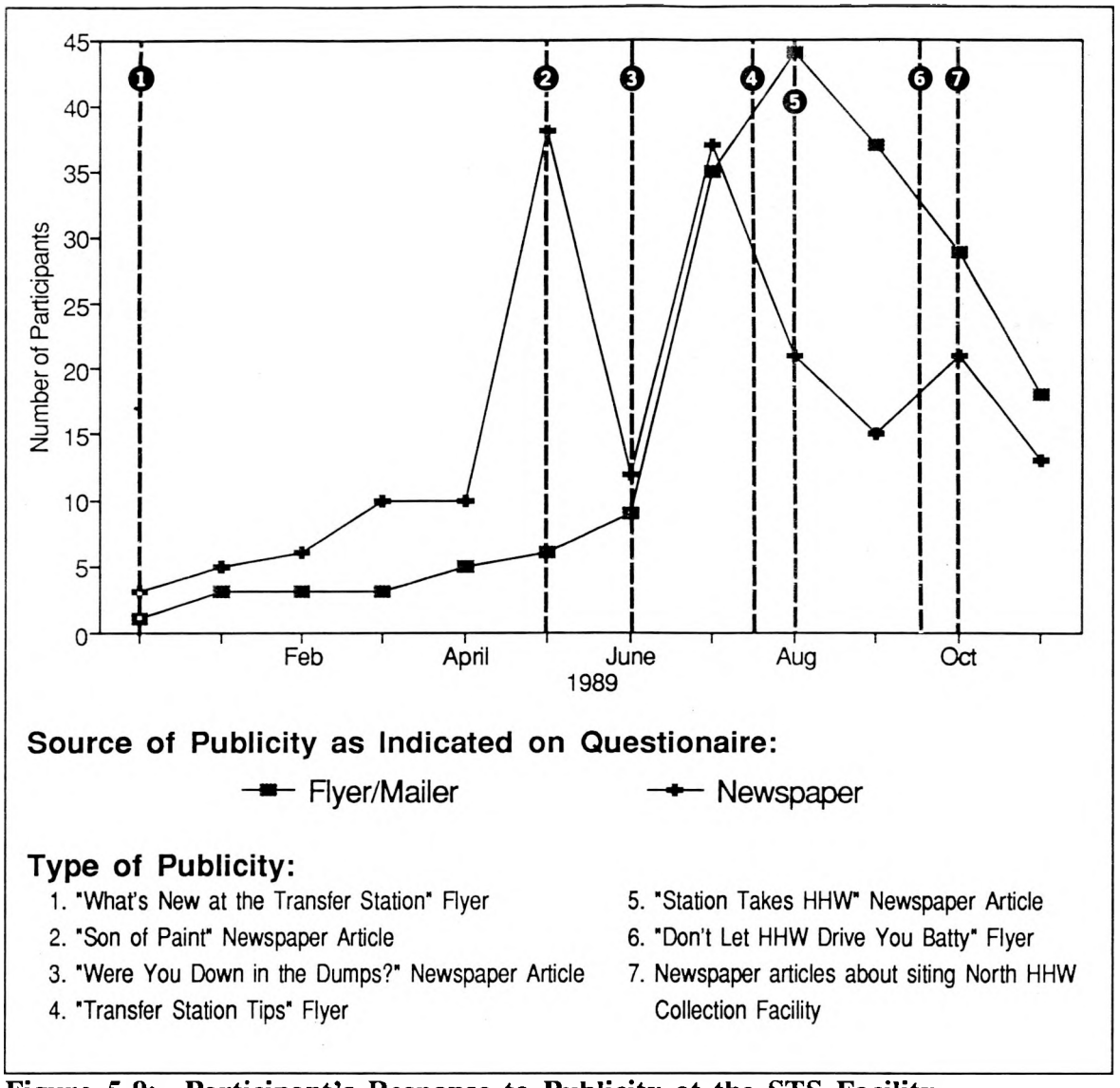

Figure 5-9: Participant's Response to Publicity at the STS Facility

at 16%, then decreased to 12% in December. This shows that the percentage of users that responded to the publicity remained fairly high several months after the publicity events occurred.

Over 295,000 notices were mailed to residential utility customers in 1989, attracting approximately 193 participants to the STS Facility, for a 0.05% response rate through December, 1989. In the months of July and September, a total of 293,400 flyers sent with the residential utility bills resulted in participation by 172 people. The cost of the two mailings was $7400. A preliminary cost effectiveness calculation results in a cost per customer of $43.00. It is expected that more people will use the

facility in the future as a result of the mailers, since there is a certain lag time in response to mailings, decreasing the cost of publicity per customer over time. Also, as mentioned before, users are relying on recall to indicate how they heard of the facility, which is not always accurate.

The proportion of Wastemobile Facility survey respondents who learned of the event through flyers and mailers varied from site to site. This was probably due to differences in the quantity of flyers and distribution methods. Overall, 32% of the Wastemobile users reported they heard about the facility from flyers or utility bill mailings. The percentage of users that learned of the Wastemobile from different referral sources is displayed in Figure 5-10.

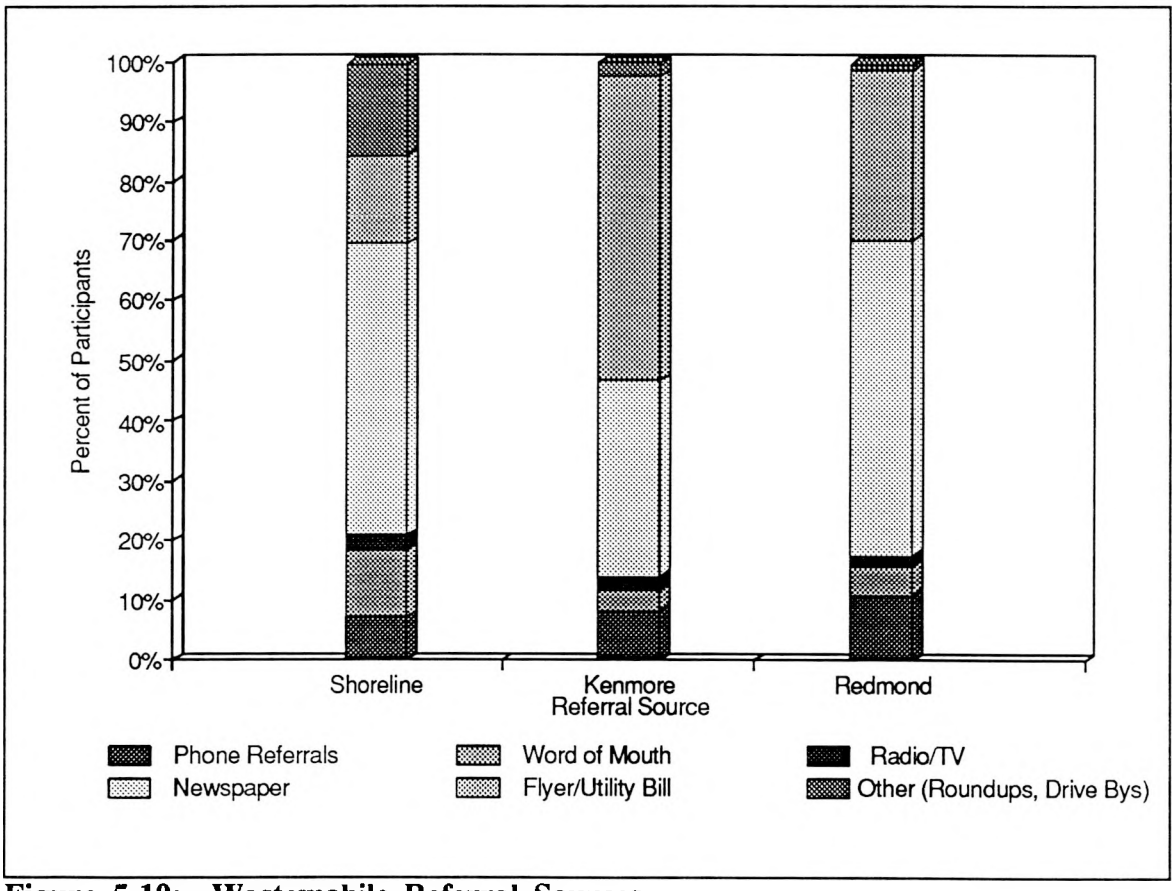

Figure 5-10: Wastemobile Referral Sources

At the Kenmore and Redmond Wastemobile sites, separate flyers were mailed to residential customers with their utility bills. The Shoreline utility bill had information about the event printed directly onto the bill itself; no flyers were inserted into the mailer.

At the Shoreline site, 15% of the survey respondents said they learned of the event through flyers, for a 0.8% response rate. The flyers distributed for the Kenmore site attracted 50% of the survey respondents, for a response rate of 1.1%. Twenty-eight percent of the Redmond participants responded to the flyers rate of 0.9%.

