City of Seattle

Seattle Public Utilities

FOOD WASTE COLLECTION PILOT PROJECT

Summary Report

Submitted to

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Prepared by

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1 Executive Summary

1.1 Project Overview & Objectives

Food waste comprises the largest single component of Seattle's residential waste stream. Together food and food-soiled paper represent more than 30% of the garbage that Seattle residents dispose. Accordingly, collecting and composting these materials is one of the most significant steps that the City of Seattle could take to reduce the amount of garbage reaching landfills. If these materials can be collected, the food waste can be made into useful compost. Otherwise, food and food-soiled paper will continue to fill valuable landfill space.

To address this issue, as well as meet the City's recycling goals, Seattle Public Utilities (SPU) is considering a citywide food waste collection program for Seattle residents. Over the past five years, the City has been gathering information about the most efficient and customer-friendly way to design the food waste collection program. In the fall of 1994, the City conducted a pilot study in which food waste was collected weekly in a separate container from yard waste.[1] That study helped document the typical amount of food waste that would be set out under several program designs. The previous pilot also demonstrated that such a program is feasible from a customer participation perspective. As follow-up to that study, the City has sought ways to lower the collection costs and prevent the need to add separate collection trucks to residential streets.

The current pilot project was designed to test a different approach in which food waste could be added to Seattle's existing biweekly yard waste collection program. This new system would eliminate the need to reconfigure trucks to handle food waste and prevent adding a separate fleet of trucks dedicated to food waste collection.

The objectives of the pilot study conducted in 2000 included the following goals:

- **Gain Health Department approval.** Health Department authorization is needed for all parts of a citywide food waste program including collection, transfer, and processing. The pilot study assessed the presence of insects, rodents, odors, and liquids along collection routes, at transfer stations, and at the composting facility.
- **Gauge household acceptance.** A phone survey administered at the conclusion of the food waste collection period gathered qualitative information to assess household acceptance of the pilot program.
- **Obtain feedback from collection companies.** The pilot study results included feedback from the City's contracted collection companies. Information such as whether current collection vehicles need modifications to manage liquid content will prove useful if SPU moves forward with implementing a citywide program.
- **Determine potential operational issues** of transferring commingled food and yard wastes. For example, the pilot study examined whether any modifications are necessary at the City's North and South Recycling and Disposal Stations or Rabanco's Third & Lander facility for proper handling of these organic materials.

[1] City of Seattle, *Residential Food Waste Curbside Weighing Study*, June 1995.

1.2 Project Design

Staff from SPU and Cascadia Consulting Group selected more than 400 households for inclusion in the study. The households were located along portions of two garbage collection routes, one in North Seattle and the other in South Seattle. In the first phase of the study, participants in the selected areas were asked to put all food waste and compostable paper into a 22-gallon container provided to the residents. This phase of the study emphasized separating food waste and compostable paper from the rest of household garbage. Instructions provided to residents also suggested that they could add some yard waste to the food waste container as a method for managing odors.

In a second follow-up phase of the study, 50 additional households adjoining the North portion of the primary study area received 96-gallon aerated containers that were specifically designed for the collection of organic materials. In this phase, residents were instructed to use the large bins for their yard waste collection and to add their food waste and compostable paper to the yard waste. In both studies, the garbage haulers collected the food waste, or the combined food and yard waste, and placed it in the yard waste compartment of the truck.

The design of the pilot program began in spring 2000. Postcards were mailed in advance to residents of the study areas informing them of the project. More than a week before the first food waste collection, containers were delivered to residents, along with detailed instructions regarding which materials to put in the cans and a number to call with any questions. The collection events in the primary phase of the study occurred biweekly between July 20 and October 12, 2000. The follow-up study ran from September 28 through December 7, 2000, and pick-ups were again conducted biweekly.

Throughout the collections, field staff observed the process and recorded the incidence of odors, insects, rodents, liquids, and other concerns; these data were made available to the Health Department for its assessment of the program. Following each phase of the study, a phone survey of residents assessed household acceptance of the program and identified potential areas for improving future food waste collection efforts.

1.3 Field Observations: Summary Results

Key findings from the field data gathered during the primary food waste collection pilot study and the follow-up study including the following points:

- **Initially 26% of the 426 residents participated in the primary study, but involvement declined slightly over time.** Overall, 42% of bin recipients set out food waste at least once, while 20 to 25% participated in any given week.
- **In the follow-up study, 45% of residents participated in the first collection, and involvement remained stable over time.** Participation rates ranged between 42 and 49% each week.
- **The 22-gallon food waste containers were seldom full in the primary study.** Nearly half of the 665 food waste bins collected were less than 25% full.
- **Two-thirds of the aerated bins in the follow-up study were more than half full.** The large bins in nearly half of the 146 set-outs were more than three-quarters full.
- **Few residents added yard waste to their 22-gallon containers.** Two-thirds of the set-outs in the primary study contained no yard waste at all.

- **Over 60% of aerated bins in the follow-up study contained more than three-quarters yard waste.** Most participants layered food and yard waste as advised.
- **More than half of the 22-gallon containers included compostable paper.** About two-thirds of North set-outs included paper, compared with about half in the South.
- **Compostable paper was more common in the 96-gallon containers than in the 22-gallon bins.** In the follow-up study, 69% of set-outs included paper in the cans.
- **Most 22-gallon containers contained little or no liquid in the primary study.** The large majority of set-outs contained less than one cup of liquid, and more than a third contained no liquid.
- **Liquid contents were less common in the follow-up study, with 85% of the large containers containing no liquid.** Those 96-gallon bins with liquids rarely contained more than two cups of fluid.
- **Plastics and other contaminants were infrequent in both studies.** Only a few residents included unacceptable materials, such as plastic bags or Styrofoam.
- **Severe odor problems were rare in the primary study.** About a fifth of all set-outs emitted a mild odor, while on some days as many as two-thirds of the 22-gallon containers produced odor. However, odor problems were almost never severe.
- **Odor was much less common in the follow-up study, with no severe odor incidents and only 2% of the aerated bins emitting even a mild odor.** Few odors problems occurred even with the lid open on the 96-gallon containers.
- **Most 22-gallon containers attracted insects in the primary study.** About two-thirds of all set-outs contained insects inside the food waste bin. The incidence of insects around the bins was much less frequent.
- **Insects were less prevalent in the 96-gallon containers, with one-fifth of set-outs having insects inside; only a single aerated bin had insects around it.** In the follow-up study, insects in and around the large container were less common.
- **Peak insect levels correlated with higher temperatures.** The percentage of bins containing insects corresponded with average daily air temperatures over time.
- **Rodent problems were not apparent in either study.** Almost no evidence was found of rodents in or around the 22-gallon bins or the 96-gallon containers.
- **Most containers were upright, with secure lids, before collection in both studies.** The food waste bins were rarely knocked over, and the lids were almost always present and secure on both types of containers.
- **Bin leakage and spills were infrequent in both studies.** Incidents of liquid leaks and solid spills were minimal with both container types.
- **Most bins were clean or only moderately soiled in the primary study.** After collection, the 22-gallon containers were most often moderately soiled.
- **The majority of the 96-gallon containers were clean after collection, and 90% were clean or only moderately soiled.** In the follow-up study, the aerated bins in 63% of all set-outs were considered clean after collection.

1.4 Phone Surveys: Summary Results

The phone survey of residents conducted at the conclusion of each phase of the food waste collection pilot study yielded additional results. The following findings focus on the primary study survey, and significant differences found in follow-up study are noted.

- **"Too messy/smelly" was the most common reason for not participating, but many reportedly did not take part because they already composted their food waste or did not generate enough to make participation worthwhile.** Additional residents elected not to participate because they reportedly did their own food waste composting or did not generate enough food waste to collect.
- **"Composting makes sense" and feelings of obligation were the most often cited reasons for participating.** Residents were also interested in reducing their household waste as well as decreasing waste in general.
- **Most participants liked reducing their household waste generation and composting, instead of disposing, their food wastes.** These reasons were the top two "likes" that participants reported in the primary study using the 22-gallon bin.
- **The most commonly cited dislike in the primary study was that the process was too messy and smelly, but this response was rare in the follow-up study.** Nearly one-third of participants using the 22-gallon bin expressed this concern.
- **Among participants in the primary study, "messy/smelly" was the most common reason for not participating in all seven collections, but this response was less common in the follow-up study.** Many residents disliked the mess and smell and mentioned these reasons for not participating in all collections.
- **More than half of participants reported no problems with the process; of problems reported, "messy/smelly" was the most common.** Participants in the primary study also noted problems with fruit flies in the 22-gallon containers.
- **Most often, participants had no suggestions for improvement; of suggestions made, more frequent collection and modifying the bin were common.** About one-fourth of primary study participants recommended more frequent collection.
- **Most participants placed food waste in a smaller, intermediate container.** Only one-third placed their food waste directly into the 22-gallon bin in the primary study.
- **A large majority stored the bins outside of their houses.** Most participants stored their collection containers outside the house, in the yard, or in the garage.
- **About half of the participants in each study thought the bin was the right size.** No one in the primary study felt that the 22-gallon container was too small.
- **Most participants felt that the bin was easy to use.** Less than one-fifth of participants in the primary study reported that the 22-gallon bin was not easy to use, and all but one user in the follow-up said that the 96-gallon can was easy to use.
- **More than half of the participants in each study had suggestions to improve the containers, but no consensus was reached.** Recommendations for the 22-gallon bin in the primary study included changing its size, adding wheels, having a more secure lid, and making the container easier to clean.

- **Most participants were satisfied with the information and instructions.** Almost all collection participants answering the phone surveys felt they received clear instructions on which wastes to include in the collection container during the pilot.
- **Of the participants with in-sink garbage disposals, more than half reported that they used their disposals less during the pilot study.** Garbage disposals were more common in the North study area, with the South area representing only one-sixth of those with disposals in the primary study.
- **More than half of participants thought their garbage cans were less full during the pilot.** About 55% of respondents in the primary study believed they had less waste in their garbage cans during the food waste collection project.
- **Of those not already using a micro can, more than half did not think they could reduce their garbage can size through regular food waste collection.** About 13% of respondents in the primary study were already using the City's smallest available garbage can size, the 12-gallon micro can.
- **More than half of all survey respondents in the primary study reported that they were very or somewhat likely to participate in a future food waste collection program. Reported likelihood of future participation was higher among pilot participants as well as in the follow-up study.** In the primary study, 56% of residents said they would be very or somewhat likely to participate in biweekly food waste collection in the future; among pilot participants, the reported levels for future participation rose to 77%.
- **Increasing or changing the frequency of collection could boost participation.** Some respondents in both studies said that increasing or changing the collection frequency could raise their likelihood of participating in future food waste collections.
- **Among potential participants in future collections, about a third would be willing to pay $2 per month to participate.** In the primary study, about 40% in the North study area expressed willingness to pay, more than twice the rate in the South area. Among both participants and non-participants in the collection events in both studies, about one-quarter expressed willingness to pay for food waste collection.

2 Project Design & Methodology

The primary food waste collection pilot study included seven collections every other Thursday from July 20 to October 12, 2000. A subsequent follow-up study using a different collection container overlapped with the last two collections of the primary study, and collections occurred six times every other Thursday from September 28 through December 7, 2000. One collection from each study was transported to Seattle's South Recycling and Disposal Station for Health Department observation. All other collections were transported to the Cedar Grove Compost Facility. Field staff collected the same data from residents participating in both studies, and each study included a phone survey at the conclusion of the collections.

2.1 Primary Study: 22-Gallon Container for Food Waste

In this first phase of the study, a 22-gallon container, described further and pictured in the subsequent *Collection Containers* section, was used to collect food waste from participating households. For the primary study, food waste was collected seven times between July 20 and October 12, 2000, on a biweekly pick-up schedule. Accompanying instructional materials focused on the collection of food waste, rather than other organic materials. Yard waste was mentioned incidentally, as a way to help manage odors, but the literature did not emphasize yard waste collection, as the follow-up study later did.

2.1.1 Primary Study Location: North & South Areas

Staff members from Seattle Public Utilities and Cascadia Consulting Group worked with two waste-hauling companies, Waste Management and Rabanco/U.S. Disposal, to select two routes for the food waste collection pilot project. One route in Waste Management's North service area was selected from an area believed to be middle- to upper-income. The route in the South was intended to represent a lower-income area. Appendix A includes copies of the hauler agreements with both Waste Management and Rabanco/U.S. Disposal.

Cascadia and the haulers selected a section within each route containing approximately 200 households, as specified by the City. Each section typically consisted of one corner of the main collection route (covering an area of about 10 blocks), so that haulers could easily identify the pilot study area during the collection period. Appendix B includes maps of the study areas.

The City selected a portion of Waste Management's Route 4 in the North area and a portion of Rabanco's Route 2 in the South as the two final areas for the food waste collection pilot project. Cascadia staff drove through each section to observe neighborhood conditions and to check for any unusual situations that might adversely affect the pilot program. Cascadia staff also collected U.S. Census data for each section of the routes including median income and household size. Table 2-1 presents demographic data for the two study areas and for the City of Seattle as a whole.[2]

[2] For each census tract block group, the Puget Sound Regional Council (PSRC) provided median income estimates and average household sizes. The PSRC estimates are extrapolations for 1998 based on Census data collected in 1990.

Table 2-1: Average Median Income and Average Household Size for Census Block Groups in Selected Routes

	Census Tract	Block Groups	Median Income	Average Household Size
Seattle	—	—	$31,457	2.22
North 4*	7	4	$40,000	2.75
	7	5	$33,929	2.22
South 2*	118	5	$22,750	3.68
	118	6	$19,044	2.69

The North route was bounded by Northeast 120th Street to the north; Northeast 115th Street to the south; the alley between 17th Avenue Northeast and 19th Avenue Northeast to the west; and 25th Avenue Northeast to the east. In the South, the selected route was bounded by South Kenyon Street to the north; South Cloverdale Street to the south; 46th Avenue South to the west; and Rainier Avenue South to the east.

2.1.2 Collection Containers: 22-Gallon Bin for Food Waste

In an initial meeting of staff members from the City of Seattle, Cascadia, and the waste haulers, Waste Management recommended the use of its 22-gallon container for the food waste collection pilot program. The City had previously approved these cans, manufactured by A1 Products Corporation, for use as micro garbage cans in Seattle's North service area. The black plastic can is rectangular, and it measures approximately 18 inches wide, 15 inches deep, and 25 inches tall. Shown here without its lid, the can features sturdy construction, stability, and a tight-fitting lid. The City's Food Waste Team inspected a sample of the proposed container and approved it for use in the food waste collection pilot program. Cascadia staff also field-tested the can for a two-week period and found it suitable for the pilot study.

2.1.3 Household Participation

The cans were delivered to Waste Management's Recycle America facility where they were stored until distribution to the North and South pilot collection areas during the first week of July. While in storage, Cascadia staff stenciled the following message on each can: "Pilot Food Waste Collection Only." Cascadia, with assistance from the City, also affixed labels to each lid that specified which food and paper products should and should not be deposited in the special food waste collection cans. (Appendix C includes samples of the bin labels).

To introduce residents to the food waste collection pilot project, a mailer was distributed to provide information about the study and encourage them to participate. The text of the mailing emphasized the benefits of participation and the temporary nature of the pilot

effort. Residents of the study areas received the mailing about 10 days before the delivery of the food waste collection bins.

