

Attitudes and Behaviour
Before & After the Introduction of
a New Domestic Resource Recovery Service
in the ACT

ACT Jurisdictional Recycling Group

FINAL REPORT

By

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Executive Summary

The ACT Jurisdictional Recycling Group (JRG) commissioned Community Change to conduct a study to evaluate the impact of a new kerbside recycling service. Household and stakeholder surveys and garbage audit data were collected in March 2003 prior to the introduction of the new service, providing a benchmark for future change and service improvement. In October 2003, follow up surveys and audit data were collected following the introduction of the new commingled recycling service.

A primary focus of the survey was single dwelling households throughout the ACT whose survey results were matched with audit data enabling links between what people *said they did* with what they *actually did* with both their garbage and their recyclables. The household target sample consisted of 200 Single dwellings (SD) from the audited areas of Tuggeranong, Conder, Civic, Belconnen and Gungahlin and 146 multi unit dwellings (MUD) from Gungahlin, Civic and Woden. Interviews were conducted with representatives from ACTNOWaste, body corporate managers, waste and recycling collection contractors and material recovery facility (MRF) operators. The following outcomes were compared before and after the new service was introduced:

- Levels of satisfaction with the new service.
- Attitudes, knowledge and self report behaviours associated with the service.
- Attitudes and features of single dwelling residents (SDs) and multi-unit dwelling residents (MUDs).
- Relationship between demographics of SD households and their recycling behaviour.
- Relationship between perceptions of recycling behaviour and actual recycling behaviour in SD households.
- Perceptions of changes to the service and barriers to implementation.

Surveys were completed for 196 SD and MUD households at benchmark and 174 at follow up. Linked audit data was available for 105 SD households with behavioural data matched to survey responses.

Project results showed high levels of participation in the new system with reasonably good separation of materials. There was excellent basic knowledge and awareness of the service at benchmark which continued to be evident at follow up although there was some confusion with both householder and stakeholder groups on the recycling status of some items, particularly spray cans, aluminium foil and waxed and coated paper.

Good levels of resource recovery and low contamination rates were associated with low numbers of people in a household and no children present. Putting out a full recycling bin was strongly related to consumption factors such as more people in the household and those with greater financial resources at their disposal. SD households had a different demographic profile to MUD households. No differences were consistently evident in relation to the accuracy of self report of SD respondents in relation to their household's recycling behaviour as measured by the audit.

Three information methods were used to promote use of the new service (brochure, calendar and bin sticker). Use of the calendar was associated with improvements in both recovery and contamination rates, with an added benefit if the calendar was displayed within the household.

Overall, householders were extremely satisfied with the service with a sense of responsibility to the environment being the primary motivation for participation.

Suggested service improvements included more information on exactly what was recyclable and, for stakeholders, developing partnerships with industry and structural changes to collection, particularly for MUDs. A series of recommendations were included for future service improvement based on project outcomes including:

- Continue actively supporting the new service and improving participation by providing information on what is recyclable and communicating feedback on recycling performance by using promotional methods that can be prominently displayed within people's homes.
- Build on the community's existing sense of responsibility to be environmentally responsible and reinforce a positive social expectation to use the service correctly.
- Set realistic education targets for the community and begin further educational effort with community, stakeholder and other key groups as potential champions for the service.
- Improve support & education for MUD households using a cooperative approach between MUD residents, tenant managers, council staff and stakeholders, particularly in relation to addressing challenging issues such as illegal dumping.
- Follow up on stakeholder suggestions for improvement in service delivery including developing partnerships with industry and following up on structural improvements to collection services.

The project demonstrated the richness of information available to program designers by tracking the links between household attitudes and behaviour. Consideration could be given to testing the outcomes using a wider group of ACT communities with differing levels of participation in kerbside recycling.

Background

Introduction

The ACT Jurisdictional Recycling Group (JRG) commissioned a study in March 2003 to determine the attitudes of the community, recycling collectors and re-processors of Canberra's kerbside recycling service.

In the third quarter of 2003 a follow up survey, designed to match issues over time, was conducted so that pre (benchmark) and post (follow up) attitude surveys could be compared. The results of this comparison provided a basis for assessing and refining implementation of a new kerbside recycling service introduced in April 2003. The study sets a benchmark of resident and specialist stakeholder attitudes and satisfaction with the recycling service prior to and after a new kerbside recycling collection service was introduced.

A primary focus of the survey was single dwelling households across the ACT who had the contents of their recycling bins audited. Results from the surveys were matched with audit results enabling identification of the links between what people *said they did* and what they *actually did*. The information was used to both inform the development of the new service, as well as assessing the effects of demographics, information and other strategies designed to increase resource recovery and reduce contamination rates at follow up.