A comparatively small response rate at Shoreline may have been due to the fact that information was printed directly on the bill, whereas the information at the Redmond and Kenmore sites was printed on a separate flyer and inserted into the bill envelope. This may indicate that the information on a separate flyer is more effective.

At the Kenmore site, which had the highest response rate, the majority of flyers were mailed directly to residential utility customers. At the Shoreline and Redmond sites, most flyers were distributed to grade school children to bring home to their parents. In this situation, the direct mailing of flyers to residents appears to be a more effective tool.

The cost of the publicity for the three Wastemobile sites, including labor, brochure development, materials and newspaper publicity was $2,068. Seventy-six percent of survey respondents reported hearing of the Wastemobile via the publicity efforts for a cost of $1.80 per participant.

Newspapers

The Wastemobile publicity campaign drew heavily upon the newspaper as a primary vehicle for disseminating information to the public. Press releases were sent to at least four local newspapers at each site. Many households in the target area subscribed to more than one of these news sources. Because of the temporary nature of the Wastemobile collection event, the articles were designed to appear within the same time period in order to reinforce the public's awareness of the upcoming event. Approximately 44% of the users reported reading about the facility in the newspaper, making it the most frequently cited publicity source at the Wastemobile sites.

On the other hand, 9% of the STS Facility users reported reading about the facility in the newspaper. This comparatively low percentage is not surprising. The press coverage of the STS Facility was incidental and not part of the planned publicity strategy by the Solid Waste Utility. Only one article was written specifically to inform

customers of the STS Facility, although several articles referenced the facility as a HHW disposal option.

Phone Referrals and Word of Mouth

The second largest source of information reported by STS Facility users was telephone referrals. Twenty-one percent of the STS Facility users obtained information by phoning various agencies and help lines such as the Hazard Line, Recycle Hotline, the City and County solid waste agencies and transfer stations.

This suggests that a large number of users were already aware of the adverse effects of improperly disposed HHW on the environment and public health. Partly this could be a result of the garbage lid imprints that directed people to call the Hazards Line. These individuals conducted an active search to identify proper disposal options for their wastes and followed up by traveling to the STS Facility to dispose of their wastes. Over 87% of those that were referred by the telephone calls drove more than six miles to use the facility.

Another 15% heard of the facility through word of mouth, indicating that people may have actively pursued information about waste disposal options by inquiring of friends, relatives, neighbors and acquaintances. Also, since the STS Facility is stationary, word has time to get around, helping to build usage in a slow, steady manner.

Only 7% of the users at the Wastemobile sites phoned for information about the collection service. Although the Hazards Line phone number was printed on the flyers and listed in several of the newspaper articles, most survey respondents listed other sources for their information.

Collectively, 7% of the Wastemobile survey respondents heard of the facility through word of mouth. When individual sites are compared, some differences emerge. A large percentage of the users, 11% at the Shoreline site, reported hearing of the facility through word of mouth versus 3% at Kenmore and 5% at the Redmond site.

The Shoreline site was highly visible from major traffic thoroughfares and was located at a transit authority Park and Ride lot at fairly busy intersection in North Seattle. Thirteen percent of the users at the Shoreline site reported noticing the facility

as they drove by. This was not the case at the Kenmore or Redmond sites that were located on less busy streets.

Site Specific Referral Sources

The STS Facility is located at the South Transfer Station in Seattle. The City of Seattle also operates a transfer station in North Seattle, but due to space constraints, the North Transfer Station is not equipped to collect HHW.

Many people who brought solid waste to the transfer station, knowingly or otherwise also brought HHW. Transfer station personnel were trained to identify HHW mixed in with residential self-haul loads and to refer the haulers to the STS Collection Facility.

Customers who brought their HHW to the South Transfer Station when the STS Facility was closed and those who brought HHWs to the North Transfer Station, were issued a raincheck. The raincheck allowed the user to dispose of HHW at the STS Facility within two weeks of the initial visit without paying a second disposal fee.

The largest percentage of STS Facility users, 32%, reported that they were referred to the facility by personnel at the South Transfer Station or North Transfer Station (STS/NTS Referral). Of these users, 27% were referred by South Transfer Station personnel, and 5% were referred by the North Transfer Station.

Twelve percent of those referred by the South Transfer Station, and 25% of those referred by North Transfer Station personnel brought rainchecks, indicating that at least 5% of the users at the STS Facility had to make a second trip to dispose of their HHW.

Offering HHW collection at the transfer station, where users can dispose of HHW and solid waste in the same trip, appears to promote participation. Over half of the users at the STS Facility, 53%, reported bringing solid waste, recyclables or both to the South Transfer Station along with the HHW. The remaining 47% of the users made a special trip to the transfer station to dispose of HHW only.

By locating the HHW collection facility at the transfer station, HHW that was destined for the solid waste landfill could be diverted to the collection facility. This adds up to a significant amount of waste. If we assume that the users who were referred by the transfer station personnel, 33% of all the users, each brought an average

of 15 gallons of HHW, a total of 10,695 gallons of hazardous waste was diverted from the landfill.

Other Referral Sources

The remaining 13% of users at the STS Facility reported "other" referral sources. The "Round-up" event brought in a large number of users who were unwilling to stand in long lines. Other publicity events associated with the Round-up such as city council mailings, public meetings and fairs, were sources of information.

The percentage of users reporting other referral sources at the Wastemobile sites was only 2%. Since the duration of the collection events was relatively short, there was probably little time for the information to be spread by other sources.

Quality of the Publicity Information

In order to determine whether the information provided by the publicity events was adequate, the user survey asked participants to give their comments. Data from the STS Facility indicate that 70% of the respondents felt the information was adequate, while 28% of the respondents reported some dissatisfaction with the information and 3% did not respond.

Twelve percent of the respondents stated that publicity could be improved by mailing a better map and driving instructions to all residents. Other suggestions included providing repeated mailings as a tangible source of information for citizens to refer to in the future. It was requested that the information contain the hours and days of operation, and note specifically that the facility hours differ from the transfer station hours. Several recommended that a special "Household Hazardous Waste" phone number be placed in the blue pages of the phone book.

The Wastemobile users reported that the information was satisfactory overall, although 18% of the respondents at the Shoreline site reported dissatisfaction with the publicity information. Many Shoreline respondents commented that newspaper articles were not adequate. It was at this site that the Seattle Times newspaper article did not include the days and hours of operation at the facility, but referred the readers to the Hazards Line for more information. Neither the users nor the Hazards Line staff liked

this arrangement and an effort was made by the Wastemobile managers to print all the information in the news article for future sites. This complaint was not voiced by users of other sites.

The majority of Kenmore site respondents, 95%, were satisfied with the publicity information, only 4% of the survey respondents were dissatisfied with the information. However, several of those that were dissatisfied requested that more detailed information be included about the types of wastes that are accepted at the collection sites.

Eighty-seven percent of the respondents were satisfied with the publicity at the Redmond site, while 10% reported they were dissatisfied with the publicity information. Two percent did not respond to this question. The Redmond Wastemobile site was located at one of two armories in Redmond and many users commented that the directions to the armory were confusing in both the flyers and newspaper articles.

Discussion of Publicity Strategies

There was a wide margin of difference between 78% of Wastemobile users who reported attending the facility due to publicity events, and 18% of STS Facility users who did so. One of the major reasons for this difference was that the STS Facility publicity efforts were initiated in the second half of 1989. After the facility was advertised, participation did increase, although the responses that occurred after December, 1989, were not included in this report.

The Wastemobile Facility, on the other hand, relied heavily on local publicity to encourage residents to use the facility. The fact that the Wastemobile was only available for a limited period provided an incentive for citizens to use the facility and take advantage of the convenience of having the facility close to home.

Another possible reason for the low participation rates generated by the publicity at the STS Facility, is that the publicity information was mailed during the fall months. Fall and winter are periods of traditional low self-hauler use of transfer stations. It is likely that as spring approaches and people do cleanups of their home and yard, they will be more likely to make a trip to the transfer stations to dispose of their wastes.

It should be noted that the utility bill mailers used at both the STS Facility and the Wastemobile Facility, targeted residential customers, who receive a utility bill. This

may or may not include individuals living in apartment buildings. Most residents in larger apartments do not receive a direct mailing from the utility. Our survey shows that a very small percentage, less than 6% of the participants, reported living in apartment buildings. This low level of participation could be due to the lack of publicity to this segment of the population. It is also possible that people living in apartments do not use and/or store as much hazardous household products as people who live in single family homes. This area needs further investigation.

EVALUATION OF COLLECTION FACILITY SERVICE

The second half of the evaluation was to determine the level of user satisfaction with the two types of collection facilities. The location, days and hours of operation, and quality of service offered were evaluated. The collection facility users were asked to rank the location, the operating hours and the quality of service provided at the site on a "excellent", "good", "fair", and "poor" scale.

Satisfaction with Collection Facility Location

A number of factors can influence the public's perception of the convenience of a facility. The distance the user has to drive, the ease of locating the facility, the accuracy of the driving instructions, and the traffic encountered during the trip to the facility, among others, all add up to create the overall impression of convenience. This survey addressed two of these factors; the customers satisfaction with the location and the distance the user traveled to the facility.