About three weeks after the first collection, follow-up postcards were sent to residents of the study areas. These reminder postcards listed the accepted and prohibited materials and provided another list of collection dates. They also included some advice regarding using paper grocery bags to line the containers and placing some yard waste in the container to reduce odors and mess. (Appendix C includes samples of the mailings sent to households, and Appendix D contains a schedule of the pilot study.)

Approximately two weeks prior to the first food waste collection event, the bins were distributed to the South and North routes. The address of each house was marked on the bin along with a unique three-digit identification number. These identification numbers were used in the data collection process to link the information gathered to each household in the study.

Accompanying each bin, residents received a detailed instruction sheet and a schedule of food waste collection days taped to the container. The instructions described the City's goals for the pilot program and emphasized the benefits of reducing waste and producing valuable compost. The information sheet explained how residents should participate in the pilot program and provided more details on acceptable and prohibited materials for inclusion in the food waste collection. The materials also included a phone number for residents to call if they had questions or experienced problems.

A total of 426 bins were distributed: 210 to the North area, and 216 to the South area. All addresses for multi-family residences and commercial establishments within the study locations were omitted. Additionally, single-family residences that appeared vacant were excluded.

2.2 Follow-up Study: 96-Gallon Container for Food & Yard Waste

In a second stage of the pilot project, a follow-up study was conducted using a different type of waste bins, as described further and shown in the following *Collection Containers* section. This second phase of the study emphasized the collection of food, food-soiled compostable paper, and all yard waste for the two-week period. The follow-up study ran from September 28 through December 7, 2000, and organic waste was collected biweekly six times during this period.

2.2.1 Follow-up Study Location: Extended North Area

To expedite implementation of the expanded pilot project, the City chose to work with only the North service area hauler, Waste Management. After reviewing route maps and inspecting the area, residents in Waste Management's Route 4 were selected to receive the additional containers for the follow-up study. These residents were located across the street and adjacent to the group of houses chosen for the North portion in the primary study.

The follow-up study area was bounded by Northeast 123rd Street to the north; Northeast 120th Street to the south; 20th Avenue Northeast to the west; and 23rd Avenue Northeast to the east (see map in Appendix B). This area was chosen based on its proximity to the existing North route. Collections in the primary and follow-up studies overlapped on two dates (collections 6 and 7 of the primary study and collections 1 and 2 of the follow-up). By selecting regions adjacent to one another, the same truck servicing the North area was able to collect food waste easily from both study groups.

2.2.2 Collection Containers: 96-Gallon Aerated Bin for Food & Yard Waste

The purpose of the follow-up study was to test a larger container specifically designed for the collection of organic materials. Testing these containers involved a modified approach that encouraged residents to combine food, food-soiled paper, and all of their yard waste for each two-week period prior to waste collection. In contrast, the primary study encouraged residents to place some yard waste and compostable paper in their containers to mitigate odors and mess, but the study was not designed to collect large portions of yard waste.

During the planning stages of the pilot study, the City of Seattle learned of a Canadian manufacturer of containers specifically designed for collection of organic materials. This manufacturer reportedly supplies bins for mixed organics collection programs in 11 communities in eastern Canada that serve a total of about 235,000 households. These programs successfully collect food and food-soiled papers as well as yard waste from residents. Like the City's pilot, the Canadian programs recommend wrapping food waste in paper bags and placing food waste between yard waste layers. Using a custom-designed container, the Canadian programs collect the entire mix of organics from residents, including food waste, yard waste, and food-soiled paper.

After considering information on the Canadian programs along with preliminary findings from the City's food waste collection pilot project, SPU's Food Waste Committee elected to expand the current pilot program to include approximately 50 households that would use a container specifically designed for collection of organics.

Initially, the City planned to use containers identical to the ones used in the Canadian program. These containers, manufactured by Schaefer System International Limited, are specifically designed for the collection and storage of residential organic waste. Perforations in the lid and sides provide a steady supply of oxygen to create heat as the bin's contents decompose. These holes also promote aerobic decomposition, resulting in fewer odors and increased water evaporation. Spacer ribs on the inside walls of the container help aerate the bin and prevent the contents from being packed too tightly. A stainless steel grate near the base of the container allows the waste to remain above the liquid collected at the bottom of the bin. The metal grate folds for easy cleaning.

Because the Schaefer containers would have required modifications to the lift mechanisms on their collection trucks, Waste Management staff suggested an alternate container manufactured by Cascade Cart that would be compatible with their existing mechanical lifts. Like the Schaefer model, Cascade Cart's product features ventilation holes in the bin and lid to promote aerobic decomposition and water evaporation, and it includes a "hinged compost plate" to elevate the waste above the bottom of the container. The 96-gallon wheeled container is constructed from study black plastic and has a hinged green lid. The bin also includes a metal bar designed for automated pick-up using a lift on the collection truck. After inspecting a sample container, City staff approved its use in lieu of the Schaefer model.

2.2.3 Household Participation

Following the methodology used in the primary study, about 10 days prior to the distribution of the 96-gallon aerated containers, residents in the follow-up study area received a mailer introducing the program and encouraging them to participate. The mailing defined compostable materials and instructed them to place all of their yard waste, food waste, and food-soiled paper in the special container. Residents were instructed specifically to include all their yard waste in the 96-gallon aerated bin, even if they currently subscribed to the City's regular yard waste collection service.

On September 18th, 10 days prior to the first collection day, the 96-gallon Cascade Cart containers were distributed to residents within the selected region. As in the primary study, an instruction sheet and a reminder postcard were taped to each bin upon delivery. Like in the primary study, the house address and a unique three-digit identifier were marked on each bin. A sticker instead of a stencil was used to identify the container as being part of the organics collection pilot program, and labels were affixed to the lids identifying the materials that should and should not be placed in the bin. (Sample mailers, instructions, and bin labels are included in Appendix C.)

A total of 50 large aerated containers were distributed to residents of single-family homes in the study area. In the distribution process, three households declined to participate and did not want a bin, which Cascadia indicated on the address sheet and selected another residence within the region. Accordingly, the total population for the follow-up study was 53 households.

3 Field Observations – Detailed Results

The food waste collection pilot study occurred during the summer and fall of 2000. Food waste was collected from residents a total of seven times every other Thursday, beginning July 20 and ending October 12, 2000. Six of the collections were transported to Cedar Grove Compost Facility. A seventh collection was first deposited at the City's South Recycling and Disposal Station, so that the King County Health Department could observe any potential problems. For the follow-up study, the waste hauler conducted six biweekly collections of food waste from September 28 through December 7, 2000.

Prior to the collection events, Cascadia coordinated with City staff to identify the data to be gathered during the food waste collection pilot study. During the collection process, a Cascadia staff member rode in the collection vehicle and gathered data from each participating household. A total of 19 observations were recorded per household for each of the seven collections. These observations included the following information:

- whether the bin was knocked over or spilled;
- the fullness of the container;
- if residents included compostable paper, a plastic lining, or yard waste in the bin;
- the amount of liquid; and
- the presence of insects, evidence of rodents, or both.

The data gathered also addressed the collection process, including whether liquid or solid wastes spilled on the ground and the condition of the container after collection. The observation data were recorded by hand in the field on a Scantron form, scanned electronically, and downloaded into a Microsoft Access database. A copy of the Scantron form for field data collection is included in Appendix C.

Following are the field results of the food waste collection pilot that Cascadia and SPU conducted with assistance from Rabanco and Waste Management. This report presents findings from the two phases of Seattle's food waste collection pilot project – both the **primary study** using the 22-gallon bin in both North and South areas as well as the **follow-up study** using the 96-gallon aerated container in an adjoining North area – followed by comparisons between the two studies. Field observation data cited in the text and charts can be found in Appendix E. Note that numbers in graphs may not total to 100 percent due to rounding.

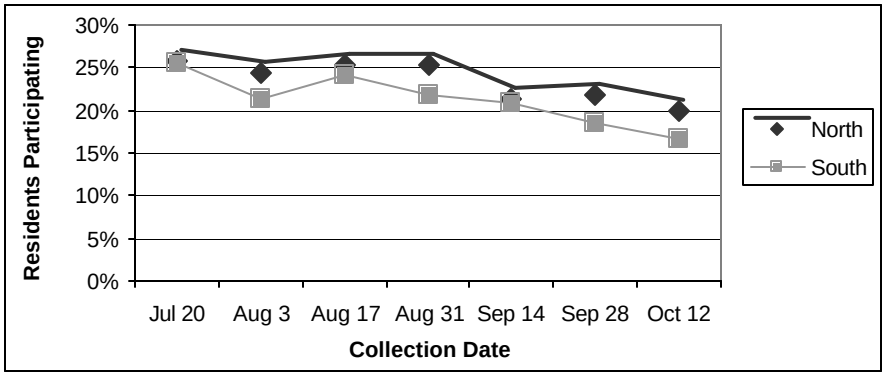
3.1 Participation in Food Waste Collection

➢ *Initially 26% of the 426 residents participated in the primary study, but involvement declined slightly over time.*

Primary Study. In the first week of collection, 109 of 426 bin recipients (about 26%) participated in the pilot project. Through the course of the study, participation fell gradually to 78 residents (about 18% of bin recipients) in the last week. Participation was comparable in both the North and South study areas, with 54 residents (26%) in the North and 55 residents (25%) in the South participating on the first collection date. Participation in the last collection was 42 residents (20%) in the North and 36 (17%) in the South. Figure 3-1 shows the percentage of residents in each area that participated in each collection event.

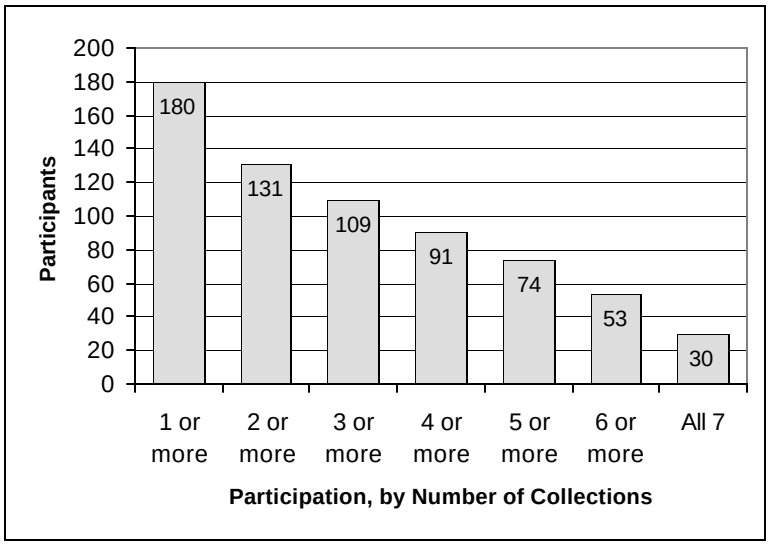
Overall, food waste bins were set out for collection 665 times, with 344 in the North and 321 in the South. These will be referred to as **set-outs**, where one set-out is defined as one resident setting out the food waste bin for collection one time.

Figure 3-1: Percentage of Residents Participating for Each Collection Date in the North and South Study Areas – PRIMARY STUDY



Although only 26% of all residents who received a bin participated in the first collection, 180 residents (42%) participated in a collection at some time during the study. However, 49 of these residents only participated once, while 30 residents participated in all seven collections. Figure 3-2 shows the number of residents who participated in one or more collections. For example, it shows that 180 residents participated in at least one collection, while 30 residents participated in all seven collections.

Figure 3-2: Number of Residents Participating, by Number of Collections – PRIMARY

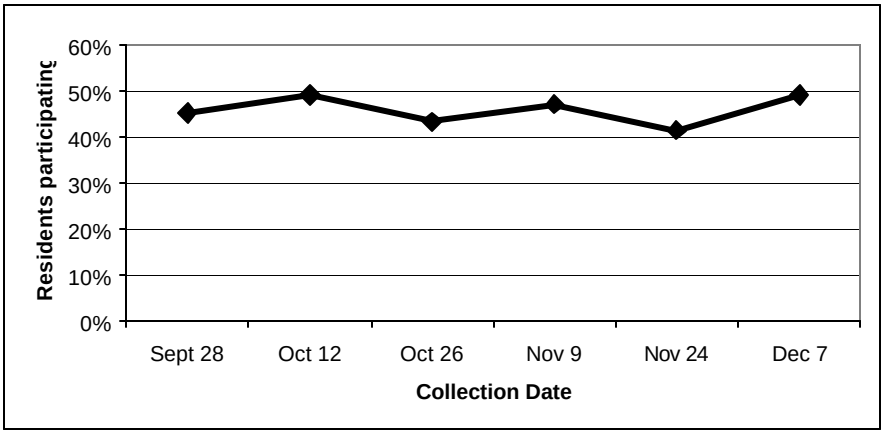


➢ *In the follow-up study, 45% of residents participated in the first collection, and involvement remained stable over time.*

Follow-up Study. Twenty-four residents (about 45% of bin recipients) participated in the first week of collection. Participation remained steady over the course of the six-week pilot, varying from 22 to 26 (42% to 49% of bin recipients) participants per week.

Overall, the 96-gallon containers were set out 146 times for collection. Figure 3-3 shows the number of residents participating in each collection.

Figure 3-3: Number of Residents Participating for Each Collection Date – FOLLOW-UP



Comparisons. Weekly participation in the follow-up study was about twice the level of participation in the primary study. Furthermore, while participation in the primary study slowly declined over time (to 20% in the last North collection and 17% in the South), participation in the follow-up study in the adjoining North area remained consistent at about 45%.

3.2 Contents of Containers

3.2.1 Bin Fullness

➢ *The 22-gallon food waste containers were seldom full in the primary study.*

Primary Study. About 44% of all bins set out were 25% full or less, and about one-fourth of the bins were 26-50% full. Figure 3-4 shows the fullness of bins in the North study area, while Figure 3-5 displays the fullness of bins in the South study area.