Aims

The specific aims of the study were:

1. To evaluate the impact of changes to the kerbside recycling service in the Australian Capital Territory.
2. To compare the following before and after the new service was introduced:
 - Levels of satisfaction with the kerbside recycling service
 - Attitudes, knowledge and self-report behaviours associated with the service
 - Attitudes and features of residents in multi-unit dwellings (MUDs) and single dwellings (SDs)
 - Relationship between demographics of households and their recycling behaviour.
 - Perceptions of recycling behaviour and actual recycling behaviour in single dwelling households.
3. To identify perceptions of changes to the service and barriers to successful implementation of the most effective service.

Project Plan, Design and Methodology

A repeated measures design was used with matched attitude surveys generating information for direct comparison before and after introduction of a new kerbside recycling service. Surveyed households were linked with audit results to enable comparison of householder characteristics with behaviour as measured by the audit process and self report. Wherever possible, the same houses were audited and surveyed at baseline and immediately following the introduction of the new service.

Survey Design

A collaborative approach to survey design involved preliminary consultation with specialist stakeholders and some residents to identify local issues and features to be included in surveys and relevant practices and variations in the kerbside recycling service. Consultation with project partners - ACT NOWaste and recycling collection and sorting companies - further refined survey target issues and structure.

Question design and content were matched wherever possible across respondent groups to increase the validity of comparisons. Survey questions were designed to collect information on the following:

- Awareness of the recycling service – including knowledge levels and understanding of the service
- Level of satisfaction with the recycling service and opinions about the value of recycling and the importance of recycling to householders
- Identification of areas for improvement and factors hindering participation
- Attitudes about the value of recycling
- Self reported recycling behaviour
- Motivation for recycling
- Demographic information

Sample

Resident surveys were targeted at two groups of householders – those living in multi unit dwellings (MUDs) and those living in single dwellings (SDs). The sample for the benchmark survey was selected in consultation with researchers conducting the waste audit process and used a modified strata sampling technique targeting key areas or clusters of households where waste audits had been conducted.

Single Dwellings (SDs)

The household target sample consisted of 200 single dwellings (SD) from the following areas where audits were conducted:

- Tuggeranong – 80 SDs from the suburbs of Monash, Fadden, Chisholm, Isabella Plains, Gordon
- Conder Civic – 40 SDs from the suburbs of O'Connor, Ainslie, Campbell and Tuner

- Belconnen – 40 SDs from the suburbs of Evatt, Hawker, Florey and Scullin
- Gungahlin – 40 SDs from the suburbs of Amaroo, Palmerston, Nicholls and Ngunnawal

The households surveyed included a mix of recently developed areas such as parts of Tuggeranong and Gungahlin along with more established areas of Belconnen and Civic. Data collectors aimed at obtaining at least 100 completed surveys from the list of 200 audited single dwellings with up to three return visits to attempt to find householders at home.

Multi Unit Dwellings (MUDs)

Multi unit dwellings (MUDs) were a mix of public and private housing including a complex for the aged where bins were audited. A targeted sample of 146 multi unit dwellings was included for surveying in the following areas:

- Gungahlin – 94 MUDs (4 complexes) from the suburbs of Amaroo, Palmerston, Nicholls and Ngunnawal
- Civic – 27 MUDs (1 complex) from the suburbs of O'Connor, Ainslie, Campbell and Tuner
- Woden – 40 MUDs (2 complexes) from the suburbs of Pearce and Waramanga

The sample of MUDs included complexes where the garbage and recycling service involved use of 240 litre mobile garbage and recycling bins and those with garbage and recycling bulk bins or hoppers. Interviewers were directed to focus their attention mainly on the SDs. Consequently a convenience sample was obtained at MUDs and there were no return visits.

Specialist Stakeholder Interviews

A range of key stakeholders was identified by ACTNOWaste. Representatives of ACTNOWaste, body corporate managers, waste and recycling collection contractors and materials recovery facility (MRF) operators were included in the sample. Key stakeholders represented a group of people with long term interests and experience in the waste management field and kerbside garbage and recycling collections in Canberra. All organisations contacted agreed to be interviewed.

Stakeholder representatives were from the following organisations and agencies:

- | | |
|---------------|---------------------------|
| • ACTNOWaste | • Visy |
| • ACT Housing | • ACT Strata Management |
| • Cleanaway | • Canberra Unit Plans |
| • SITA | • Badenoch Real Estate |
| • Theiss | • Independent Real Estate |

Data Collection

A team of interviewers conducted door-to-door quantitative surveys, designed to engage and maintain stakeholders' involvement in the project and to focus attention on the changes to the collection system. Households contributing to the first benchmark survey were encouraged to participate in the second follow up survey. Households were surveyed within a week after their bins were collected and audited so that results could be linked to the most recent example of kerbside behaviours.