The STS Facility received lower ratings for the convenience of location than the Wastemobile facility. The facility was rated "poor" by one third of the users, while only 36% rated it as "good" or "excellent". Only 1% of the Wastemobile users rated the location as "poor" and 78% rated it as "good" or "excellent".

In general, STS Facility users drove farther than the Wastemobile users. Only 18% of the STS Facility users drove five miles or less, 47% drove six to ten miles, while 30% drove more than ten miles. Sixty-eight percent of Wastemobile respondents

drove five miles or less to the site, 23% traveled six to ten miles and only 8% drove more than ten miles.

It was found that at the STS Facility, users were generally less satisfied with the location of the collection center, as opposed to Wastemobile users, regardless of the distance traveled (See Figures 5-11 a & b). Of those that drove five miles or less to the STS Facility, only 24% rated the location as "excellent" and 52% rated it as "good". At the Wastemobile site, however, 79% of those driving five miles or less rated the facility location as "excellent" and 27% rated it as "good".

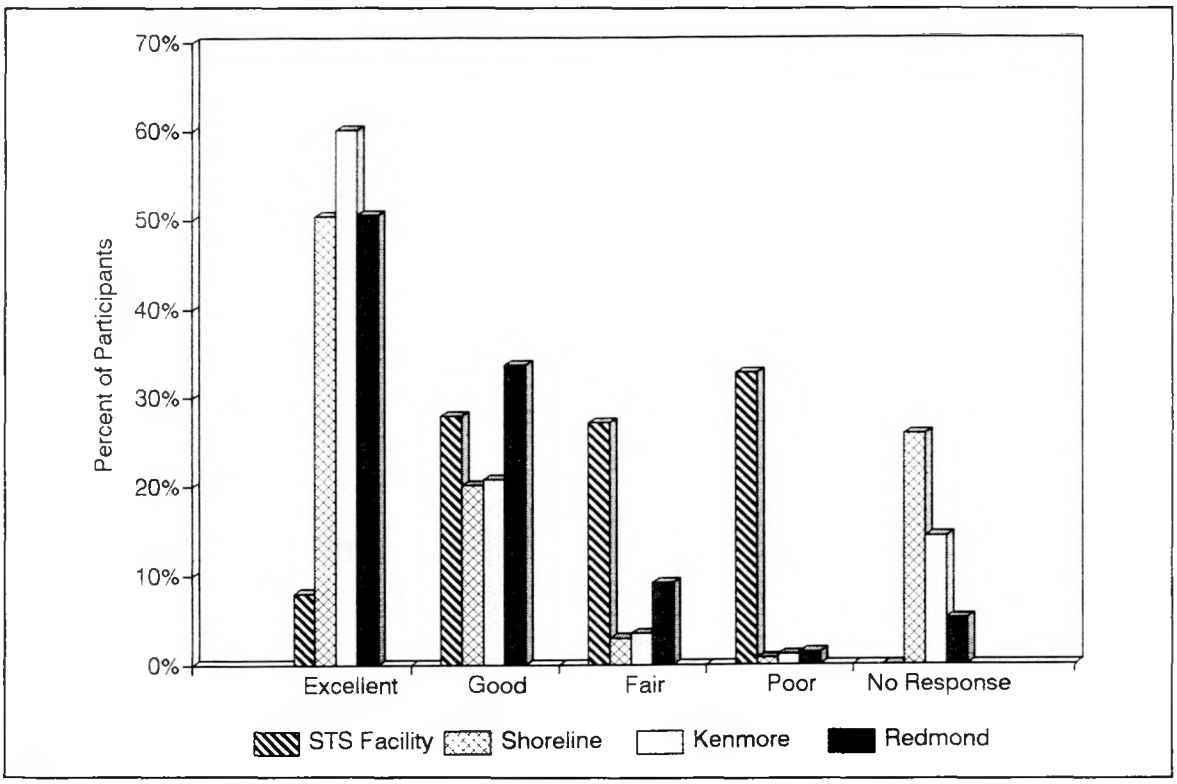

Figure 5-11a: Satisfaction with Facility Location

This indicates that other factors may have influenced the STS Facility users' perception of the convenience and satisfaction with the location. It is very possible that the STS Facility was difficult for users to locate at the South Transfer Station. The facility is located at a temporary site until construction on the permanent site is completed. The temporary site takes advantage of existing access roads, but is not designed for public access and is not clearly signed. The South Transfer Station itself is located in an industrial section of the city, not typically traveled by the majority

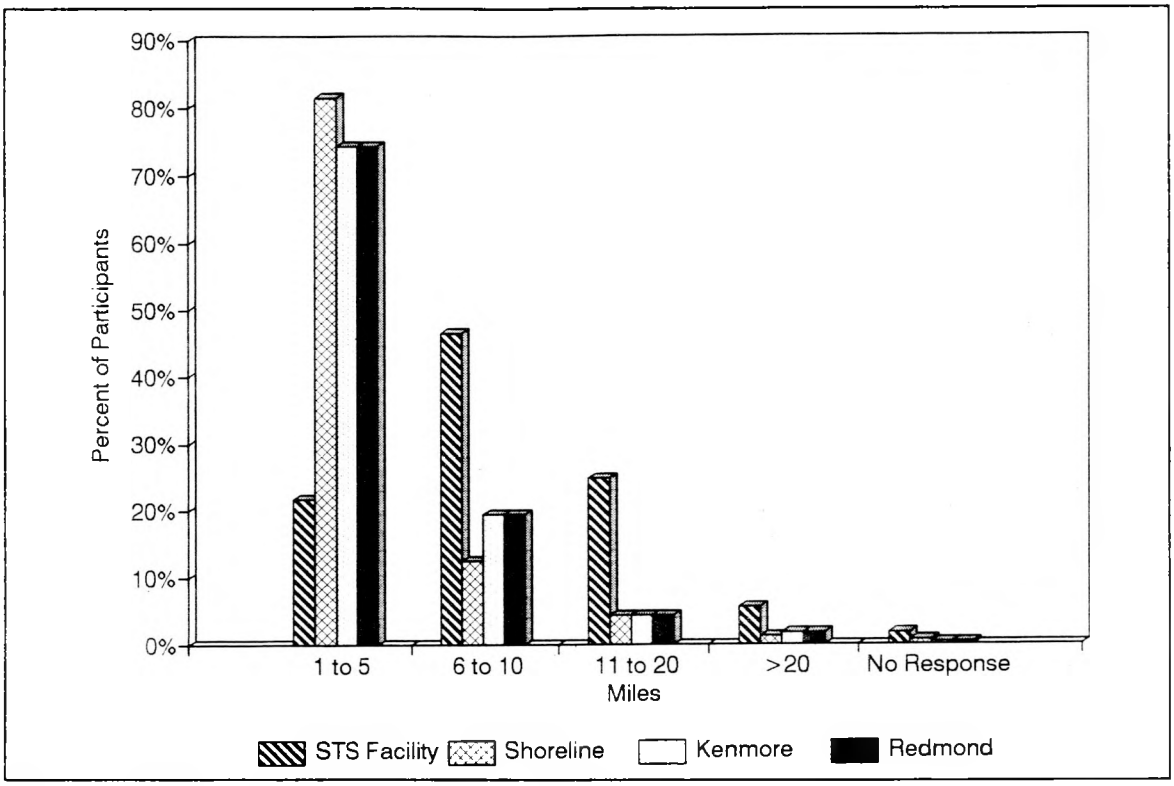

Figure 5-11b: Distance Traveled to Facility

of city residents. The combination of these two factors may lead to a good deal of confusion and frustration and may limit the desire to use the site.

The Wastemobile facilities were located in residential communities where publicity was targeted to residents within a ten mile radius. As a result, the facility was relatively close, most of the users were somewhat familiar with the neighborhood, and they had little difficulty locating the site. The distance respondents had to drive to the facility and the ease of finding the facility are two important considerations in siting a collection facility.

STS Facility survey respondents were asked to give their preference for the location of future stationary facilities; 39% of the respondents noted that the North Seattle area would be more convenient. Roughly 34% of the users at the STS Collection Facility reported living in north King County. This indicates that a large number of users are traveling from North Seattle, a distance of six to ten miles, to dispose of their HHW. It also indicates that they prefer the facility to be near where they live. Support for this theory is found in the level of use of the wastemobiles.

Facility Days and Hours of Operation

The Wastemobile facility was advertised as being open on Thursdays and Fridays, noon to 7:00 p.m., and Saturdays from 10:00 a.m. to 5:00 p.m. These hours have stayed constant for all the Wastemobile sites. The hours and days of operation at the STS Facility vary, depending upon the season. The transfer station typically experiences a decrease in participation during the fall and winter months. In order to operate efficiently, the STS Facility adjusted the operating hours to accommodate this decrease in usage.