Figure 3-4: Fullness of Bins in North Study Area – PRIMARY

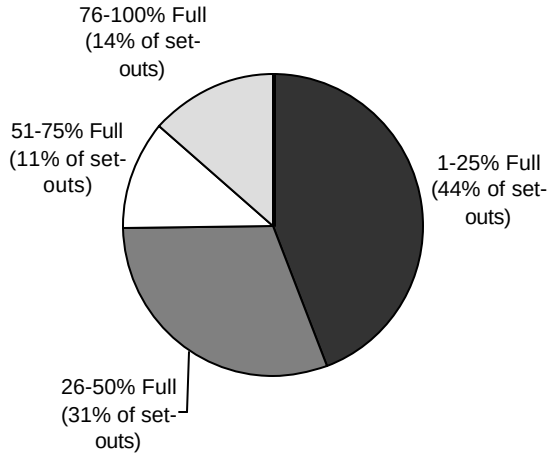
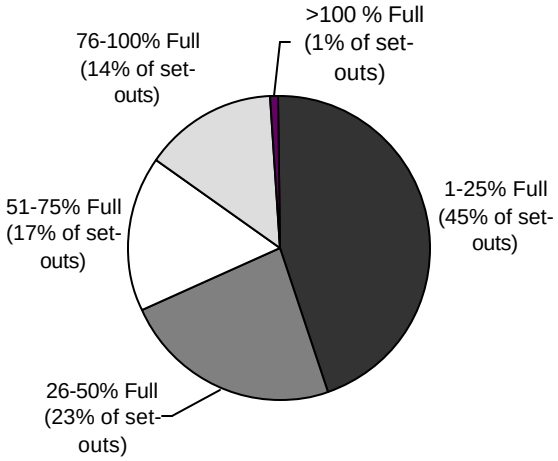


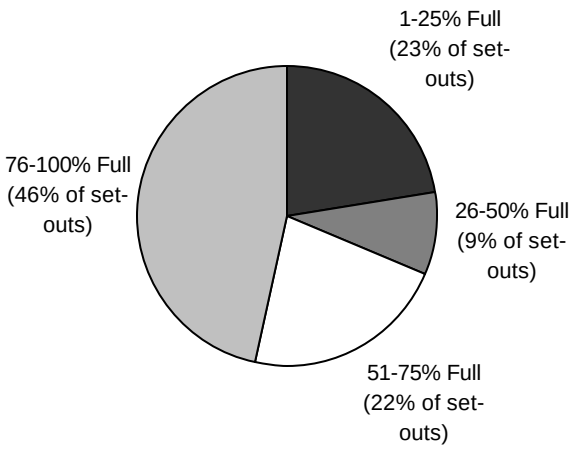
Figure 3-5: Fullness of Bins in South Study Area – PRIMARY



➢ *Two-thirds of the aerated bins in the follow-up study were more than half full.*

Follow-up Study. Nearly half of the large aerated containers set out were greater than 75% full. About a quarter of the bins were less than 25% full. Figure 3-6 shows the fullness of bins.

Figure 3-6: Fullness of 96-Gallon Containers – FOLLOW-UP



Comparisons. Despite their larger size, bins in the follow-up study were generally much more full than bins in the primary study. The 96-gallon aerated containers in the follow-up were most often greater than half full, while the 22-gallon food waste bins in the primary study were most often less than half full. In fact, nearly half of the 96-gallon bins were greater than 75% full, whereas nearly half of the 22-gallon bins in the primary study were less than one-quarter full.

3.2.2 Yard Waste

➢ *Few residents added yard waste to their 22-gallon containers.*

Primary Study. As noted in the previous section, about 15% of the bins in the North and South areas were more than 75% full. Of these 98 full bins, more than a third (38%) included more than 50% yard waste, but 35% of these full set-outs contained no yard waste at all. Of all 665 set-outs, two-thirds contained no yard waste whatsoever in the bin. In nearly one-fifth of all set-outs, yard waste represented more than one-quarter of the contents. Figure 3-7 shows the fraction of bin contents that yard waste comprised in the North study area, and Figure 3-8 shows the fraction included in the South area.

Figure 3-7: Fraction of Yard Waste Included in Bins in North Study Area – PRIMARY

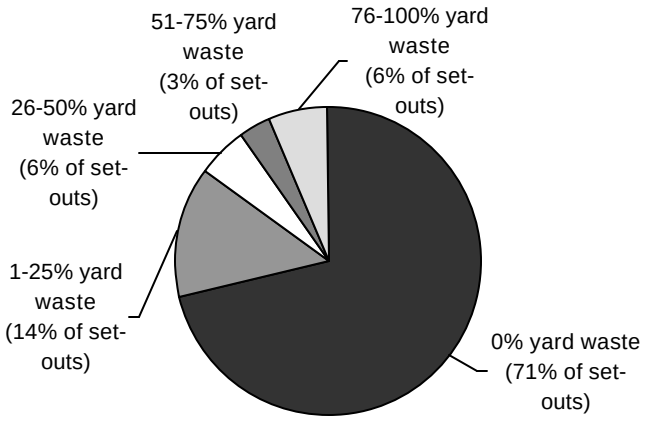
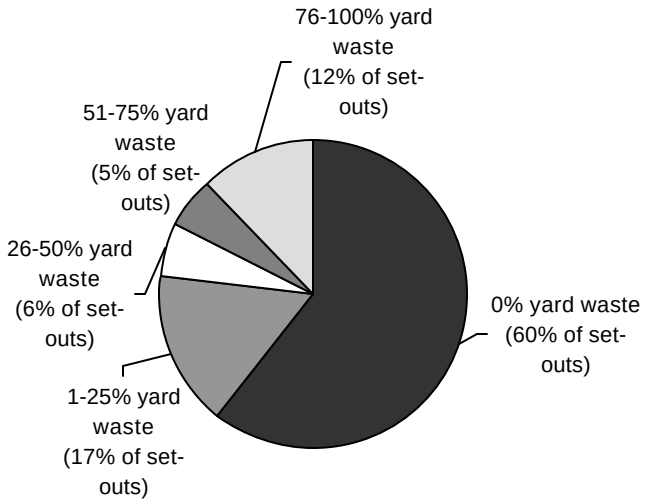


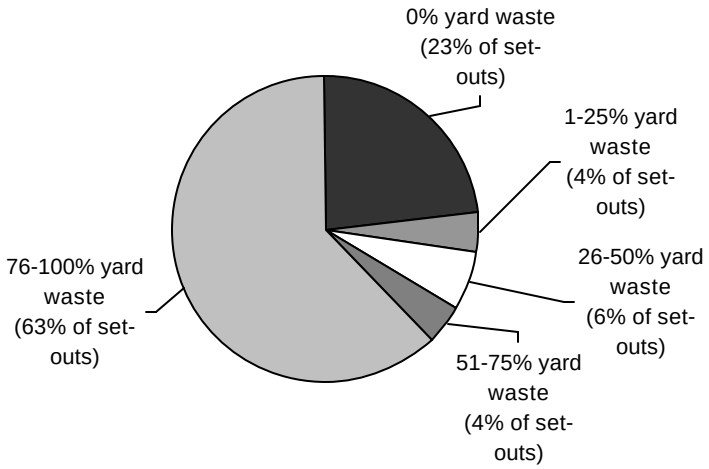
Figure 3-8: Fraction of Yard Waste Included in Bins in South Study Area – PRIMARY



➢ *Over 60% of aerated bins in the follow-up study contained more than three-quarters yard waste.*

Follow-up Study. The contents of the 96-gallon containers most often included a large fraction of yard waste, and most participants followed the recommendation to layer their food and yard waste. The contents of 63% of set-outs were more than 75% yard waste. On the other hand, 23% of set-outs contained no yard waste at all. Field observations did not record the fraction of food waste present in the 96-gallon aerated containers, but anecdotal reports from field staff noted that most bins contained at least some food waste. Figure 3-7 shows the fraction of yard waste included in the 96-gallon containers.

Figure 3-9: Fraction of Yard Waste Included in 96-Gallon Containers – FOLLOW-UP



Comparisons. Containers in the follow-up study contained a significantly larger fraction of yard waste than in the primary study. While the two-thirds of the 22-gallon containers in the primary study included no yard waste, less than a quarter of the aerated bins in the follow-up study contained no yard waste. Of the 146 set-outs in the follow-up study, 63% contained more than three-quarters yard waste.

3.2.3 Compostable Paper

➢ *More than half of the 22-gallon containers included compostable paper.*

Primary Study. Many residents included compostable paper in their food waste bins. In the North study area, 66% of set-outs included some amount of compostable paper. In the South study area, 53% of set-outs did so. While about the same number of set-outs included compostable paper from week to week in both the North and South areas, the percentage of total set-outs including paper increased slightly as total participation tapered. For example, in the first week (July 20), 55 bins contained compostable paper, about 50% of set-outs for that week. During the last week of the primary study (October 12), 54 bins contained compostable paper, about 69% of set-outs.

- *Compostable paper was more common in the 96-gallon containers than in the 22-gallon bins.*

Follow-up Study. Many residents (69% of set-outs) included compostable paper in their food waste bins, and the inclusion of paper remained consistent from week to week. Many residents wrapped their food waste in paper grocery sacks, as the pilot instructions recommended. Field staff noted that compostable paper typically appeared in association with food waste, though the converse was not necessarily true, as not all residents followed the guidance to accompany food waste with compostable paper.

Comparisons. More set-outs contained compostable paper in the follow-up study. In the primary study, the percentage of 22-gallon containers with compostable paper increased over time, as overall participation decreased. The presence of paper remained relatively stable over time in the follow-up study.

3.2.4 Liquids

- *Most 22-gallon containers contained little or no liquid in the primary study.*

Primary Study. Another concern this study addressed was the quantity of liquid in the collection bins. Many bins contained no liquid: 39% of set-outs in the North and 35% of set-outs in the South. But while the percentage of bins containing no liquid was about the same in both areas, bins that did contain liquid generally contained more liquid if they were in the South. For example, the South had nearly twice as many bins containing over one cup of liquid, representing 38% of set-outs in the South, compared to 20% of set-outs in the North.

- *Liquid contents were less common in the follow-up study, with 85% of the large containers containing no liquid.*

Follow-up Study. Few of the 96-gallon bins contained liquid (only 15% of set-outs), and those that did most often contained less than 2 cups. Only 4 set-outs (3%) contained more than 4 cups of liquid.

Comparisons. Liquids did not pose a significant problem in either study, though levels were lower in the large aerated bins used in the follow-up study.

3.2.5 Contamination

- *Plastics and other contaminants were infrequent in both studies.*

Primary Study. Generally, few non-compostable contaminants were present in the bins. However, a few residents included a plastic lining in their food waste bin, even though they were specifically instructed not to do so. Only 1% of set-outs in the North and 6% of South set-outs included a lining. Other contaminants were occasionally present as well, particularly plastic bags and Styrofoam. If possible, the contaminants were removed and placed in the resident's garbage can, but in most cases, the bin was collected without removing contaminants. A note was taped to the outside of the food waste bin thanking the resident for participating and noting the type of contamination.

Follow-up Study. Few residents (only 5% of set-outs) included a plastic lining in their 96-gallon containers.

Comparisons. Contamination levels from plastic, Styrofoam, and other materials remained low in both studies.

3.3 Odors, Insects, and Rodents

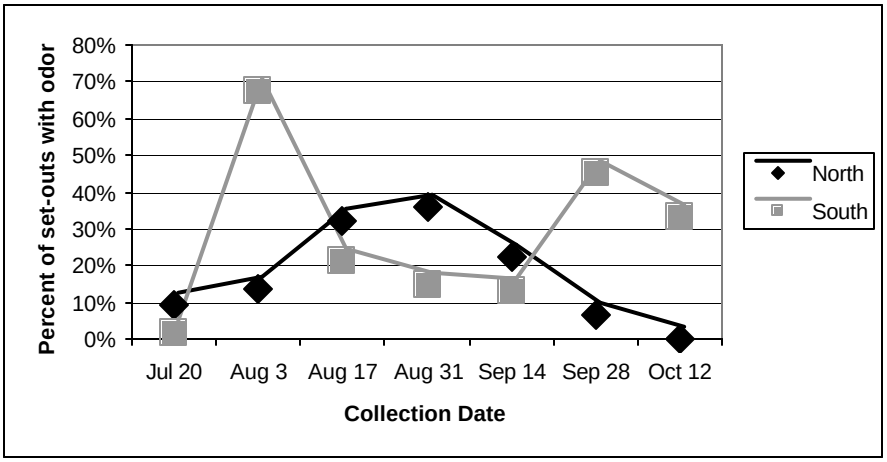
A major concern regarding residential food waste collection is the potential for odors, insects, and rodents in and around the collection bins. Cascadia staff monitored the degree of odor that the bin emitted, the presence of insects in and around the bins, and evidence of rats in and around the bins.

3.3.1 Odor

➢ *Severe odor problems were rare in the primary study.*

Primary Study. Field observations assessed the degree of odor (none, mild, or severe) emitted by the bin with the lid on prior to food waste collection. Bins yielded a severe odor in only three incidents in the North (1% of all set-outs) and nine incidents (3% of set-outs) in the South. Anecdotal information suggests that worse odors were often observed in association with more liquid contents in the bins. Because incidents of severe odor were few compared to overall incidents of odor, Figure 3-10 simply tracks the presence of any odor for each collection date in the North and South. Note that bin odor reached its peak at nearly 40% of set-outs in the North, and in the South odor levels peaked at nearly 70% of set-outs. At present, we lack a sufficient explanation for the nearly inverse trends over time observed in Figure 3-10.

Figure 3-10: Bin Odor for Each Collection Date, in North and South – PRIMARY



➢ *Odor was much less common in the follow-up study, with no severe odor incidents and only 2% of the aerated bins emitting even a mild odor.*

Follow-up Study. Cascadia staff monitored the degree of odor (none, mild, or severe) emitted with the lid on the container. The 96-gallon bins never emitted a severe odor, and they gave off a mild odor in only 3 incidents (2% of set-outs). Furthermore, even with the bin lid open, field staff noticed few odor problems.

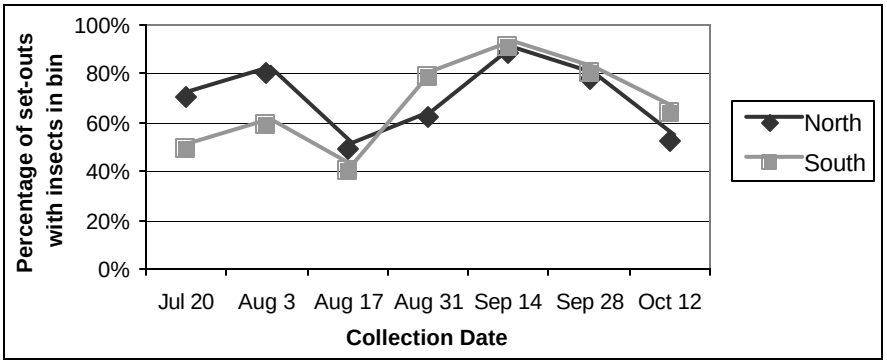
Comparisons. Severe odor was not a problem in either study, but food waste collection containers experienced fewer odor problems in the follow-up study. In the follow-up study, even mild odor was extremely rare, with only 2% of all set-outs emitted even a mild odor, compared with peak levels of 40 to 70% in the primary study.

3.3.2 Insects

➢ *Most 22-gallon containers attracted insects in the primary study.*

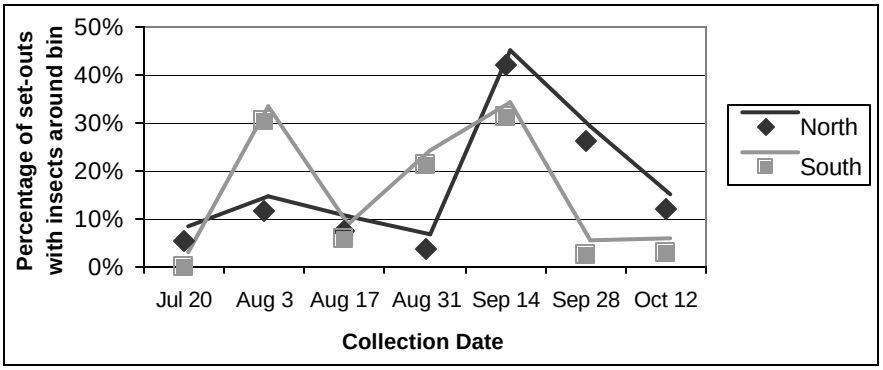
Primary Study. The majority of set-outs contained insects: 69% of set-outs in the North and 65% of set-outs in the South. Figure 3-11 shows the percentage of set-outs with insects in the bin for each collection date in the North and South study areas.