Pre and Post surveys were presented in the same standard manner to reduce likelihood of variability due to data collection procedures. Up to three visits were allocated for single dwellings, to account for household absences. Times for interviewing ranged from 9.15am to 7.15pm. Benchmark Interviews were conducted on two consecutive weekends (5 days) in March 2003. Follow Up interviews were conducted on a weekend in October and a weekend in December 2003 (total 5 days) following some delays with the auditing of bins.

Table 1 Householder Data Collection Dates

Data Collection Dates - Householder Surveys	
Benchmark Survey	Follow Up Survey
Friday 21 to Sunday 23 March 2003 and Saturday 30 to Sunday 31 March 2003	Saturday 18 to Sunday 19 October 2003 and Friday 5 to Sunday 7 December 2003

Specialist stakeholder interviews used a face to face in-depth survey technique that included quantitative questions matched to householder surveys and some qualitative questions. Specialist stakeholder interviews were conducted during business hours at the interviewee’s workplaces. Benchmark interviews were conducted during two days in March 2003 prior to implementation of the new recycling service, and in October 2003, six months after commencement of the new recycling service. Many stakeholders elaborated extensively on survey issues and a number of recurring themes were identified in relation to the change-over of the service.

Table 2 Stakeholder Data Collection Dates

Data Collection Dates - Specialist Stakeholder Interviews	
Benchmark Interviews	Follow Up Interviews
Thursday 20 and Friday 21 March 2003	Thursday 23 and Friday 24 October 2003

Response Rates

The total response rate for household interviews (SDs and MUDs) was 50%, with 174 people completing surveys, providing a valid basis for assessing follow up attitudes and other information on the new service. This was slightly less than the response rate for the benchmark period (57%).

Table 3 Response Rates

Sample	Benchmark Responses		Follow Up Responses	
	N Approached	N Participated	N Approached	N Participated
Single Dwellings	200	150 (75%)	200	119 (60%)
Multi Unit Dwellings	146	46 (32%)	146	55 (38%)
Specialist Stakeholders	11	11 (100%)	12	12 (100%)

All audited addresses were able to be found using the coding system with SD residents having a high participation rate (60%) with many people at home on the weekends when interviewers called. Participation rates for MUD households were much lower (38%), with 47% of householders away from home when interviewers called; only 26% of SD residents were unable to be contacted. Some residents were approached to participate but declined (13%) with levels similar for SDs and MUDs.

Linked audit data was available for 105 SD households so that behavioural data could be matched to survey responses.

The response rate of specialist stakeholders was excellent with all 12 stakeholders agreeing to participate at follow up interview.

Data Analysis

Quantitative data was analysed using the Statistical Package for Social Scientists (SPSS). Qualitative data was analysed through identification of themes and trends.

Bin audit data was matched with householder survey information to enable comparisons between reported behaviour and understandings and actual recycling behaviour.

Outcomes

Sample Characteristics - Householders

There were some clear differences in the demographic profile of householders living in single dwellings and those in multi unit dwellings. The demographic profile of householders interviewed at benchmark was similar to that at follow up.

Gender

Slightly more females than males were interviewed at both SDs and MUDs, both at benchmark and follow up, as shown in Table 4. This tendency was somewhat reduced for SDs at follow up, where numbers of men and women respondents were similar.

Table 4 Gender of Interview Participants

Proportion of Females Interviewed		
	SD	MUD
Benchmark	63%	61%
Follow Up	53%	64%

Age

While the proportion of people in age categories differed little between benchmark and follow up, there were some clear differences in ages between SD and MUD residents.

Generally, SD residents were in the middle age groups, while MUD residents were either in a younger age group or were elderly. The largest age group interviewed in SDs were 35 to 54 years – 50% at benchmark and 49% at follow up. In comparison, MUD residents had only 19% at benchmark and 17% at follow up in this age bracket.

The largest age group of people interviewed in MUDs were 25 to 34 year olds - 39% at benchmark and 47% at follow up, compared to 19% at benchmark and 15% at follow up for SD residents. The next largest age group of MUD residents were 65 years or more – 18% at benchmark and 19% at follow up, compared to 10% at benchmark and 15% at follow up for SDs.