The Wastemobile users rated the days and hours of the facility operation higher that the users at the STS Facility. Forty-seven percent felt the Wastemobile operating hours were "excellent" while only 12% rated the STS Facility "excellent". Only 4% rated the Wastemobile as "fair" or "poor" while 55% did so at the STS Facility.

It seems that as long the Wastemobile facility was open as advertised, the users were fairly satisfied with the operating hours. The flyers distributed for the Wastemobile publicity campaign clearly stated the days and hours, but some of the newspaper articles referred the reader to the Hazards Line for more information. When the times of operation were missing from the publicity, the respondents noted they would like to see the information provided in the article, rather than having to make an additional phone call. Several Wastemobile users also commented that they would like to have the facility open earlier than 10:00 a.m. on the weekends.

Several of the STS Facility survey respondents noted that the times were not well documented and that it was confusing to have the STS Facility keeping different hours than the transfer station.

Satisfaction with the Quality of Service

Two staff are on-site at the STS Facility during operating hours to assist the customers. The HHW is unloaded from the vehicle by the site personnel and is placed on a cart and wheeled into the sorting area, as the customer fills out a User Release Form. Users were asked to rate and/or comment on this service (Figure 5-12). The quality of service was rated "good" or "excellent" by 64% of the respondents, 38% rated "fair". None of the respondents noted that the quality of service was "poor" and very few comments were volunteered.

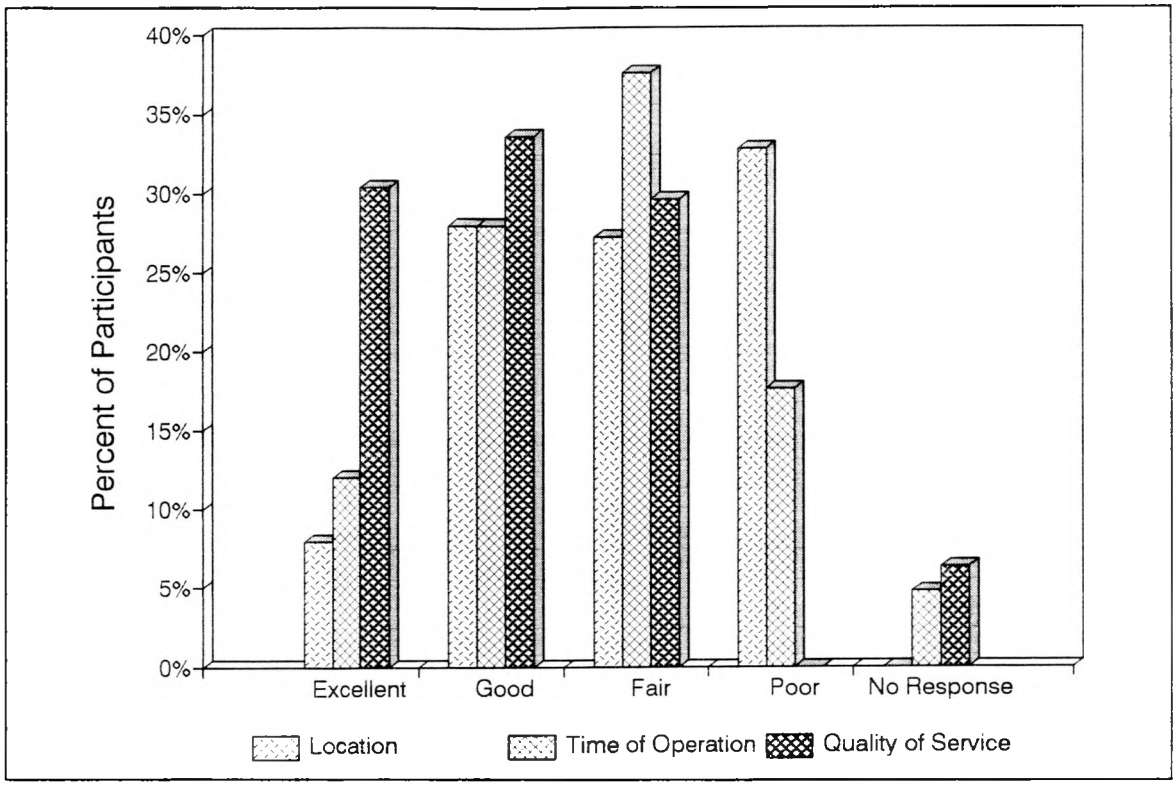

Figure 5-12: Satisfaction with the Quality of Service at the STS Facility

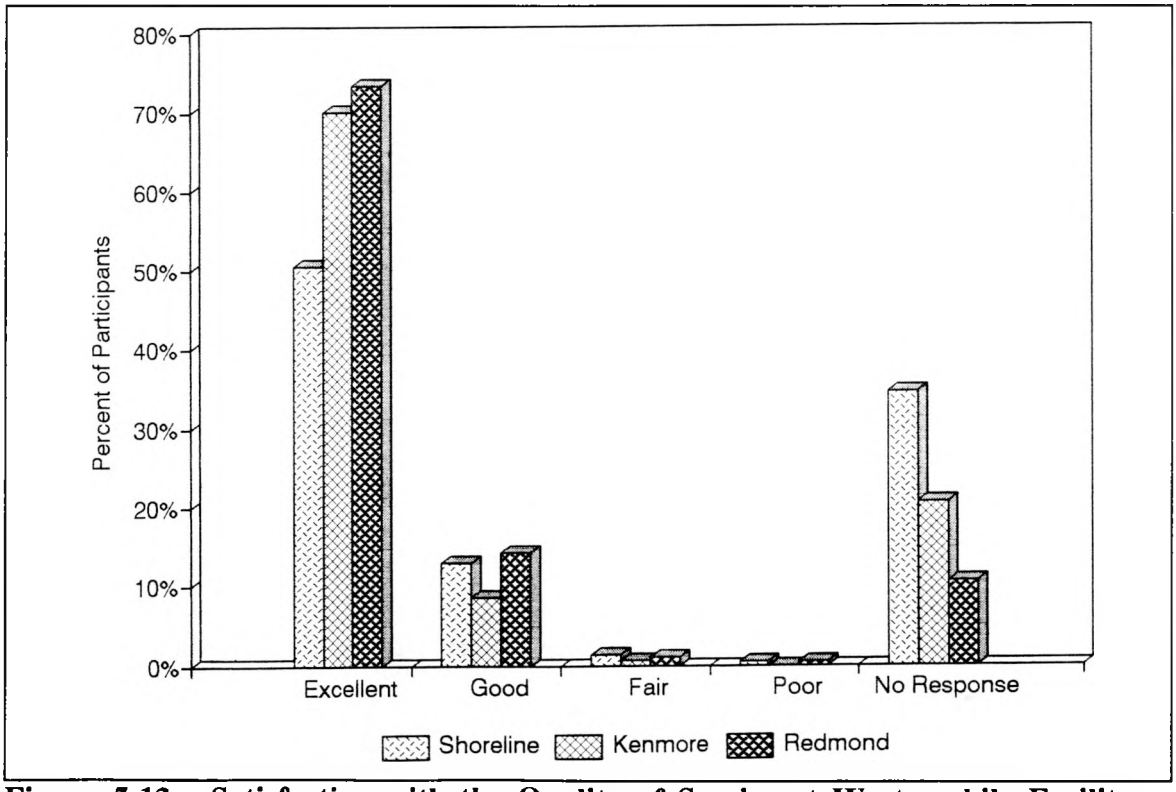

Figure 5-13: Satisfaction with the Quality of Service at Wastemobile Facility

The Wastemobile Facility followed similar unloading and waste handling procedures. The main difference was that, due to the high volume of users at the Wastemobile Facility, a line often formed, even though the facility was set up to unload two vehicles at a time. Even after waiting in line, users reported they were satisfied with the service. The majority of Wastemobile users rated the facility as "excellent" and only 13% rated it less than "excellent" (Figure 5-13).