Figure 3-11: Insects in Bin, in North and South – PRIMARY



About half as many set-outs had insects around the bin than had insects inside of the bin. Figure 3-12 shows the percentage of set-outs with insects around the bin for each collection date in the North and South study areas.

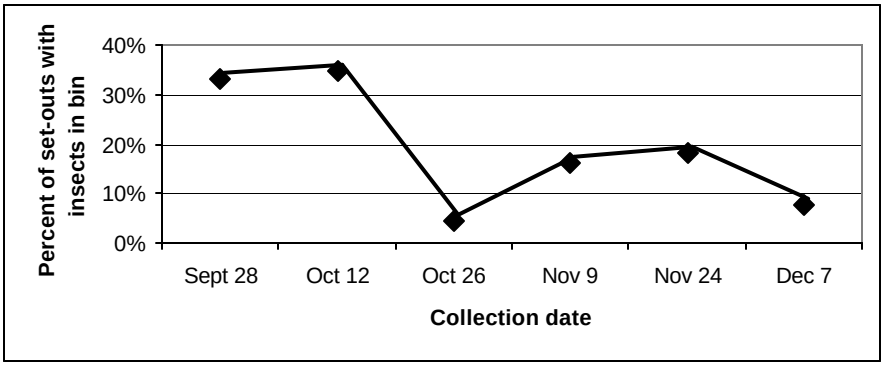
Figure 3-12: Insects around the Bin, in North and South – PRIMARY



➢ *Insects were less prevalent in the 96-gallon containers, with one-fifth of set-outs having insects inside; only a single aerated bin had insects around it.*

Follow-up Study. In only one incident were insects present around the 96-gallon container. However, several bins (19% of set-outs) did contain insects on the inside of the container. Figure 3-11 tracks the presence of insects in the large aerated bins over time.

Figure 3-13: Insects in 96-Gallon Containers, by Collection Date – FOLLOW-UP

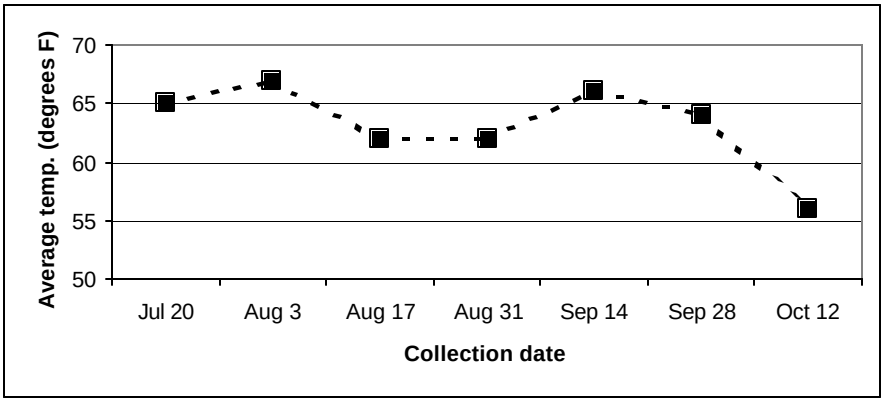


Comparisons. Insects in and around the containers were less common in the follow-up study. About two-thirds of the 22-gallon containers contained insects, while only 19% of the large aerated bins had insects inside. Insects around the container were only observed once in the follow-up study, while more than a third of the 22-gallon containers in the primary study had insects around them. On September 28 and October 12, when the two studies overlapped, the frequency of insects in the 96-gallon containers was about half that of the 22-gallon containers in the primary study.

➢ *Peak insect levels correlated with higher temperatures.*

Primary Study. The trends over time for Figure 3-11 and Figure 3-12 seem to parallel each other. This correlation suggests that some external factor may be influencing the presence and quantity of insects in and around the bins. Figure 3-14 traces the average daily temperature observed at the University of Washington's atmospheric sciences building. The University is located between the two study areas, approximately four miles from the North study area and nine miles from the South study area.

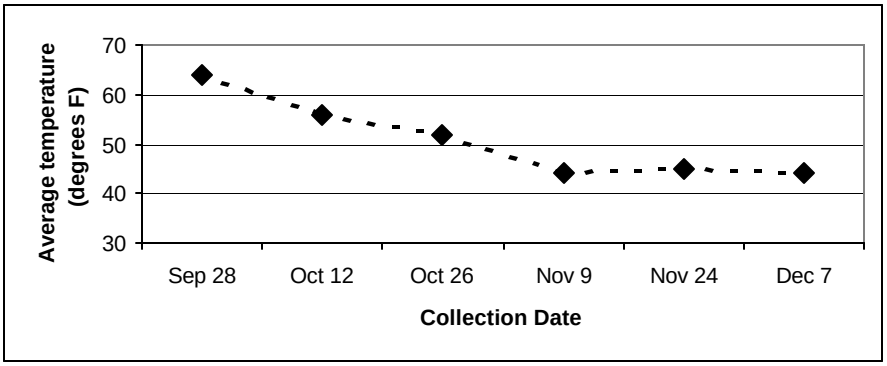
Figure 3-14: Average Daily Temperature
Observed at the University of Washington – PRIMARY



Notice how the trends in average daily temperature closely follow the insect trends in both Figure 3-11 and Figure 3-12. The correlation is especially convincing with the data on insects in the bin, presented in Figure 3-11. Perhaps in the closed bin environment temperature is the most important factor, whereas outside the bin other factors (wind, for example) may also influence the quantity of insects.

Follow-up Study. In the primary study, the presence of insects seemed closely correlated to outside temperature. Figure 3-15 shows the average daily temperature recorded at the University of Washington during the follow-up study. While Figure 3-15 does not seem to show the strong week-to-week correlation between temperature and insects that the previous study displayed, it does show a general cooling trend, comparable to the overall decrease in insects observed in Figure 3-13.

Figure 3-15: Average Daily Temperature
Observed at the University of Washington – FOLLOW-UP



Comparisons. The incidence of insects generally decreased with lower average daily temperatures. Insects levels in the primary study correlated closely with temperature readings. In the follow-up study, general correspondence between temperature and insects was observed, but the correlation was not as striking.

3.3.3 Rodents

➢ *Rodent problems were not apparent in either study.*

Primary Study. Cascadia staff never found rodents in any of the bins, and on only two occasions (both in the South) was there evidence of their presence around the bins. No holes were found chewed in the bins by rodents. However, one resident in the South reported that she had observed rats after putting a rotten chicken in her bin.

Follow-up Study. There was never any evidence of rats around the bins, nor were there any holes chewed in the bins.

Comparisons. Rodents were not a problem in either study. Rodents were never found in food waste bins, nor did rodents chew holes in the bins. Evidence of the presence of rodents was noted on only two occasions in the primary study.

3.4 Collection

Collection of the food waste generally was a clean process that occurred without significant problems or messes.

3.4.1 Bin Stability and Lid Security

➢ *Most containers were upright, with secure lids, before collection in both studies.*

Primary Study. Upon arrival for collection, Cascadia staff noted that the bins were rarely knocked over (only 3 incidents of 665 set-outs). Lids on the bins were almost always secure, with only 9% of set-outs in the North and 3% of set-outs in the South having loose or absent lids.

Follow-up Study. Cascadia staff noted that upon arrival the bins were never knocked over or spilled. Lids on the 96-gallon containers were always secure.

Comparisons. Spills and missing lids were not a significant problem in the primary study, but these issues were nonexistent in the follow-up study using the 96-gallon bin.

3.4.2 Bin Spills

➢ *Bin leakage and spills were infrequent in both studies.*

Primary Study. Liquid leaked in 6% of North collections and 3% of South collections. Solid waste spilled once in the North and never in the South. The one spill in the North occurred as a result of a jerky lift mechanism on a Waste Management truck. The spill consisted of a small amount of lightweight yard waste.

Follow-up Study. Collection of the food waste from the 96-gallon containers generally went smoothly and neatly. Liquid leaked in only one collection. Solid waste spilled in only 8% of bin collections. These spills were the result of a jerky lift on Waste Management's truck and consisted of small amounts of leaves. (A new front-loading Waste Management truck used during the December 7 collection did not encounter these problems, and no solid waste was spilled.)

Comparisons. Liquid leaked in 3 to 6% of collections in the primary study and only once in the follow-up study. Solid waste spilled only once in the primary study, and in 8% of set-outs in the follow-up study, as the result of a jerky lift mechanism.

3.4.3 Bin Cleanliness

- *Most bins were clean or only moderately soiled in the primary study.*

Primary Study. Immediately after collection, bins were categorized as Clean, Moderately Soiled, or Severely Soiled. In general, bins in the North study area were most often Moderately Soiled (48% of all North set-outs), and next often Clean (38% of all North set-outs). Bins were least often Severely Soiled (13% of all North set-outs). However, there were more instances of Severely Soiled bins in the North in the later collections than there were in the earlier collections.

In the South study area, bins were also most often Moderately Soiled (50% of all South set-outs) after food waste collection. Clean bins accounted for 35% of all set-outs and Severely Soiled bins accounted for 15% of all set-outs. In the South, more instances of Severely Soiled bins occurred in the middle part of the study (late August-early September) than in either the beginning or the end of the study.

- *The majority of the 96-gallon containers were clean after collection, and 90% were clean or only moderately soiled.*

Follow-up Study. In general, the 96-gallon containers were most often Clean (63% of set-outs) and next often Moderately Soiled (27% of set-outs). The large aerated bins were least often Severely Soiled (10% of set-outs). However, the number of instances of Severely Soiled bins rose steadily over time, such that during the last collection 27% of set-outs were Severely Soiled. Perhaps this trend indicates an increased amount of caked-on waste material from earlier weeks.

Comparisons. After collection, the 96-gallon aerated containers in the follow-up study were more often rated as "Clean" than the 22-gallon bins in the primary study. However, in both studies the number of dirty bins increased over time, perhaps as a result of caked-on material from earlier weeks.

3.5 Haulers & Transfer Stations

Overall, the collection process appeared to proceed smoothly, both along the truck routes and at the transfer station. The haulers were cooperative, and the food waste collection did not seem to present major challenges for them. However, they generally preferred the semi-automated container used in the follow-up study to the 22-gallon containers used in the primary phase, which required manual dumping.

During the study, Cedar Grove processed the materials into compost, using an aerated static pile composting process within an enclosed portion of their site. Most packer truck loads of commingled food and yard waste were delivered directly to Cedar Grove, though after two collection events (one in each phase of the pilot), loads were first delivered to the Seattle's South Recycling and Disposal Station for Health Department observation. At Cedar Grove, the delivered loads contained food and yard waste from the study areas combined with other yard waste from outside the study site, so the amount of food waste contained in the yard waste was small. Liquids, or leachate, did not appear to present any problems. Seattle Public Utilities staff members are following up with the Health Department regarding approval of future food waste collection efforts.

4 Phone Survey – Detailed Results

4.1 Survey Methods

At the conclusion of the food waste collection period, a telephone survey was administered to the residents of the study area. The objective of the phone survey was to provide feedback from Seattle Public Utilities customers on the pilot program and to assess overall household acceptance of the food waste collection effort. The survey covered such topics as how well the container worked, what aspects of the study participants were satisfied with, and what parts of the program did not work as well.

Cascadia designed the survey instrument with assistance from SPU staff. The survey instrument was designed similarly to the phone survey administered as part of the City of Seattle's prior food waste collection study in 1994. Markets Trends, a marketing firm that specializes in survey research, conducted the phone interviews from October 2000 through January 2001. This report presents phone survey findings from both phases of the pilot project – both the **primary study** using the 22-gallon bin in the North and South as well as the **follow-up study** using the 96-gallon aerated container in an adjoining North area – followed by comparisons between the two studies.

4.1.1 Primary Study Phone Survey

Using a reverse directory, telephone numbers were found for 243 out of the 426 participants (145 of 210 in the North, and 98 of 216 in the South). Also, the City of Seattle was able to provide phone numbers from its records for 35 additional households, for a total of 278 numbers. All phone numbers were called, and numbers were discarded if one of the following criteria applied:

- Phone number was disconnected, a fax number, or otherwise blocked;
- Respondent refused to participate in phone survey;
- Communication barrier (e.g., foreign language);
- Phone survey was terminated before completion (by respondent); or
- Respondent did not recollect food waste study.

These reasons for exclusion are fairly typical, but the uncertainty associated with non-respondents can pose problems in any survey. To minimize potential bias associated with non-response error, however, the City and the consultant team sent reminder postcards and offered incentives to increase participation in the phone survey.

Multiple attempts (at least five) were made for each number before it was considered incomplete. Reasons for incomplete calls after multiple attempts included the following:

- Call back requested or respondent not available;
- No answer, answering machine, or voice mail; and
- Busy signal.

All households that did not initially complete the phone survey were sent a postcard encouraging them to call Market Trends to provide their feedback on the food waste collection pilot study. The subsequent mailing included those households with unlisted

phone numbers, ones that initially refused the survey, and ones with calls deemed incomplete. A second reminder postcard offered the remaining residents $5 cash or a free trip to a transfer station as an incentive for participation in the phone survey. Copies of the postcards are included in Appendix F.

A pre-test of the survey was administered on October 19th to 15 residents. The purpose of the pre-test was to verify the clarity and validity of the questions and to make any adjustments, if necessary. Representatives from Cascadia Consulting Group attended the pre-test and made slight modifications to the survey instrument. The surveys completed during the pre-test were included in the overall survey results.

This summary presents the major findings of a telephone survey of 133 respondents, including both those who participated in the food waste collection pilot study and those who did not take part in the project. A topline report summarizing the survey responses for each question in the primary study appears in Appendix G.

The food waste collection pilot study included a population of 426 households in two different neighborhoods located in North and South Seattle. Phone numbers were obtained for about two-thirds of those households. About half of those households participated in the phone survey, representing 31% of the 426 households. Though the study population was not intended to comprise a random or representative sample of all Seattle residents, the pilot project was designed to yield meaningful data relevant to SPU's single-family customers. These results provide a range of useful information about the survey respondents, though it is important to remember that the margin of error increases when examining smaller subsets of the study population, such as participants in food waste composting or residents of a particular area.

Response bias may also affect the phone survey results, as those who participated in the food waste collection itself were also more likely to participate in the phone survey than those who did not participate in the curbside collection. In fact, 48% of food waste collection participants answered the phone survey, while only 19% of non-participants completed the survey. Reminders were sent and incentives were offered in efforts to increase participation in the phone survey.

A higher percentage of valid phone numbers was obtained for the North area, and that area also had more responses to the phone survey. Of the 133 survey respondents, more than two-thirds (90, or 68%) were in the North area, and slightly less than one-third (43, or 32%) lived in the South area.

4.1.2 Follow-up Study Phone Survey

Like the primary study, the follow-up pilot study using the 96-gallon container for food and yard waste collection also included a subsequent phone survey of residents in the study area. The phone survey for the follow-up study followed similar methods to the primary study described above. Appendix H includes the phone survey instrument and topline report for the follow-up food waste study.

The phone survey of the follow-up study consisted of only 20 bin recipients. In contrast, the primary study phone survey included 133 bin recipients (90 from the North area, which adjoined the target area for the follow-up study). As a result of this size discrepancy, results are not statistically comparable. The small sample size also magnifies differences, as each respondent represents 5% of the phone survey population in the follow-up study. Accordingly, many results are presented according to the number of respondents (of 20) rather than as percentages to minimize the potential

for error in extrapolating from these survey results to a larger population. As the survey results allow, this chapter presents data from the primary study, observations from the follow-up study, and comparisons between the two phone surveys. Also, numbers in graphs may not total to 100 percent due to rounding.