Level of Service

The STS Collection Facility is the only stationary collection facility open all year round to customers. Users were asked if they thought this level of service was adequate. Forty-nine percent of the survey respondents agreed that it was while 46%

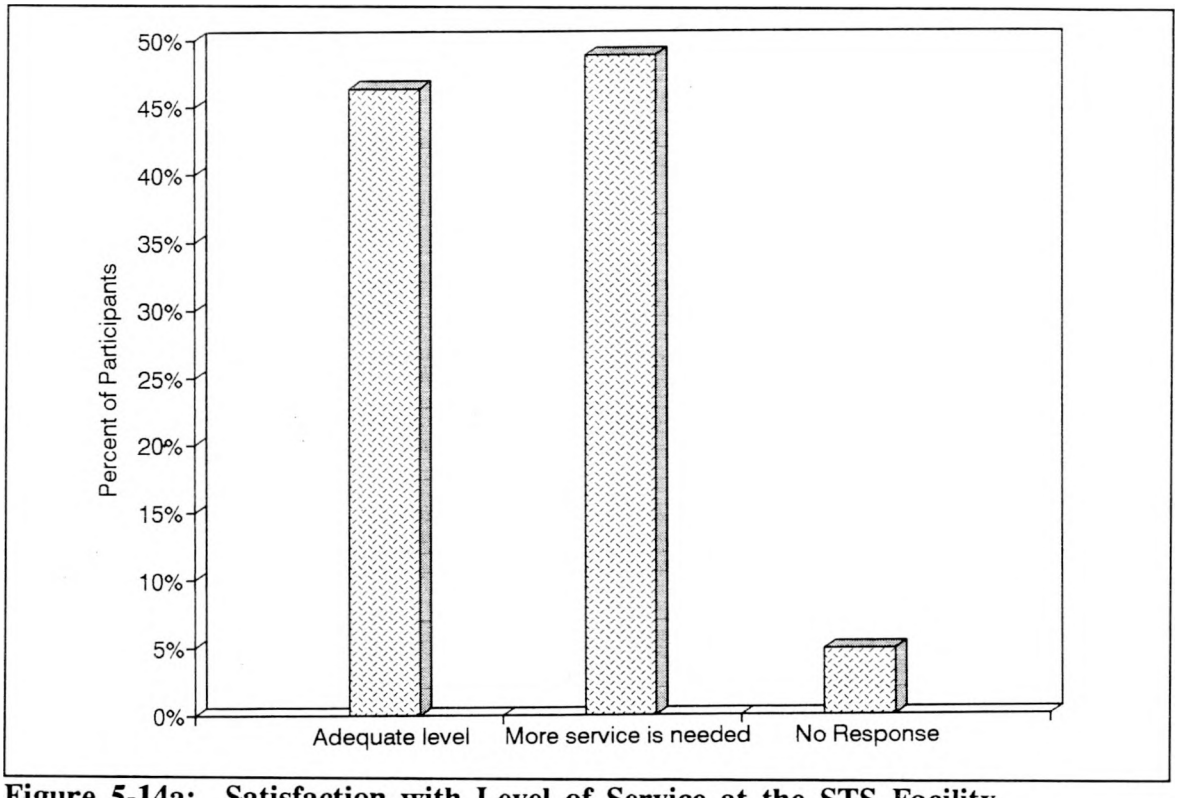

Figure 5-14a: Satisfaction with Level of Service at the STS Facility

said that more services were needed (Figure 5-14a). Twenty-four percent of the users felt that they would use the facility "only once" and 23% said they would use it "once

every two years". Fifty-one of the respondents indicated that they would like to have the service available at least once a year (Figure 5-14b).

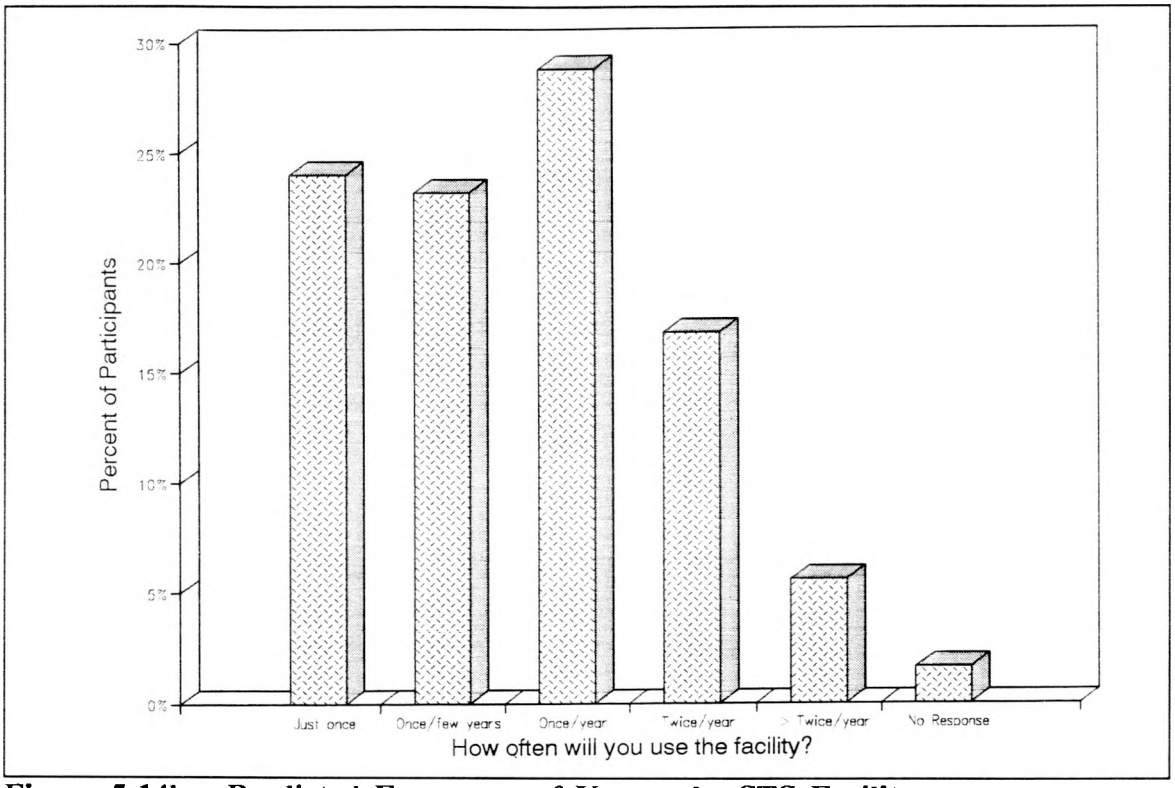

Figure 5-14b: Predicted Frequency of Use at the STS Facility

It seems that half of the users would like to see more services available and half are likely to use the facility at least once a year. The other half intends to use the service sparingly and are satisfied with the current level of service. The users who indicated they would like to see more services available might be those who have traveled from the north end of the county and would like to have a closer facility available.

The Wastemobile users were asked if they thought that having the Wastemobile in or near their neighborhood twice a year was an adequate level of service. The majority of respondents, 66%, indicated that they felt this was the right level of service. Only 6% felt more service was needed (Figure 5-15a). The majority of users, 63%, said they would use the Facility once or twice a year (Figure 5-15b). Only 10% felt they would use the service more than twice a year. This indicates that the majority of users are satisfied with the current operating schedule.