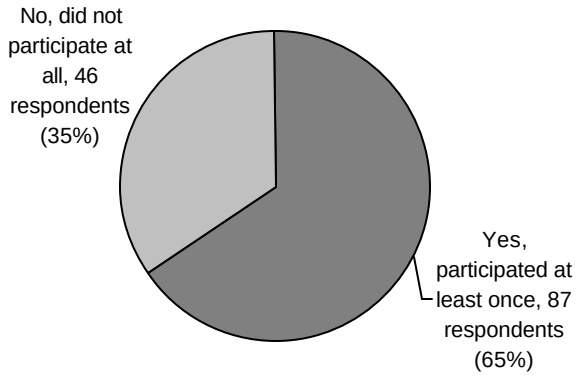
4.2 Participation in Food Waste Collection

4.2.1 Reported Participation

Primary Study. Of the 133 survey respondents, nearly two-thirds (87, or 65%) stated that they set out food, yard, and/or paper waste in the 22-gallon food waste collection container for pick-up at least once during the pilot study. About one-third (46, or 35%) of phone survey respondents did not participate in the food waste collection pilot project. Figure 4-1 shows the participation levels graphically. The distribution between the North and South areas of survey respondents who participated in food waste collection is similar to the breakdown noted above for all 133 survey respondents: two-thirds (58 of 87 participants, or 67%) in the North and one-third (29, or 33%) in the South.

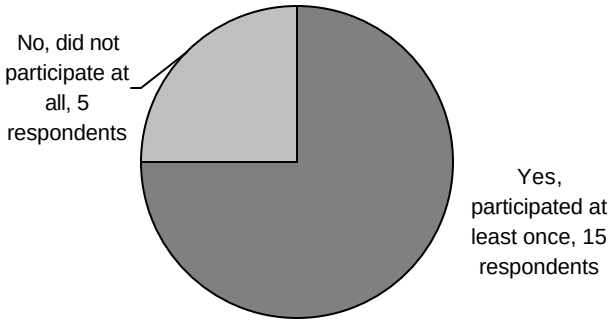
As noted previously in the field observations, of the 426 households in the study area, 180 participated in at least one food waste collection event. Of those 180 collection participants, 87 also participated in the phone survey. The 87 residents that participated in both the phone survey and one or more collections represent 65% of 133 survey respondents and 20% of the households in the study area. The phone survey also obtained responses from 46 of the 246 households that did not participate in any of the seven food waste collection events. The 46 residents who answered the survey but did not participate in food waste collection represent 35% of all survey respondents and 11% of the study population.

Figure 4-1: Participation (at least once) in Food Waste Collection, among Phone Survey Respondents [n=133] – PRIMARY



Follow-up Study. Three-quarters of the survey respondents (15 of 20) stated that they set out food, yard, and/or paper waste in the 96-gallon food and yard waste collection container for pick-up at least once during the pilot study period. These residents will often be referred to simply as "participants." Figure 4-2 shows participation graphically.

Figure 4-2: Participation (at least once) in Food and Yard Waste Collection, Among Phone Survey Respondents [n=20] – FOLLOW-UP



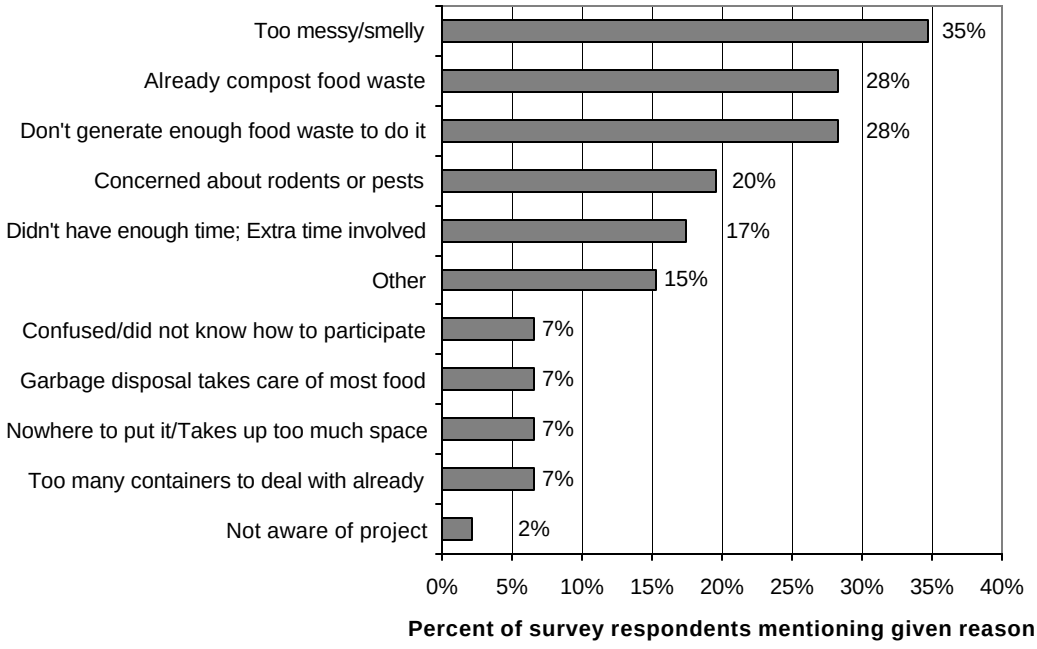
Comparisons. In the primary study, 65% of phone survey respondents participated in at least one food waste collection event, compared to 75% in the follow-up study. More than half of the surveyed participants in each study did not participate in all seven or six of the collection events, respectively.

4.2.2 Reasons for Not Participating

- *"Too messy/smelly" was the most common reason for not participating, but many reportedly did not take part because they already composted their food waste or did not generate enough to make participation worthwhile.*

Primary Study. Survey respondents who did not participate in the food waste collection pilot program mentioned several reasons for not participating (multiple responses were allowed). Overall, the most frequently mentioned reason (mentioned by 16 of the 46 non-participants, or 35%) for non-participation was that the process was too messy and/or smelly. The next two most commonly mentioned reasons (each with 13 responses among the 46 residents, or 28%) were that the resident already composted or did not feel he or she generated enough food waste to make participation worthwhile. Figure 4-3 shows the frequency of these and other reasons mentioned for not participating in the food waste collection pilot.

Figure 4-3: Reasons Given by Phone Survey Respondents for Not Participating in Food Waste Collection [n=46] (multiple responses allowed) – PRIMARY



Follow-up Study. The five survey respondents who did not participate in the food and yard waste collection pilot mentioned several reasons for not participating (multiple reasons were allowed). One respondent said that the process was too messy or smelly. One resident was not aware of the project, and another responded mentioned that the household already composted its food waste. The respondent who already composted was aware that the pilot project could collect materials such as meat, dairy, and paper products, which are not easily composted at home, but still elected not to participate.

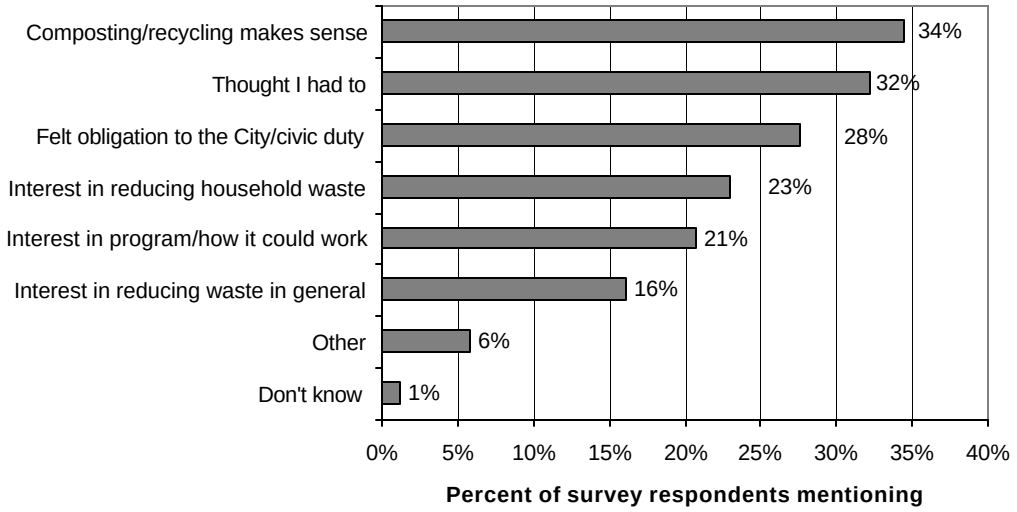
Comparisons. Because the follow-up study's phone survey included only five non-participants in the collections, it is difficult to draw conclusions from the small sample. Generally, reasons for not participating in the pilot project were similar for both studies.

4.2.3 Reasons for Participation

- *"Composting makes sense" and feelings of obligation were the most often cited reasons for participating.*

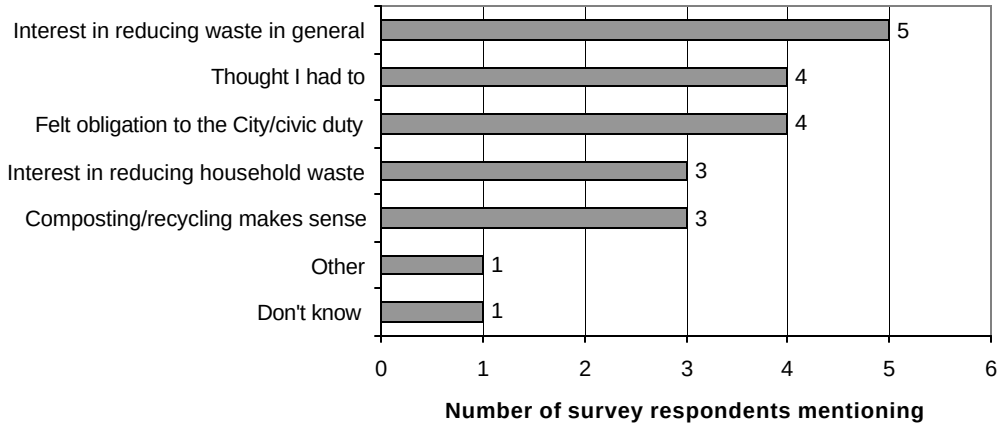
Primary Study. Survey respondents who participated in the food waste collection pilot project mentioned several reasons for doing so. The most commonly mentioned reason, which about a third of respondents cited (30 of 87 participants, or 34%), was that composting and recycling make sense. The next most common responses overall were that the respondents thought participation was required (32%) or they felt a sense of civic duty or obligation (28%). In addition, some participants also stated they were interested in reducing household waste (23%) or reducing waste in general (16%). Figure 4-4 shows the frequency of these and other reasons that residents mentioned for participating in the food waste collection pilot study.

Figure 4-4: Reasons Given by Phone Survey Respondents for Participating in Food Waste Collection [n=87] (multiple responses allowed) – PRIMARY



Follow-up Study. Survey respondents who participated in food and yard waste collection mentioned several reasons for doing so. The most commonly mentioned reason for participating was an interest in reducing global and city waste. This idea was mentioned by a third of participant respondents (5 of 15). The second most common responses (each with 4 respondents mentioning) were that the resident felt he or she had to participate or the resident felt a sense of civic duty or obligation to the city. These ideas both represent a feeling of obligation, and when considered together they were mentioned by over half of participant respondents. Figure 4-4 shows the shows the frequency of these and other reasons mentioned for participating in the food and yard waste collection pilot study.

Figure 4-5: Reasons Given by Phone Survey Respondents for Participating in Food and Yard Waste Collection [n=15] (multiple responses allowed) – FOLLOW-UP



Comparisons. More than half of the surveyed participants in each study explained that they felt an obligation to participate. Other reasons mentioned for participating were similar between the two studies, and reported reasons included interest in reducing waste and the idea that composting makes sense.

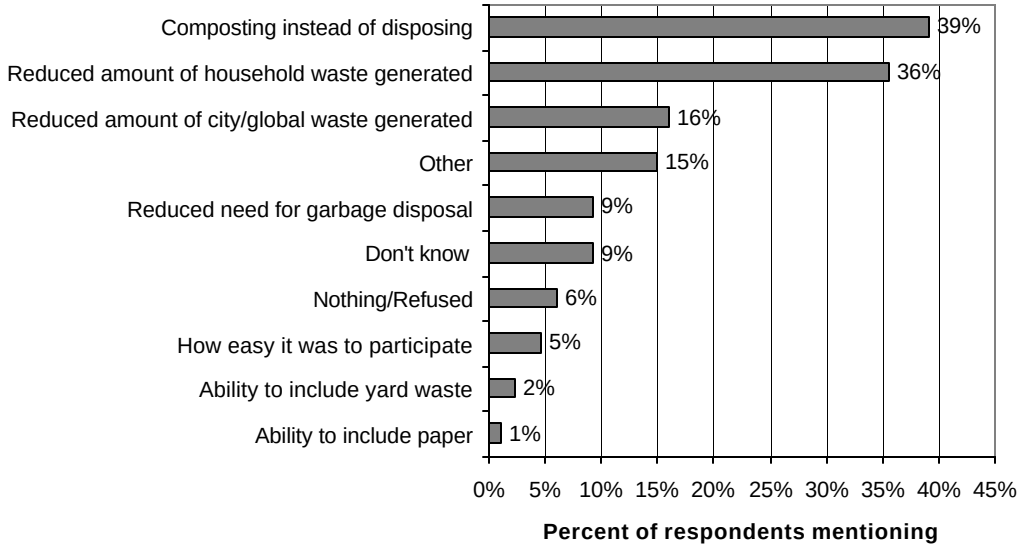
4.3 General "Likes" and "Dislikes"

4.3.1 What Participants Liked

➢ *Most participants liked reducing their household waste generation and composting, instead of disposing, their food wastes.*

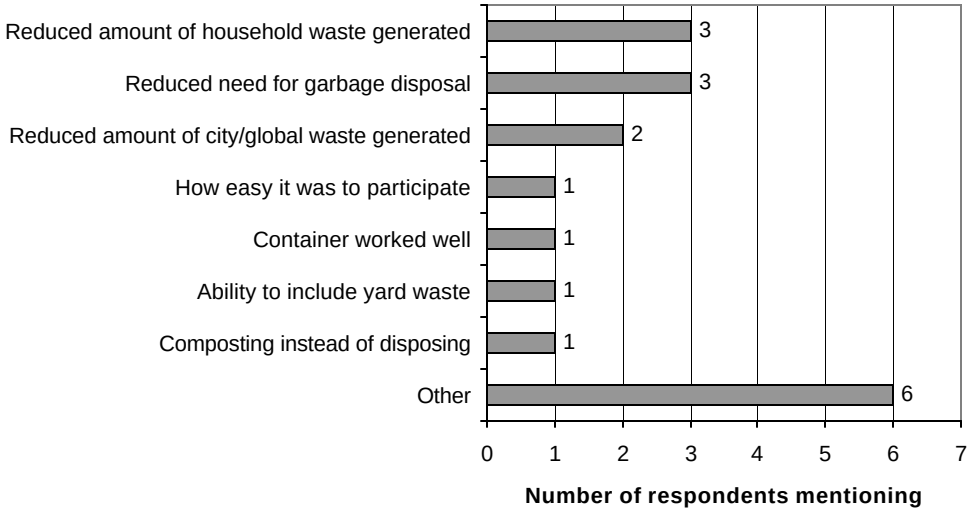
Primary Study. Nearly 40% of participants (34 of 87, or 39%) who participated in at least one collection mentioned that they liked the program because food scraps would be composted rather than disposed. More than a third (31, or 36%) liked the program because it reduced their amount of household waste. Figure 4-6 shows these and other aspects of the program that participants liked. (Likes in the "Other" category included reducing water use and keeping smelly food waste out of the kitchen.)