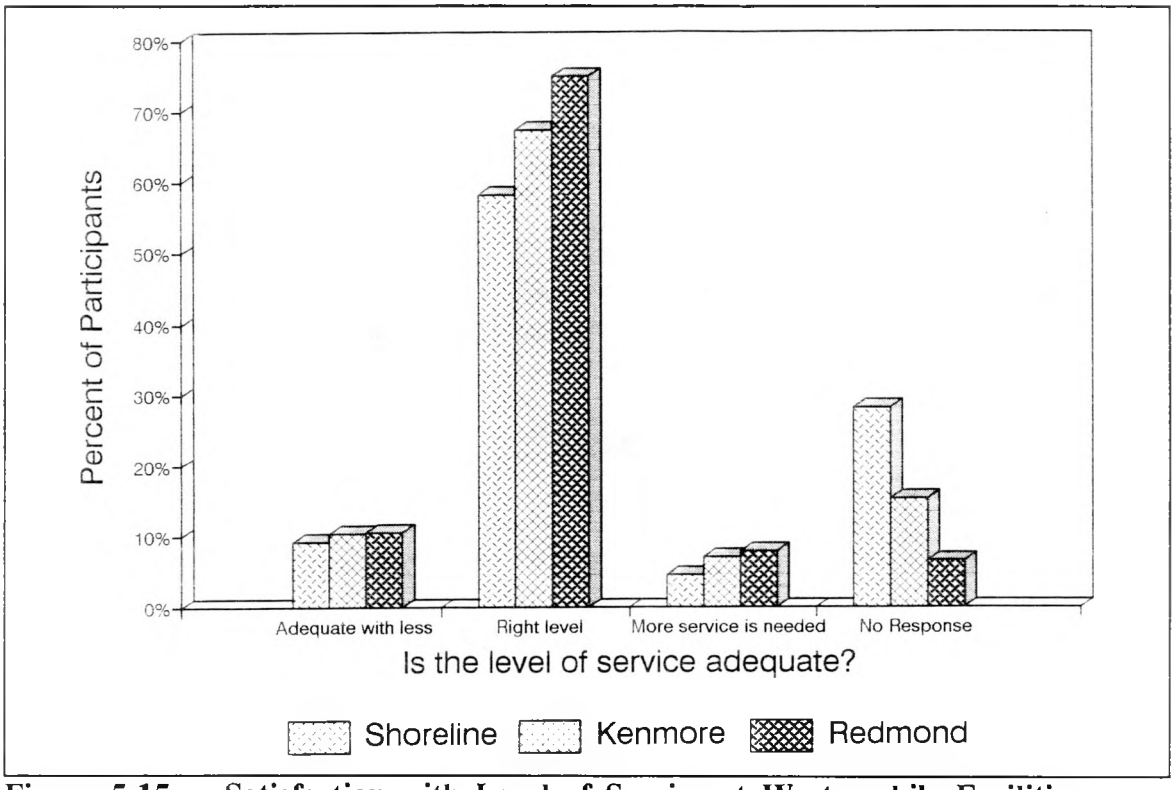

Figure 5-15a: Satisfaction with Level of Service at Wastemobile Facilities

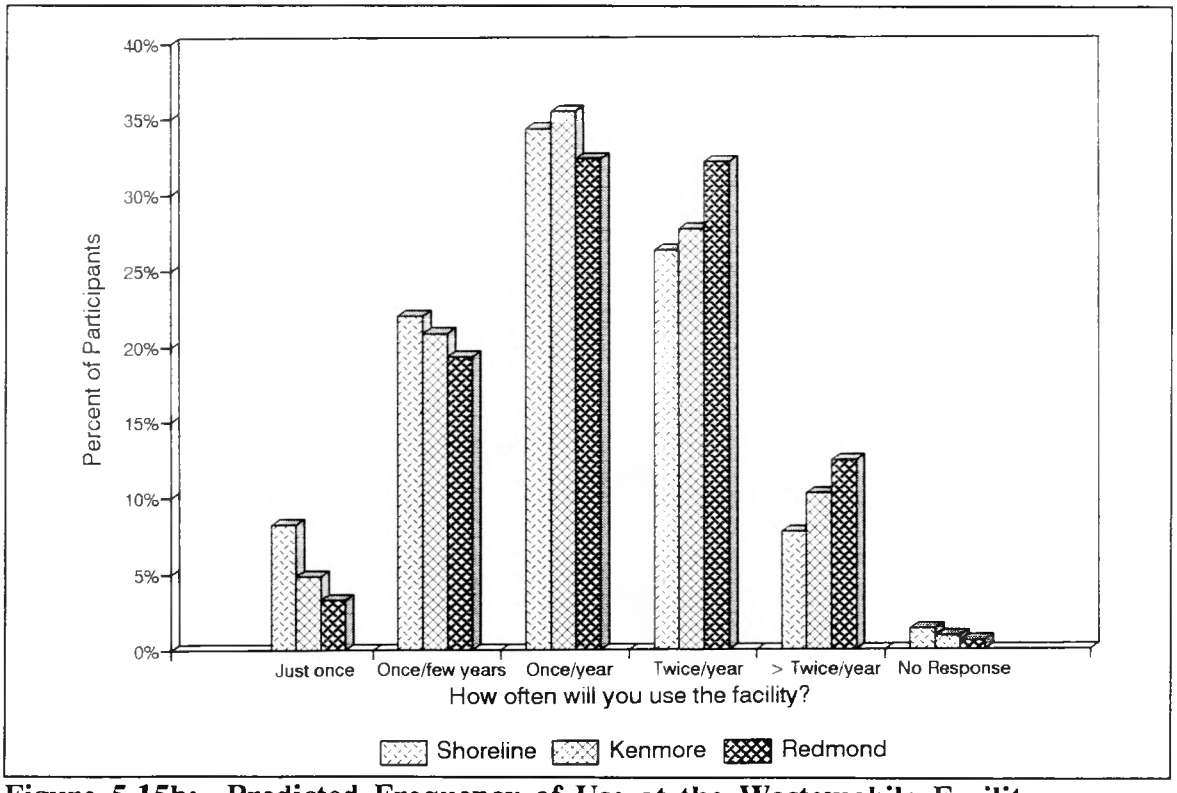

Figure 5-15b: Predicted Frequency of Use at the Wastemobile Facility

CONCLUSION

Wastemobile users indicated they were satisfied with the service offered by the facility. The majority of users rated the publicity as adequate, and judging from the participation levels, it has proved to be effective. The news releases seemed to be the most effective publicity tools, even when the articles were fairly short and appeared on the inside pages.

Utility bill inserts were also an effective publicity tool as well. It was interesting to note that the separate inserts elicited more participation that the printed utility bills. It was also found that the flyers sent home with school children did not elicit as large a response as those mailed home with utility bills.

The convenience provided by locating the Wastemobile in the neighborhood seems to be a major draw. Customers were not required to drive great distances, were familiar with the area, and had little difficulty locating the facility. The customers reported they were satisfied with the days and hours of the operations, and felt the service at the site was excellent.

STS Facility users reported a lower level of satisfaction with the publicity and the convenience of the facility. Two factors seemed to be primarily responsible: the facility was at a location which was difficult for users to find; and the facility operates on a seasonal schedule, without providing adequate notification of changes in days and hours of operation to potential users.

Locating the facility at the transfer station, had an unexpected benefit: the largest number of STS Facility users in 1989 were referred by transfer station personnel. It is probable that the individuals who were referred to the STS Facility by transfer station personnel would have otherwise disposed of the HHW with solid waste.

By providing the HHW collection service, a safe, alternative disposal option was provided, and the HHW was effectively diverted from the solid waste stream.

The Solid Waste Utility mailings were effective in increasing the number of participants at the STS Facility. To judge the effectiveness of mailings, it is recommended that another mailing be sent out in early spring when people are gearing up for the traditional spring cleaning and yard maintenance and are more likely to

make trips to the transfer station. Periodic mailings should include a year-long schedule of the days and hours of operation to reduce confusion.

When the permanent site is completed, the problems with the facility location will be partially resolved. The City of Seattle Engineering Department is planning to make some street revisions in the South Park area, although construction will not be completed for several years. Eventually, this should make the facility easier for customers to locate.

At this time, the siting of another stationary HHW Collection Facility is being conducted in the North Seattle area. This additional service should provide a more accessible disposal option for customers who traveled from North Seattle to dispose of their HHW at the south transfer station.

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APPENDIX

SURVEY

Users of the STS and Wastemobile facilities were asked to fill out a survey regarding their use of the facility. The survey form consisted of one sheet of paper with questions on both sides. The front side of the form asked questions about the source of information, distance traveled to the facility, and expected frequency of use. Demographic questions were listed on back side of the form. It was apparent, after the first week of the survey, that many participants were not completing both sides of the form. Because the survey was attached to a clipboard, many people did not notice that the questions continued onto the back side of the form. Because of this, the Shoreline site survey, the first to be conducted, had a large number of "no responses". In the weeks following, the facility staff made a special point of informing the participants that the questionnaire continued onto the back side of the page.

One question was worded differently on the STS Facility form and the Wastemobile Facility form. The STS Facility users were asked if "they felt more collection facilities were needed to provide them with an adequate level of service". The response options were "yes" or "no". The Wastemobile survey was worded to let the people know what the level of service was expected to be; "the Wastemobile will be in or near your community for two weeks every six months" and then asked, "How do you feel about this level of service?". Respondents were given the options "this is

the right level of service", "more service is needed" or "it would be adequate if less service were provided".

The remaining questions were identical on both survey forms. Users were asked if they felt the facility was convenient and to provide information about their level of satisfaction (or dissatisfaction) with certain elements of the service. The customers were asked to rate the "location" of the facility, the "days and hours of operation", and "quality of service" on a scale of "excellent, good, fair or poor". The final series of questions asked for demographic information (age, income, type of residence, and education level).

In addition to the user survey, the customers at the STS Facility were required to complete a User Release Form. This was part of the on-going operating procedures at the STS Collection Facility. The Release form was designed to provide the project managers with information such as zip code, county, referral source, and date of service. This data was used in conjunction with the User Survey data to evaluate the effectiveness of the publicity campaign at the STS Collection Facility.

Waste Quantities

Pages A-10 through A-14 provide the actual waste quantities reported by all jurisdictions for programs described in Chapter 3. All conversions to gallons were based on this information.

HOUSEHOLD HAZARDOUS WASTE COLLECTION FACILITY
SURVEY QUESTIONNAIRE

Date_____

Site_____

We appreciate your help in completing both sides of this survey form. This information will be used to help us plan other Household Hazardous Waste collection services.

1. What is your zip code?_____

2. How did you hear about this Household Hazardous Waste Collection Facility?
   [ ] Hazards Line
   [ ] word of mouth
   [ ] radio or TV
   [ ] community meeting
   [ ] newspaper
   [ ] flyer
   [ ] utility billing
   [ ] other_____

3. Were you provided with adequate information about what to bring, when and where?
   [ ] yes
   [ ] no
   Do you have any suggestions for improving the information or the way it is distributed?_____

   _____

   _____

4. How far *did* you drive today to dispose of your household hazardous waste?
   [ ] 1 to 5 miles
   [ ] 6 to 10 miles
   [ ] 11 to 20 miles
   [ ] more than 20 miles

5. How many households are represented by this delivery?
   [ ] one
   [ ] two
   [ ] more than two _____ how many?

6. Do you live in a:
   [ ] single family house
   [ ] duplex/triplex
   [ ] apartment building
   [ ] other

OVER

Facility User Survey Form - Side 1

7. How often are you likely to use this collection service?
   [ ] just this once
   [ ] once every few years
   [ ] once a year
   [ ] twice a year
   [ ] more than twice a year

8. The Household Hazardous Wastemobile will be in or near your community for two weeks every six months. How do you feel about this level of service?
   [ ] it would be adequate if less service were provided
   [ ] this is the right level of service
   [ ] more service is needed
   If you feel that more collection services are needed, where would you like to see them provided?