Figure 4-6: What Participants Liked about the Program [n=87] – PRIMARY



Follow-up Study. Residents who participated in at least one collection liked the program for several reasons. Commonly mentioned reasons included waste reduction and less need for a garbage disposal. Figure 4-7 shows these and other aspects of the program that participants liked.

Figure 4-7: What Participants Liked about the Program [n=15] – FOLLOW-UP



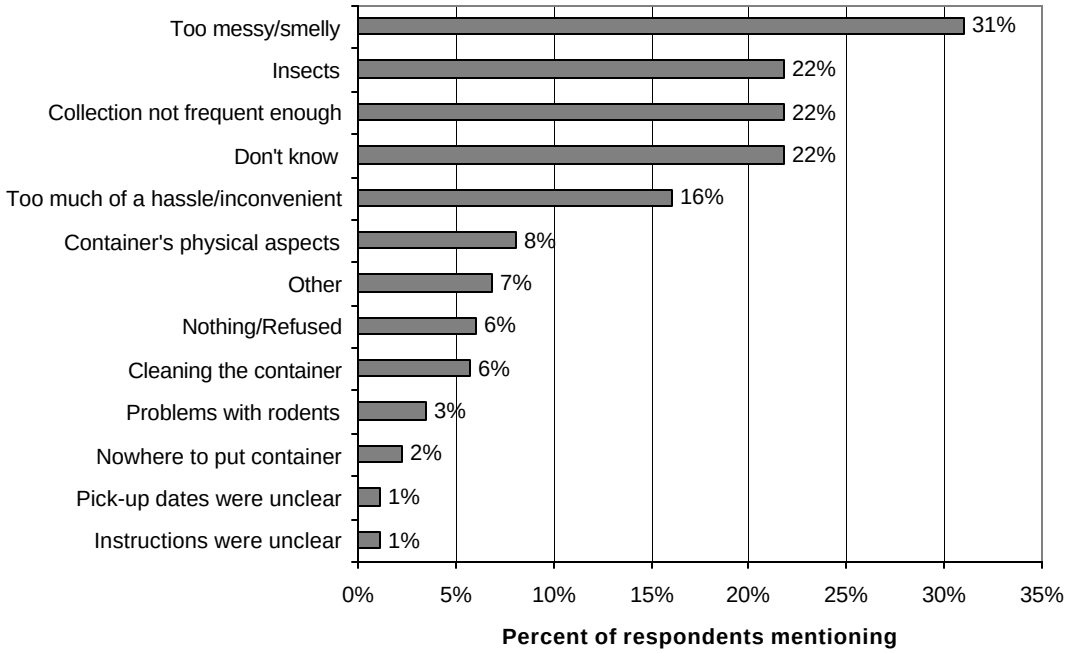
Comparisons. Reducing the amount of household waste generated was a common "like" mentioned frequently in both studies. Other responses were generally similar between the two studies; the frequency of some answers appeared to vary, but it is difficult to draw firm conclusions from the small sample size of the follow-up study.

4.3.2 What Participants Disliked

➢ *The most commonly cited dislike in the primary study was that the process was too messy and smelly, but this response was rare in the follow-up study.*

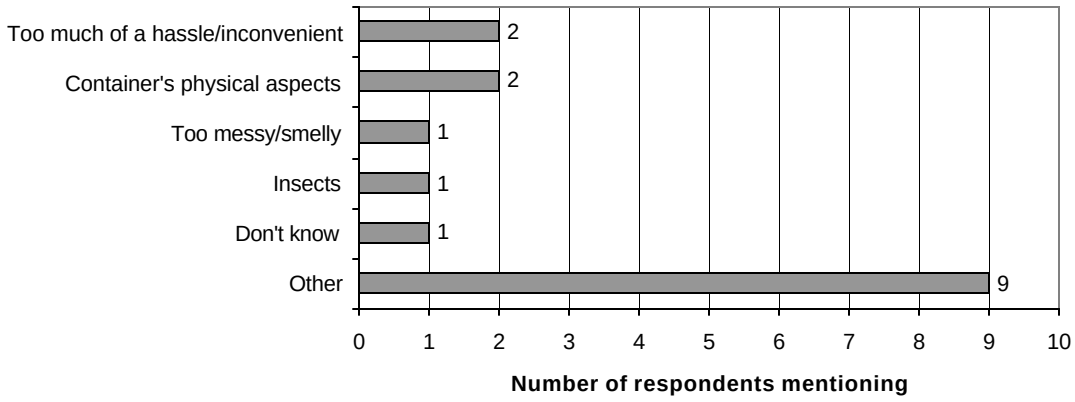
Primary Study. About a third of participants (27, or 31%) mentioned that the program was too messy and/or smelly. The frequency of collection and presence of insects were each mentioned by 22% of participants (19, for each); an equal number answered, "don't know." Figure 4-8 shows aspects of the program that participants disliked.

Figure 4-8: What Participants Disliked about the Program [n=87] – PRIMARY



Follow-up Study. Inconvenience and physical aspects of the container were two elements of the program that participants disliked. Some residents gave various other responses not identified in the survey. Figure 4-9 shows the responses provided.

Figure 4-9: What Participants Disliked about the Program [n=15] – FOLLOW-UP



Comparisons. While 31% of the participants surveyed cited mess and smell as a "dislike" in the primary study, only one participant mentioned that problem in the follow-up study using the 96-gallon container for food and yard waste collection. Insects and insufficient collection frequency were the next most common dislikes in the primary study, with 22% each, but collection frequency was not mentioned in the follow-up study, and only one participant complained about insects.

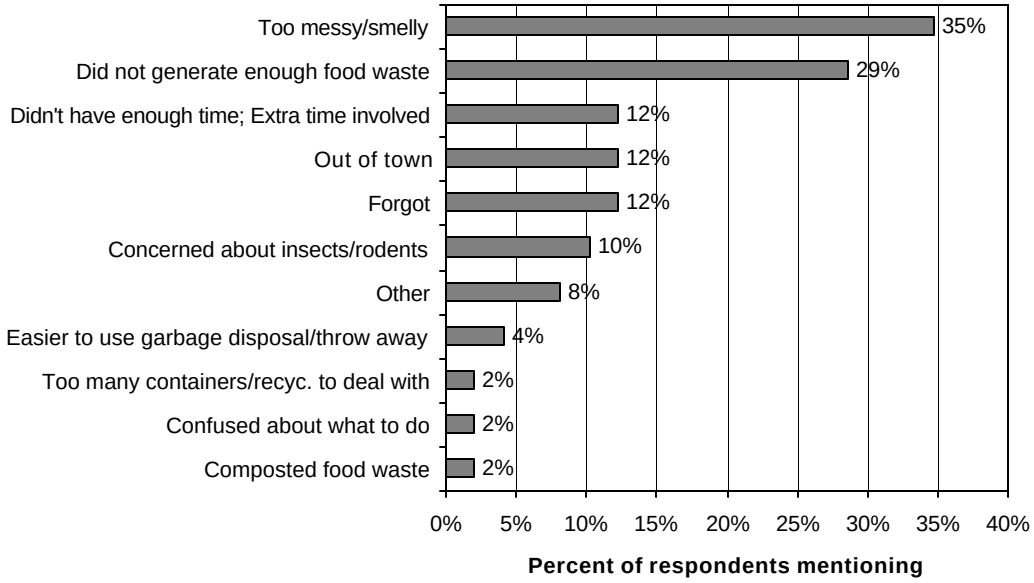
4.4 Food Waste Set-outs

4.4.1 Reasons for Missed Collections

- *Among participants in the primary study, "messy/smelly" was the most common reason for not participating in all seven collections, but this response was less common in the follow-up study.*

Primary Study. Of the 87 participants in the food waste pilot surveyed, more than half (49, or 56%) reported that they did not participate in all seven collection events. The 49 respondents who missed one or more collections mentioned several reasons for not always setting out their bins. The most frequently mentioned reason was that the bins were too messy and/or smelly, mentioned by 35% of participants (17). Also, 29% (14) mentioned that they had not generated enough food waste to set out the bin for some pick-ups. Figure 4-10 shows the reasons that participants gave for missing collections.

Figure 4-10: Participants' Reasons for Missing Collections [n=49] – PRIMARY



Follow-up Study. Of the 15 participants surveyed, slightly over half (8) reported that they did not take part in all six collection events. Participants mentioned several reasons for not always setting out their bins, including not generating enough food waste, not having enough time, mess or smell, concern about insects or rodents, or simply forgetting. Figure 4-10 shows the reasons that participants gave for missing collections.

Figure 4-11: Participants' Reasons for Missing Collections [n=15] – FOLLOW-UP

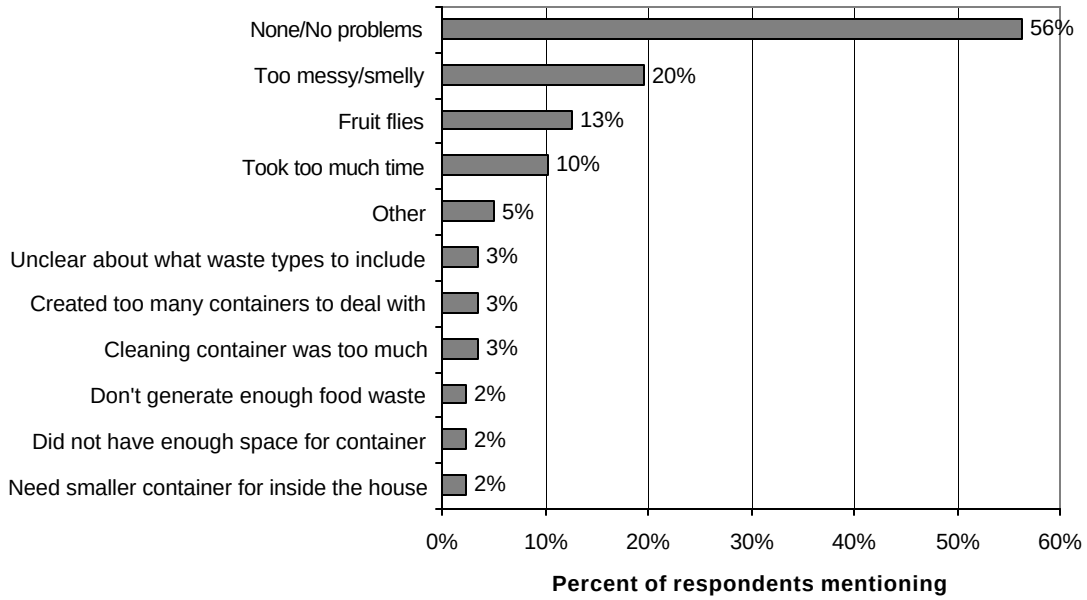
Comparisons. Reasons for missing a collection were similar for both studies, and they include not generating enough food and yard waste, not having enough time, or a messy and smelly bin. The frequency of responses, however, appeared to vary. For example, 35% of the respondents in the primary mentioned mess and smell as reasons for missing one or more collections, but only one person mentioned that problem in the follow-up study.

4.4.2 Reported Problems

- *More than half of participants reported no problems with the process; of problems reported, "messy/smelly" was the most common.*

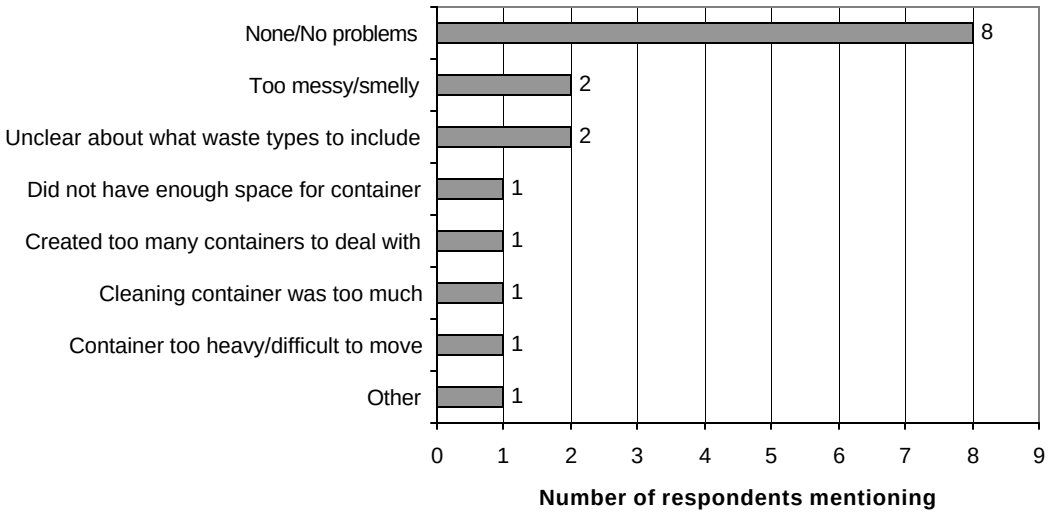
Primary Study. More than half of the pilot participants (49 of 87, or 56%) mentioned having no problems separating and setting out their food waste. When participants did have problems, they reported most often that the bin was too messy, smelly, or both (17, or 20%). Some participants noted problems with fruit flies, and some reported that food waste collection was too time-consuming. Figure 4-12 shows the problems participants experienced during the process of sorting and setting out their food waste.

Figure 4-12: Participants' Reported Problems with Separating and Setting out Food Waste [n=87] – PRIMARY



Follow-up Study. About half of the participants (8 out of 15) mentioned having no problems separating and setting out their food waste. When participants did have problems, they reported that the process was too messy or smelly, that they were unclear about what waste types to include, or one of several other responses. Figure 4-12 shows the problems participants experienced in the process of sorting and setting out their food waste.

Figure 4-13: Participants' Problems with Separating and Setting out Food Waste [n=15] – FOLLOW-UP



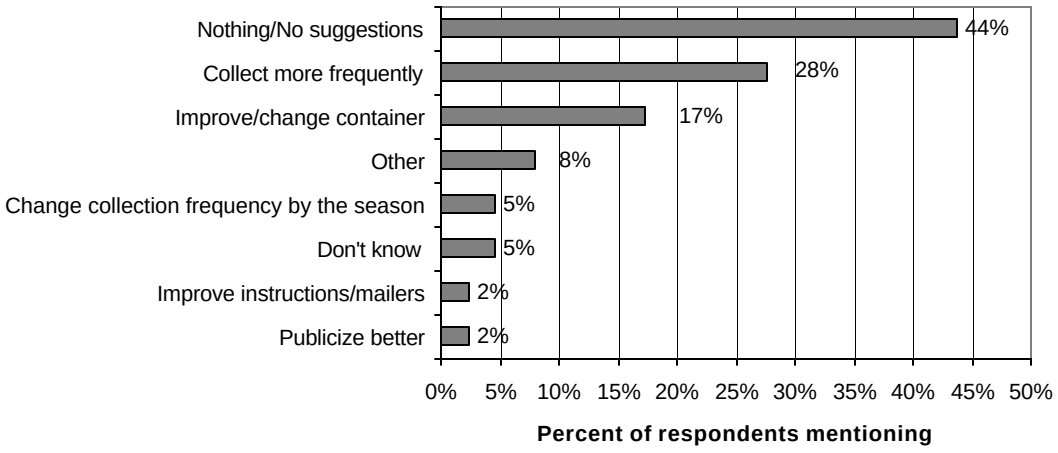
Comparisons. More than half of the participants in each study reported having no problems setting out their food and/or yard waste.