   _____

9. Rate the following in terms of convenience and satisfaction:

	excellent	good	fair	poor
a. facility location in relation to your home:	[ ]	[ ]	[ ]	[ ]
b. days and hours of operation:	[ ]	[ ]	[ ]	[ ]
c. quality of service provided at this site:	[ ]	[ ]	[ ]	[ ]

10. Your additional comments:

Thank You!!

Facility User Survey Form - Side 2

Survey Results
South Transfer Station

Respondents		STS Facility	%
1.	How did you hear of the site?		
	Phone Referrals	450	21%
	Word of Mouth	336	16%
	Radio/TV	0	0%
	Newspaper	191	9%
	Flyer/Utility Bill	193	9%
	NTS/STS	713	33%
	Other (Round ups, Drive bys)	290	13%
	TOTAL	2,174	100%
2.	Were you provided with adequate info?		
	Yes	87	70%
	No	34	27%
	No Response	125	100%
	TOTAL	125	100%
3.	How far did you drive?		
	1 to 5	27	22%
	6 to 10	58	46%
	11 to 20	31	25%
	More than 20	7	6%
	No Response	2	2%
	TOTAL	125	100%
4.	How often are you likely to use this collection service?		
	Just once	30	24%
	Once/few years	29	23%
	Once/year	36	29%
	Twice year	21	17%
	More than twice a year	7	6%
	No response	2	2%
	TOTAL	125	100%
5.	Do you feel more facilities (perm - STS) are needed to provide you with adequate service?		
	Adequate level	58	46%
	More service is needed	61	49%
	No Response	6	5%
	TOTAL	125	100%
6.	Rate the following in terms of convenience and customer satisfaction:		
	a. facility location		
	excellent	10	8%
	good	35	28%
	fair	47	38%
	poor	22	18%
	no response	11	9%
	TOTAL	125	100%

Respondents		STS Facility	%
	b. days and hours of operation		
	excellent	15	12%
	good	35	28%
	fair	47	38%
	poor	22	18%
	no response	6	5%
	TOTAL	125	100%
	c. quality of service		
	excellent	38	30%
	good	42	34%
	fair	37	30%
	poor	0	0%
	no response	8	6%
	TOTAL	125	100%
7.	Do you live in a:		
	Single-family home	95	76%
	Apartment building	8	6%
	Duplex/triplex	9	7%
	Other	4	3%
	No Response	9	7%
	TOTAL	125	100%
8.	Annual Household Income?		
	Less than 15k	4	3%
	$15 - 25k	23	18%
	$26 - 40k	40	32%
	$42 - 55k	23	18%
	More than $55k	18	14%
	No Response	17	14%
	TOTAL	125	100%
9.	Education		
	Grade School	2	2%
	High School	21	17%
	Some College	34	27%
	Undergraduate Degree	31	25%
	Graduate Degree	23	18%
	No Response	14	11%
	TOTAL	125	100%
10.	Age		
	Less than 21	0	0%
	21 - 30	18	14%
	31 - 45	50	40%
	46 - 60	29	23%
	Over 60	13	10%
	No Response	15	12%
	TOTAL	125	100%

Survey Results
Wastemobile

	Shoreline	%	Kenmore	%	Redmond	%
1. How did you hear of the site?						
Phone Referrals	31	7%	35	8%	40	11%
Word of Mouth	50	11%	17	4%	18	5%
Radio/TV	11	3%	10	2%	7	2%
Newspaper	213	49%	143	33%	194	53%
Flyer/Utility Bill	66	15%	222	51%	105	29%
NTS/STS	0	0%	0	0%	0	0%
Other (Round ups, Drive bys)	66	15%	10	2%	4	1%
TOTAL	437	100%	437	100%	368	100%
2. Were you provided with adequate information?						
Yes	322	74%	414	95%	322	88%
No	81	19%	19	4%	37	10%
No Response	34	8%	4	1%	9	2%
TOTAL	437	100%	437	100%	368	100%
3. How far did you drive?						
1 to 5	356	81%	325	74%	161	44%
6 to 10	54	12%	85	19%	153	42%
11 to 20	19	4%	19	4%	49	13%
More than 20	5	1%	7	2%	4	1%
No Response	3	1%	1	0%	1	0%
TOTAL	437	100%	437	100%	368	100%
4. How often are you likely to use this collection service?						
Just once	36	8%	21	5%	12	12%
Once/few years	96	22%	91	21%	71	19%
Once/year	150	34%	155	35%	119	32%
Twice/year	115	26%	121	28%	118	32%
More than twice a year	34	8%	45	10%	46	13%
No Response	6	1%	4	1%	2	1%
TOTAL	437	100%	437	100%	368	100%
5. How do you feel about the current level of service provided by the Wastemobile?						
Adequate with less	40	9%	45	10%	39	11%
Right level	254	58%	294	67%	276	75%
More service is needed	20	5%	31	7%	29	8%
No Response	123	28%	67	15%	24	7%
TOTAL	437	100%	437	100%	368	100%

	Shoreline	%	Kenmore	%	Redmond	%
6. Rate the following in terms of convenience and customer satisfaction:						
a. facility location						
excellent	220	50%	263	60%	186	51%
good	88	20%	91	21%	124	34%
fair	13	3%	15	3%	34	9%
poor	3	1%	5	1%	5	1%
no response	113	26%	63	14%	19	5%
TOTAL	437	100%	437	100%	368	100%
b. days & hours of operation						
excellent	178	41%	229	52%	173	47%
good	111	25%	115	26%	145	39%
fair	14	3%	10	2%	16	4%
poor	3	1%	0	0%	3	1%
no response	131	30%	83	19%	31	8%
TOTAL	437	100%	437%	100%	368	100%
c. quality of service						
excellent	221	51%	306	70%	270	73%
good	57	13	38	9%	53	14%
fair	6	1%	3	1%	4	1%
poor	2	0%	0	0%	2	1%
no response	151	35%	90	21%	39	11%
TOTAL	437	100%	437	100%	368	100%
7. Do you live in a:						
Single family home	304	70%	364	83%	337	92%
Apartment building	6	1%	5	1%	2	1%
Duplex/triplex	6	1%	1	0%	3	1%
Other	8	2%	3	1%	6	2%
No response	113	26%	64	15%	20	5%
TOTAL	437	100%	437	100%	368	100%
8. Annual Household income?						
Less than $15k	25	6%	20	5%	9	2%
$15 - 25k	78	18%	51	12%	40	11%
$26 - 40k	93	21%	106	24%	100	27%
$41 - 55k	54	12%	100	23%	89	24%
More than 55k	61	14%	83	19%	98	27%
No response	126	29%	77	18%	32	9%
TOTAL	437	100%	437	100%	368	100%
9. Education						
Grade School	2	0%	2	0%	2	1%
High School	60	14%	46	11%	43	12%
Some College	77	18%	107	24%	70	19%
Undergraduate Degree	82	19%	96	22%	107	29%
Graduate Degree	97	22%	119	27%	126	34%
No response	119	27%	67	16%	20	5%
TOTAL	437	100%	437	100%	368	100%

	Shoreline	%	Kenmore	%	Redmond	%
10. Age						
Less than 21	1	0%	4	1%	0	0%
21 - 30	16	4%	26	6%	15	4%
31 - 45	114	26%	134	31%	158	43%
46 - 60	77	18%	101	23%	94	26%
Over 60	117	27%	108	25%	80	22%
No response	112	26%	64	15%	21	6%
TOTAL	437	100%	437	100%	368	100%

WASTE QUANTITIES REPORTED

San Bernardino County, California
HHW Program
July, 1988 to June, 1989

Waste Type	Waste Quantity
Labpacked Acids, Pesticides, Oxidizers Alkilies, Poisons and Flammable Liquids	109 55-gallon drums
Latex Paint (bulked)	39 drums
Oil Base Paint (bulked)	75 drums
Oil Base Paint w/PCB's (bulked)	21 drums
Waste Oil	19,210 gallons
Car Batteries	388
Other Batteries (Non-household)	683 lbs.
Mercury	50 lbs.

King County Wastemobile
Waste Stream Breakdown
September 28, 1989 - March 24, 1990

	Total Pounds	
	Fourth Quarter 1989	First Quarter 1990
Latex Paint	39,523	32,867
Pesticides	11,701	10,962
Oil Based Paint	49,137	52,845
Acids	5,504	5,344
Bases	5,671	4,760
Aerosol Paint	2,204	2,483
Aersol Pesticide	284	339
Automotive Oils	46,187	42,112
Solvents	17,395	14,910
Antifreeze	2,919	3,550
Auto Batteries	12,088	13,560
Pentachlorophenol	901	1,136
Oxidizers	976	1,517
Other	2,233	2,468
Quarter Totals:	196,723	188,853

Six Month Total: 385,576 lbs.

City and County of San Francisco
HHW Collection Facility
Labpacked Waste
January, 1988 to January, 1989

WASTE CLASS	WASTE VOLUME (GAL.)	DRUM VOLUME (GAL.)	PERCENT of TOTAL WASTE RECYCLED or REUSED
Flammable Solids	699	3,780	-
Organic Poisons	313	1,420	-
Inorganic Bases	224	1,160	-
Aerosols	165	900	-
Organic Bases	144	770	-
Dioxin Precursors	144	495	-
Household Cleaners	130	495	-
Inorganic Acids	102	585	-
Neutral Oxidizers	33	100	-
Organic Acids	23	100	-
Inorganic Poisons	10	200	-
Heavy Metals	1	20	-
Organic Peroxides	1	20	-
Batteries (1 gal. each)	192*		.6
TOTALS:	2,181	10,045	.6%

*Batteries were stored in plastic tubs until picked up.

City and County of San Francisco
HHW Collection Facility
Bulked HHW
January, 1988 to January, 1989

WASTE CLASS	WASTE VOLUME (GAL.)	DRUM VOLUME (GAL.)	PERCENT (of TOTAL) WASTE RECYCLED or used for fuel
Oil Base Paint	4,744	5,170	17
Water Base Paint (fuel)	2,850	2,850	9
" " "(recycled)	1,000	1,000	3
Solvents, Thinners	1,576	3,965	13
Antifreeze	48	115	.4
Sulfur	41	60	-
Used Oil	N/A	7,525*	24
TOTALS:	10,259	20,685	66.4%

*Oil was bulked in a large tank.

City of Bellingham
Quantity of Waste Collected
by Waste Stream
1989

Waste Type	Total Wt.*/Vol.
ORM - A	1000 lbs. (1)
Poison B	1500 lbs. (1)
ORM - E	500 lbs. (1)
Oxidizers	500 lbs. (1)
Flammable Liquids	110 gal.
Antifreeze	440 lbs.
Total:	(1): Lab pack

Town of Southold, New York
Waste Quantities Reported 1989

Oil Base Paint/ Paint Related	7 bulked drums
Flammable Liquids	14 (1)
Flammable Solids	4 (1)
Poison Liquids	2 (1)
Poison Solids	3 (1)
Compressed Gas	4 (1)
HH Batteries	11 (1)
Aerosols	4 (1)
Acid Liquids	2 (1)
Alkali Liquids	1 (1)

(1) = Lab pack

CITY OF BELLEVUE
HOUSEHOLD HAZARDOUS WASTE ROUNDUP
April-June 1989

69 vehicles 137 162 74 236 67

	4/1			4/15			5/6			5/20			6/3			6/17			DISPOSED
	DM	G	P	DM	G	P	DM	G	P	DM	G	P	DM	G	P	DM	G	P	AT
Discarded bases in labpack	1	14		2	30		1	5		1	6		1	11		1	7		NWES
Discarded acids in loosepack	1	4		1	5		1	15		1	5		1	6		1	2		NWES
Latex paint (non-hazardous)	9	200		13	20		17	540		8	225		34	610		11	347		ESI (D-Series)
Chlorinated solvents	1	25																	ENSCO
Chlorinated solvents in loosepack				1	25		1	55		1	50		2	90		1	1		ENSCO
Poison B, solid in loosepack	1		15	2		150	3		150	2		250				1		250	CSSI
Aerosol solvents in labpack	1	1		2	50		3	100		1	25		3	190		1	15		SYSTEC
ORM-E's in loosepack				1	20								6	300					ESI (API)
ORM-E's (solid) in loosepack	1		50							1		40				4		950	ESI (API)
Oil	2	100		5	225		6	330		5	245		7	350		1	50		NWES
Paint in loosepack	9	168		17	430		25	790		2	70		14	310					ESI (D-Series)
Batteries in loosepack	1		60	5		750	5		1500	2		400	5		1550	1		400	EPC
Poison B, liquid	2	15																	CSSI
Gasoline				1	20														NWES
Solid bases in loosepack				1		100													NWES
Antifreeze (non-hazardous)				1	20								1	55		1	20		NWES
Oxidizers in loosepack				1	1					1	3		1	10					NWES
Unknown household hazardous waste																			NWES
Poison B solid, dioxin bearing waste in loosepack				2		100										2		50	CSSI
Poison B liquid, dioxin bearing waste in loosepack				1	25		1	4		1	7		1	55		1	9		CSSI
Poison B, liquid in loosepack				5	100					2	20					1	20		CSSI
Flammable pesticides in loosepack							3	50		1	5		2	60		2	10		ENSCO
PCB light ballasts in loosepack							1		10										APTUS
Paint related material in loosepack										4	100		20	390		13	381		ESI (D-Series)
Non-chlorinated solvents in loosepack				1	25											3	24		SYSTEC
	29	527	125	62	996	1100	67	1889	1660	33	761	690	98	2437	1550	45	886	1650	

Page Total:

Drums (DM)	334
Gallons (G)	7496
Pounds (P)	6775

CITY OF BELLEVUE
HOUSEHOLD HAZARDOUS WASTE ROUNDUP
July-September 1989

69 75 101 85 118 133 Vehicles

	7/1			7/15			8/5			8/19			9/2			9/16			DISPOSED
	DM	G	P	DM	G	P	DM	G	P	DM	G	P	DM	G	P	DM	G	P	AT
Discarded bases in labpack	1	4					1	15		1	25		1	1		1	15		NWES
Discarded acids in loosepack				1	2		1	15		1	5		1	8		1	10		NWES
Latex paint (non-hazardous)	12	330		9	280		13	424		14	353		12	406		18	601		ESI (D-Series)
Chlorinated solvents																			ENSCO
Chlorinated solvents in loosepack	1	25								2	80								ENSCO
Poison B, solid in loosepack	1		70	1		40	1		200	2		15	3		300	1		200	CSSI
Aerosol solvents in labpack	3	7		2	50								2	22		2	45		SYSTEC
ORM-E's in loosepack	1	10		6	85		1	30								2	40		ESI (API)
ORM-E's (solid) in loosepack				4		120				1		125	2		45	2		400	ESI (API)
Oil	2	95		3	140		2	85		2	110		2	110		4	185		NWES
Paint in loosepack	4	108								5	134		12	309					ESI (D-Series)
Batteries in loosepack	2		540	2		800	1		450	1		320	1	360		2		500	EPC
Poison B, liquid																			CSSI
Gasoline																			NWES
Solid bases in loosepack																			NWES
Antifreeze (non-hazardous)							1	10								1	25		NWES
Oxidizers in loosepack				1	2											1	1		NWES
Unknown household hazardous waste																			NWES
Poison B solid, dioxin bearing waste in loosepack							1		110	1		50							CSSI
Poison B liquid, dioxin bearing waste in loosepack	1	11		1	5		1	5		2	17		1	8		3	50		CSSI
Poison B, liquid in loosepack	2	10		2	21		1	10					2	25					CSSI
Flammable pesticides in loosepack				1	3					1	3		1	2		1	10		ENSCO
PCB light ballasts in loosepack																			APTUS
Paint related material in loosepack	5	127		10	234		15	448		6	189		8	230		20	633		ESI (D-Series)
Non-chlorinated solvents in loosepack				1	40		1	25					1	50		2	70		SYSTEC
Asbestos										1		2	1		100				ESI
	35	727	610	44	862	960	40	1067	760	40	916	512	50	1531	445	61	1685	1100	

Page Total:

Drums (DM) 270 + 334 = 604 Drums
Gallons (G) 6788 + 7,496 = 14,284 Gallons
Pounds (P) 3777 6,775 = 10,552 Pounds

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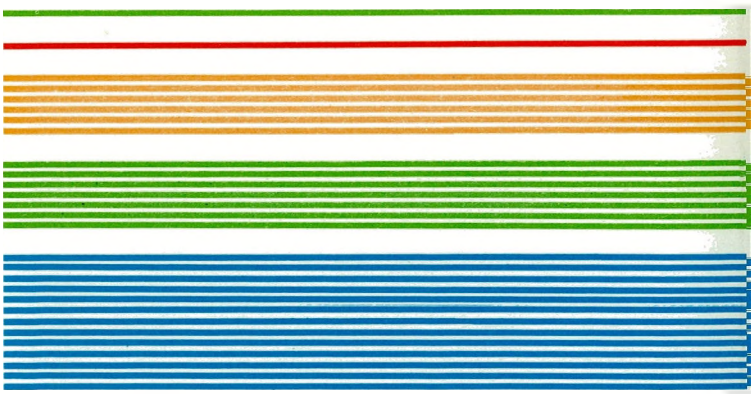

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