4.4.3 Suggestions for Improvement of Collection

➢ *Most often, participants had no suggestions for improvement; of suggestions made, more frequent collection and modifying the bin were common.*

Primary Study. Many participants (38 of 87, or 44%) did not have any suggestions for making food waste collection work more effectively. However, about one-quarter of participants (24, or 28%) mentioned that they would like to see food waste collected more frequently. Fifteen participants (17%) mentioned improving or changing the can. Figure 4-14 shows the frequency of suggestions made for improving collection.

Figure 4-14: Participants' Suggestions for Improving Food Waste Collection [n=87] – PRIMARY



Follow-up Study. More than half of the participants (8 out of 15) did not have any suggestions for making food and yard waste collection work more effectively, though two residents mentioned changing the size of the bin.

Comparisons. About half of the participants in each study had no suggestions for improving the food waste collection system. Suggestions included collecting the waste more frequently (mentioned in the primary study only) and changing the collection bin.

4.5 Collection Containers

4.5.1 Household Collection Methods

➢ *Most participants placed food waste in a smaller, intermediate container.*

Primary Study. Of the 87 participants in the pilot project surveyed, two-thirds (58, or 67%) placed their food waste in a smaller, intermediate collection container of their own before putting the material into the collection container that the City provided. (The study instructions suggested using a resealable plastic tub as a "kitchen container," but the phone survey did not ask residents about the exact type of intermediate container or its location.) One-third of participants (29, or 33%) put their food waste directly into the 22-gallon container. Survey respondents from the North and South areas reported

different behaviors, with 80% of South respondents using a small container first, compared to 60% in the North.

Follow-up Study. Of the 15 pilot project participants surveyed, 11 residents placed their food waste in smaller, intermediate collection containers of their own before putting the material in the larger containers that the City provided.

Comparisons. At least two-thirds of the participants in each study placed food waste in smaller, intermediate containers prior to putting it in the bins for curbside collection.

4.5.2 Container Storage Location

- *A large majority stored the bins outside of their houses.*

Primary Study. Of the 87 participants surveyed, the vast majority (70, or 80%) stored the black container outside their house and/or in their yard before setting it out for collection. Of those surveyed, 13 participants (15%) stored the bins in their garages or carports, and only three stored it in their kitchens.

Follow-up Study. Nine participants stored the containers outside their houses and/or in their yards before setting them out for collection. Two participants stored the bins in the kitchen. The remaining participants stored them in garages, carports, or other locations.

Comparisons. Most participants in both studies stored their bins outside the house, in their yards, garages, carports, or other locations prior to collection.

4.5.3 Container Size

- *About half of the participants in each study thought the bin was the right size.*

Primary Study. When asked about the size of the collection container, respondents were almost evenly divided, with 47% stating the size was "about right" and 53% reporting it was "too big." None of the respondents felt the container was too small. In the North area, 57% of participants commented that the container was too big, while 45% of those in the South expressed the same opinion.

Follow-up Study. When asked about the size of the collection container, about half of participants (7 out of 15) surveyed reported that it was "about right." Five respondents thought that the containers were too big, and three felt that the 96-gallon container were too small.

Comparisons. Although the bin sizes used in each study were vastly different, about half of the participants surveyed in each study thought the collection container was about the right size. In the primary study, the other half felt the 22-gallon container was too big, and in the follow-up study, the other half was split between thinking it was too big or too small.

4.5.4 Ease of Use

- *Most participants felt that the bin was easy to use.*

Primary Study. Of the participants surveyed, 82% (71 of 87) felt that the black food waste collection container was easy to use, while 18% (16 participants) did not. In the South area, 90% stated that the bin was easy to use, compared with 78% in the North.

Follow-up Study. Of the participants surveyed, almost all (14 out of 15) felt that the food and yard waste collection container was easy to use.

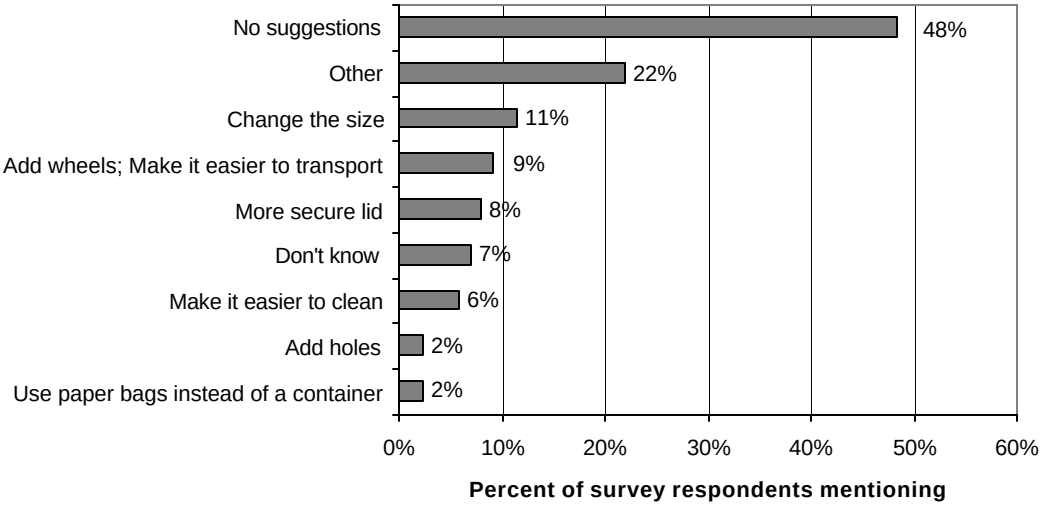
Comparisons. The large majority of participants in both studies felt that the collection containers were easy to use. The 96-gallon container used in the follow-up study received somewhat higher ratings for ease of use than the 22-gallon container used in the primary study.

4.5.5 Suggestions for Improvement of Containers

➢ *More than half of the participants in each study had suggestions to improve the containers, but no consensus was reached.*

Primary Study. Of the 87 participants, 52% had suggestions about improving the container, while 48% had no such recommendations. However, no clear consensus emerged about what changes to make. The most common suggestion was to change the size, mentioned by 11% of participants (10). Figure 4-15 shows the ideas that participants suggested. The 22% of participants mentioning "Other" suggestions included adding a charcoal filter to reduce odor and having a small hole to dump food waste into the bin without opening the whole lid. Respondents with no suggestions for improvement represented 62% of the South area participants surveyed and 41% of those in the North.

Figure 4-15: Participants' Suggestions for Improvement of Container [n=87] – PRIMARY



Follow-up Study. Most residents did not have any suggestions for improving the container, though two respondents mentioned changing its size.

Comparisons. About half of the participants in the primary study had no suggestions for improving the container, and the majority of residents in the follow-up study also had no recommendations. Of the suggestions mentioned, changing its size was the most common single reason mentioned in both studies.

4.6 Mailings and Instructions

➢ *Most participants were satisfied with the information and instructions.*

Primary Study. Based on the survey responses, most participants appeared satisfied with the information and instructions they received about the food waste collection pilot program. Of those surveyed, 87% (76 of 87) of participants stated that they received enough information about how to participate in the program before it began, and 94% (82) felt that the instructions were clear regarding which wastes could be put into the collection container.

Follow-up Study. Based on the survey responses, most participants appeared satisfied with the information and instructions they received about the food and yard waste collection pilot program. Of the 15 participants surveyed, 11 stated that they received enough information about how to participate in the program before the project began. Of the participants, 14 felt the instructions they received were clear about what types of waste to include.

Comparisons. The vast majority of the participants in both studies reported that they received sufficient information on how to participate before the program began and that the instructions they received were clear.

4.7 Impact of Program on Food Waste Disposal

4.7.1 Garbage Disposal Use

➢ *Of the participants with in-sink garbage disposals, more than half reported that they used their disposals less during the pilot study.*

Primary Study. In the phone survey, the majority of participants in the primary study pilot project who had kitchen garbage disposals (19 of 36 participants with garbage disposals, or 53%) stated that they used their disposals less often during the program. The remainder used their disposals with about the same frequency. The large majority of participants with garbage disposals answering the phone survey resided in the North; only one-sixth of those with garbage disposals lived in the South area. In the North, 60% (18 of 30) reported using their garbage disposals less during the pilot study, while 17% (1 of 6) said so in the South; sample sizes are small, however, so variations may be overstated.

Follow-up Study. Six surveyed participants had kitchen garbage disposals. Three participants stated that they used their disposals less often during the pilot program, and three used their disposals with about the same frequency.

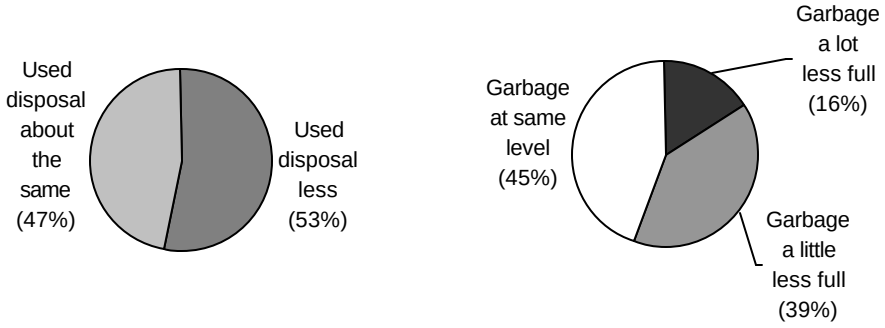
Comparisons. About half of the participants with garbage disposals in each study reported using them less during the pilot. However, small sample sizes make it difficult to draw solid conclusions or highlight comparisons between the two studies.

4.7.2 Garbage Can Fullness

➢ *More than half of participants thought their garbage cans were less full during the pilot.*

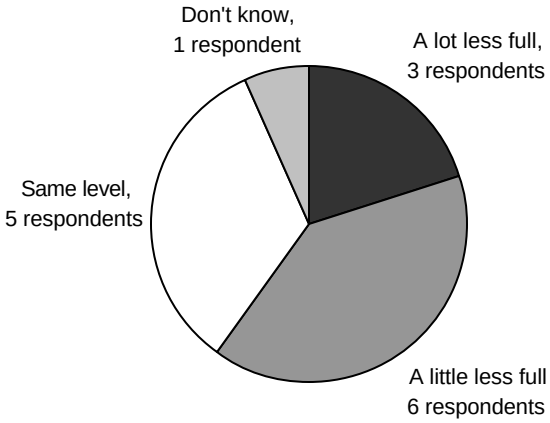
Primary Study. While using the 22-gallon food waste containers, 55% (48 of 87) of participants surveyed believed that their garbage can was less full during the program. Figure 4-16 shows participant use of garbage disposals and the fullness of their garbage cans during the pilot study.

Figure 4-16: Participants' Use of In-sink Garbage Disposal and Fullness of Garbage Cans during Pilot Study [n=36] - PRIMARY



Follow-up Study. While using the 96-gallon aerated containers, 9 out of 15 participants found that their garbage can was less full during the program. Figure 4-17 shows the fullness of participants' garbage cans during the follow-up stage of the pilot study.

Figure 4-17: Participants' Fullness of Garbage Cans during Pilot Study [n=15] – FOLLOW-UP



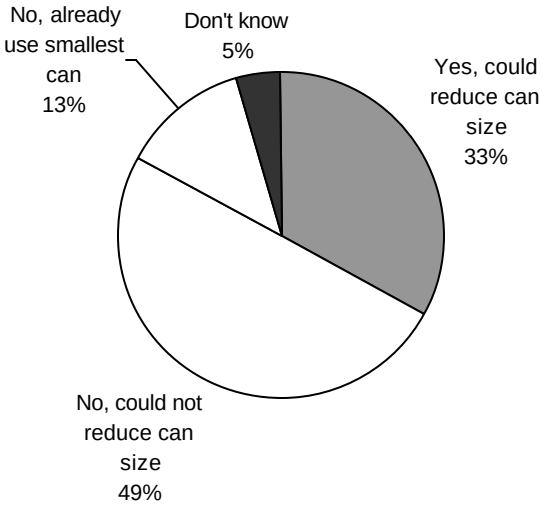
Comparisons. Reported levels of garbage can fullness were similar for the two studies, though slightly more participants seemed to think their garbage cans were less full in the follow-up study using the 96-gallon containers. Slightly over half of the participants in each study found that their garbage cans were less full during the pilot project.

4.7.3 Garbage Can Size

- *Of those not already using a micro can, more than half did not think they could reduce their garbage can size through regular food waste collection.*

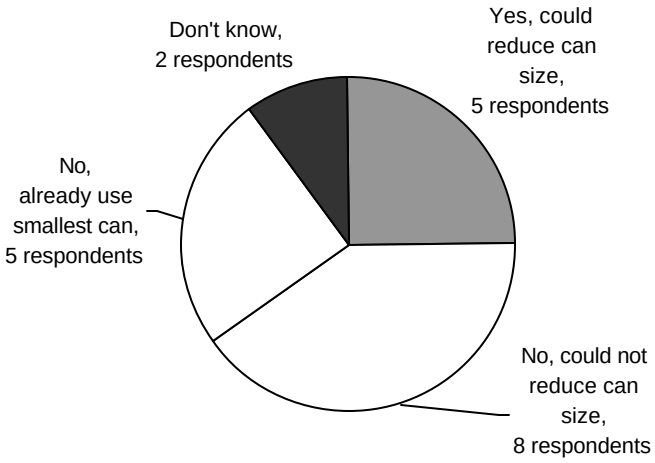
Primary Study. Seventeen (13%) of the 133 respondents reported that they already use the smallest available size, the 12-gallon micro can, for their regular garbage service. Of the remaining 116 respondents who potentially could reduce the size of their garbage cans, more than half (66, or 57%) did not think they could reduce their can size if they participated in an ongoing food waste collection program. However, 38% (44) reported that they could reduce the can size. Figure 4-18 illustrates these responses.

Figure 4-18: Answers to Question, "If you participated in an ongoing food waste collection program, do you think you could reduce the size of your garbage can?" [n=133] – PRIMARY



Follow-up Study. More than half (13 of 20) of all survey respondents in the follow-up study, regardless of whether they actually participated in the food waste collection, did not think they could reduce the size of their cans if they participated in ongoing food and yard waste collection. Five of these 13 residents reported they already have the smallest available size, the micro can. Five residents thought they could reduce the size of their cans. Figure 4-18 shows this graphically.

Figure 4-19: "If you participated in an ongoing food and yard waste collection program, do you think you could reduce the size of your garbage can?" [n=20] – FOLLOW-UP



Comparisons. About half of the respondents in each survey either already had the smallest garbage can size or felt they could reduce the size of their can if they participated in ongoing food waste collection.

4.8 Future Participation

4.8.1 Likelihood of Future Participation

- *More than half of all survey respondents in the primary study reported that they were very or somewhat likely to participate in a future food waste collection program. Reported likelihood of future participation was higher among pilot participants as well as in the follow-up study.*

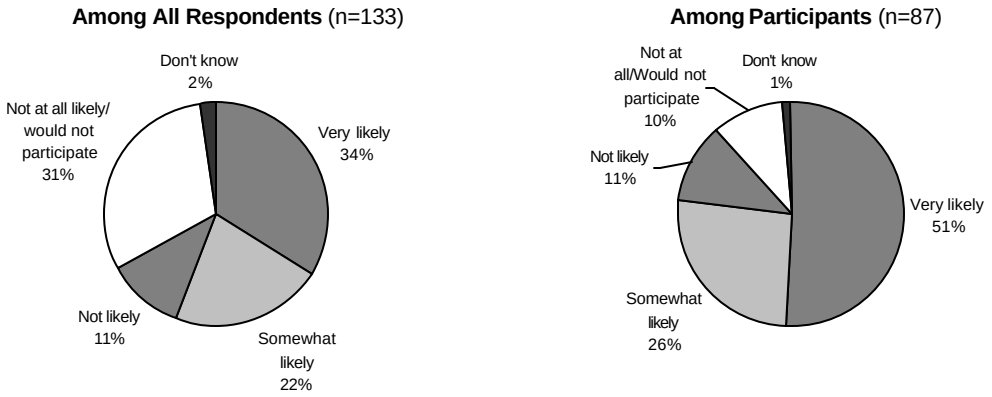
Primary Study. The majority of all phone survey respondents (74 of 133, or 56%) stated that they were "somewhat likely" or "very likely" to participate in future biweekly food waste collection. Less than a third of all respondents (41, or 31%) rated their likelihood as "not at all likely/would not participate." In the South area, about one-quarter of all survey respondents (11 of 43, or 26%) would not participate, compared with one-third (30 of 90, or 33%) in the North.

Among the 87 pilot participants surveyed, the likelihood of future participation rose to 77%, with 51% reporting that they were "very likely" to participate and 23% "somewhat likely." Among pilot participants, only 10% (9 of 87) reported that they would not participate in a future biweekly food waste program if one existed. Based on the survey

results, Figure 4-20 shows the likelihood to take part in future food waste collection for all survey respondents as well as for only participants in the pilot collection events.

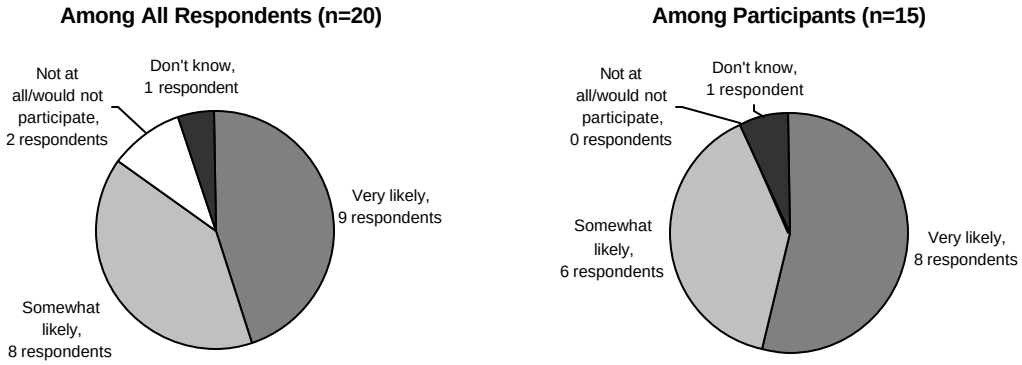
The reported likelihood of future participation was considerably higher than the actual participation rates during the pilot. Because the response rate for the phone survey was higher among participants in the pilot collection events than among those who did not set out food waste, projections of future participation should seek to explore the likely role of households like those that did not participate in the phone survey or pilot set-outs.

Figure 4-20: Likelihood to Participate in Biweekly Food Waste Collection in the Future, among All Survey Respondents [n=133] and among Participants Only [n=87] – PRIMARY



Follow-up Study. The strong majority of survey respondents (17 out of 20) stated that they were "somewhat likely" or "very likely" to participate in future biweekly food and yard waste collection. Only 2 respondents rated their likelihood as "not at all likely/would not participate." Figure 4-20 shows a breakdown of survey respondent likelihood to participate in the future, if the City offered a biweekly food waste collection program.

Figure 4-21: Likelihood to Participate in Biweekly Food Waste and Yard Waste Collection in the Future, among All Respondents [n=20] and among Participants [n=15] – FOLLOW-UP



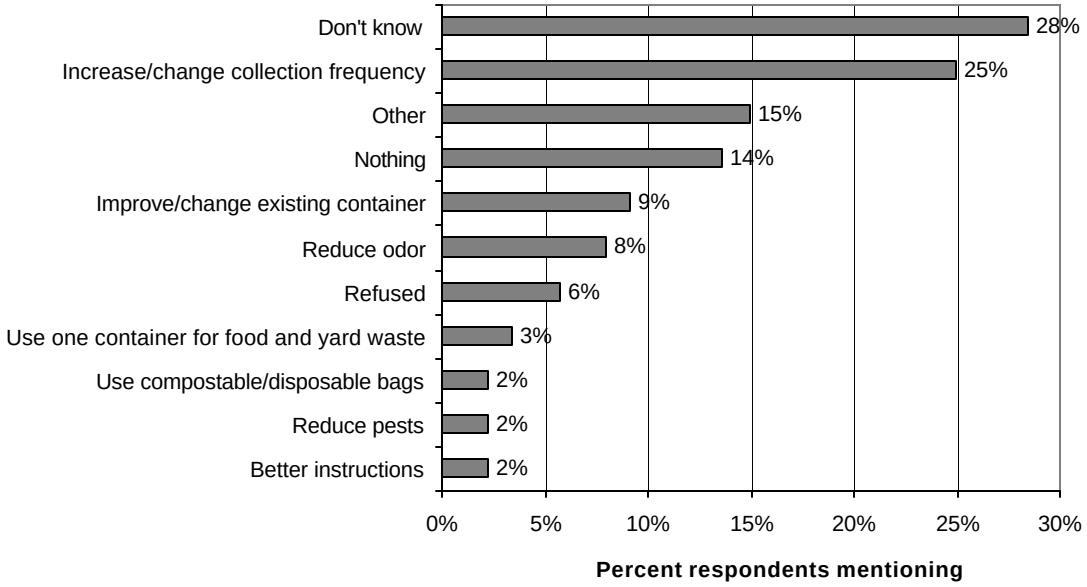
Comparisons. A much higher percentage of surveyed residents were "very likely" or "somewhat likely" to engage in future collection after participating in the follow-up study with the 96-gallon container than after participating in the primary study with the smaller 22-gallon container.

4.8.2 Ways to Increase Participation

➢ *Increasing or changing the frequency of collection could boost participation.*

Primary Study. Except for the 45 residents who reported that they were already "very likely" to participate in a future food waste collection program, survey respondents were asked for feedback about changes that would make them more likely to participate. Most often, respondents replied (22 of 88 residents, or 25%) that they would prefer a different collection frequency, but many other responses were also given. Figure 4-22 shows the most frequent responses.

Figure 4-22: Responses to Question, "What would need to be changed in order to increase the likelihood of your participation?" [n=88] (not asked of respondents reported as "very likely" to engage in future collection) – PRIMARY



Follow-up Study. Residents who were anything but "very likely" to participate in future collection were asked for feedback about changes that would make them more likely to participate. Six of these 11 residents didn't know what would make them more likely to participate or refused the question. Two residents wanted to increase the collection frequency, and three residents had other ideas.

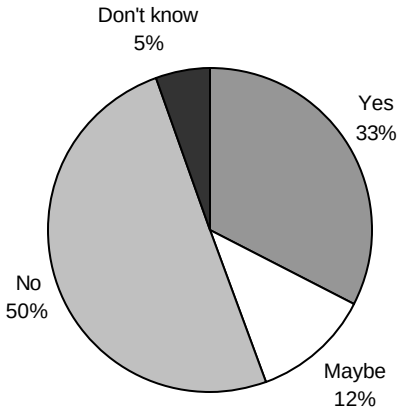
Comparisons. When residents were asked what changes would make residents more likely to participate in future food waste collection, "don't know" was the most frequent response in both studies. Of the suggestions given, increasing or changing the collection frequency was the most common response in both studies.

4.8.3 Willingness to Pay

- *Among potential participants in future collections, about a third would be willing to pay $2 per month to participate.*

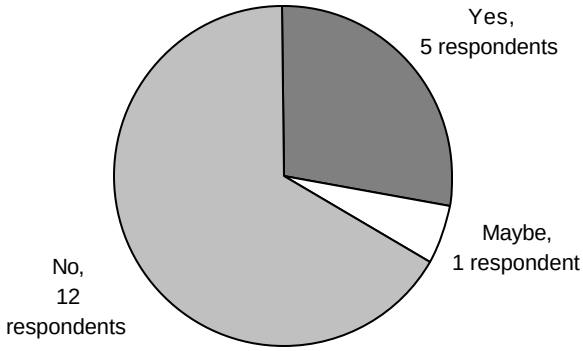
Primary Study. The 92 respondents who reported they might participate in future collections were asked about their willingness to pay $2.00/month for the service. (The 41 respondents, or 31% of the 133 surveyed, who rated themselves "not at all likely to participate/would not participate" were excluded from this question, so overall willingness to pay is likely lower.) Half of the possible participants in future collections (46 of 92, or 50%) said no, they would not be willing to pay. A third (30, or 33%) said yes, they would be willing to pay. In the South area, only 19% were willing to pay for food waste collection, compared with 40% in the North. The 30 respondents expressing willingness to pay represent about 23% of the 133 households surveyed (including the 41 respondents who said they would not participate in future food waste collection). Figure 4-23 shows the responses regarding willingness to pay $2 per month for food waste collection, among potential participants.

Figure 4-23: Willingness to Pay $2/Month for Collection (among respondents who rated themselves as anything but "not at all likely" to participate) [n=92] – PRIMARY



Follow-up Study. Residents who would consider participation in future collections (all residents except those who rated themselves "not at all likely to participate/would not participate") were asked about their willingness to pay $2.00/month for the service. Two-thirds (12 of 18) said no, they would not be willing to pay. Less than a third (5 of 18) said yes, they would be willing to pay. Of all 20 survey respondents, those willing to pay for food waste composting service represent about one-quarter of the total. Figure 4-23 shows the responses regarding willingness to pay, among potential participants.

Figure 4-24: Willingness to Pay $2/Month for Collection (among respondents who rated themselves as anything but "not at all likely" to participate) [n=18] – FOLLOW-UP



Comparisons. About one-third of the respondents questioned in each survey expressed willingness to pay $2.00 per month to participate in future food waste collection. Because those respondents who rated themselves "not at all likely to participate/would not participate" in future food waste collection were excluded from the question and assumed unwilling to pay, overall willingness to pay is expected to be lower. Of all respondents, about one-quarter in each survey expressed willingness to pay $2 per month for food waste collection. Again, because the response rate for the phone survey was higher among participants in the pilot collection events than among those who did not set out food waste, plans for future participation should consider the role of households like those that did not participate in the phone survey or pilot set-outs.

4.9 Demographics

Primary Study. The majority of the 133 survey respondents stated that they were White/Caucasian (73%). The South area had greater ethnic diversity than the North, but that study area represented only one-third of the survey respondents. Most respondents (86%) reported owning their homes. Of respondents, 91% stated that they had completed high school, and 55% said they had completed college. Most respondents (59%) were between the ages of 35 and 64, while 24% were 65 or older. The majority of respondents were female (64%), as noted by surveyor observation.

In describing their households, the vast majority (87%) of respondents reported having four or fewer people living there, and a majority (55%) had two or fewer. Among the respondents, 88% of households with more than one person had two or more adults over 18. Finally, many residents either did not know or refused to describe their gross

household income range, but of those that did, 61% had a gross household income before taxes of over $40,000. Only 14% had an income less than $25,000.

More detailed information on demographics and additional survey questions are presented in Appendix G, which includes the survey instrument and topline report of survey results of the primary study.

Follow-up Study. The vast majority of survey respondents stated that they were European American or Caucasian (19 out of 20) and owned their homes (18 of 20). All had completed high school, and 13 out of 20 said they had completed college. Nine respondents were between the ages of 35 and 64, while eight were 65 or older. The majority of respondents were female (12 of 20) as noted by surveyor observation.

The majority of respondents (15 of 20) reported having two or fewer people living in their households. Ten of 11 households with more than one person had two or more adults over 18. Finally, several residents (5 of 20) either did not know or refused to describe their gross household income range. Of those that did provide such information, six had gross household incomes between $25,000 and $39,000. Two households had incomes below $25,000, and six had incomes above $40,000.

5 Conclusions

The two phases of Seattle's residential food waste collection pilot project successfully demonstrated the feasibility of biweekly curbside collection of food waste and other compostable organic materials from local households. In terms of collection logistics and customer acceptance, critical barriers to program implementation did not emerge during the pilot effort. The study also generated valuable information for improving any potential future service.

Data collected in the course of the pilot study, as well as qualitative observations from the field, showed that those residents who wrapped food waste in paper and layered yard waste and food waste in the collection container generally experienced fewer odor and insect problems. The presence of yard waste and compostable paper also appeared to decrease liquid in the bin. In short, residents using these recommended strategies to reduce odors, insects, and mess typically had much cleaner food waste containers. Collection of food waste along with yard waste and compostable paper helped reduced odors, insects, and messiness in the pilot study.

By enabling the combined collection of all compostable organics, the specially designed 96-gallon aerated container used in the follow-up study facilitated the strategies that reduced odor, pest, and mess problems associated with household food waste collection. Overall, the follow-up study with the aerated bin experienced fewer problems and elicited greater participant satisfaction than the primary study. The collection of mixed food and yard waste in a single large ventilated container resulted in bins that were fuller, cleaner, less smelly, and less insect-prone than the smaller 22-gallon containers used in the primary study for collection of food waste only. Furthermore, residents surveyed in the follow-up phase appeared to prefer the big bin approach and were more likely to consider future participation in food and yard waste collection than were residents in the primary study.

Data from the field studies and phone surveys highlight the promise of biweekly collection of food waste and organics from Seattle households. To move forward from research to reality, Seattle Public Utilities needs to address any remaining Health Department concerns, perhaps through an assessment of the 96-gallon aerated containers on a broader scale during the warmer summer months. Strategies for processing the organic waste into useful compost, including capital facility requirements, must also be resolved to develop a complete, effective, and environmentally beneficial curbside food waste composting program for Seattle residents. With continued efforts, Seattle has the opportunity to reduce waste, increase recycling, and improve environmental quality through citywide food waste composting.

6 Appendices

A Written Correspondence and Agreements

B Maps of Pilot Study Areas

C Sample Labels, Mailers, and Field Forms

D Schedules to Complete Phases I, II, and III

E Biweekly Collection Summaries

F Phone Survey Follow-up Mailings

G Primary Study Phone Survey Instrument and Topline Report

H Follow-up Study Phone Survey Instrument and Topline Report