Education Level

Education levels were similar for SD and MUD residents. More than half of both groups had tertiary or post-graduate qualifications. Secondary level schooling was the highest education level for slightly more MUD residents - 30% at benchmark and 43% at follow up, compared to 38% at benchmark and 26% at follow up for SD residents.

Employment

Just over half the householders interviewed at SDs and MUDs were employed, with around 20% of both groups retired. The remainder of interviewees in both dwelling types were spread fairly evenly across the other employment categories.

Household Ownership

SD residents were more likely to be home owners or to be purchasing the home (around 80%), compared to about 50% of MUD residents owning or buying their residence.

Years Lived at the Address

While a majority of those interviewed at both SDs and MUDs had lived in the home for five years or less, longer length of residence was positively associated with living in a single dwelling. About 50% of SD residents had lived in the home for more than five years compared to around 9% of MUD residents.

Household Composition

At both benchmark and follow up, around 50% of SDs were comprised of four or more people with less than 10% in this category for MUDs. MUD households were most likely to comprise one or two people - around 80% at benchmark and follow up, compared to around 30% for SD households.

Children

The majority of SDs comprised two adults with children - around 60% at benchmark and follow up. This contrasts with MUDs where only 10% had this household composition. MUD households were much more likely to consist of only adults - either living alone (35%) or sharing (15%) - or to contain a couple with no children (30%).

Household Income

People in SDs were more than twice as likely to refuse to provide information on their household income than were respondents from MUDs (21% SDs refused this question at benchmark and 31% at follow up). Nevertheless it was clear that household income in SDs was higher than in MUDs. Around 59% of SD residents at both benchmark and follow up had a household income of more than \$85,000 compared to only 25% of MUD households. Just over one third of MUDs had a household income of \$35,000 or less at benchmark, compared to 10% of SDs.

Summary of Household Demographic Features

People surveyed in SDs were more likely to have a higher household income, to have children, to live in a larger household, be aged between 35 and 54 years and to have post tertiary qualifications. Householders surveyed in MUDs were most likely to be in the younger or older age groups, to have lower household income, to have tertiary only qualifications and to have lived for less than five years at their current address. MUD residents were more likely to be renting than SD residents who were more likely to own or be purchasing their home.

Although there were some differences in the demographic information for SD and MUD residents between benchmark and follow up, their overall profile remained very similar.

Sample Characteristics - Stakeholders

Almost two thirds of stakeholders surveyed were male (73%) and most were aged 35-64 years (64%). Typically they had a secondary or TAFE education, most were in managerial roles and all were working full time. Over two thirds had more than nine years experience in waste management in the Canberra area.

There were some minor differences in the demographic features of key stakeholders between benchmark and follow up (summarised in Table 6) unlikely to contribute any systematic bias to outcomes.

Table 5 Demographic Features of Key Stakeholders

Key Stakeholder Demographic Features	Benchmark	Follow up
Male	73%	50%
Age 35-64 years	64%	66%
Secondary or TAFE education	82%	86%
Experience working on waste management issues	9 years	8.5 years
Working as managers	73%	83%
Full time worker	100%	100%

The sample comprised a broad a cross-section of key stakeholders, consisting of full time staff with extensive experience and interest in Canberra’s waste minimisation and kerbside collection systems.

Stakeholder Evaluation

At benchmark, just prior to the introduction of the new service, stakeholders indicated that the split bin collection service tended to have fallen below previous high standards. Following the introduction of the new service, stakeholders once again commented on the previous service and recalled a number of problems involving overlooked collections, flagging employee morale, losses in productivity and customer complaints.

Satisfaction with the New Service

Stakeholders reported that the new service had addressed the major difficulty of service unreliability. All respondents were satisfied with the new levels of reliability with three quarters indicating improved reliability. High levels of satisfaction were also reported for the convenience, frequency and efficiency of the new service.

Three quarters of stakeholders indicated the new service led to more recyclables being put out for collection and indicated they were recycling nearly all of the available paper, cardboard, glass aluminium and plastics in their own households.

Just under two thirds said it took less time to sort materials, with one quarter indicating it had not made a difference to the amount of time spent sorting recyclables. Two stakeholders indicated the new system took more time and one suggested fewer recyclables were being put out for collection.

Around half the stakeholders said they had no concerns with the new system, everything appearing to be going well. As one stakeholder commented *"the new service had to be better than what we had... despite considerable difficulties particularly early on in the process."*

In contrast to benchmark (before the change-over when more than half the stakeholders felt that householders would be dissatisfied), all stakeholders at follow up indicated that they felt householders would be very satisfied with the new kerbside service.

Stakeholder interviews elicited the following positive features of the new service:

- The appearance and quietness of the trucks was improved.
- The yellow colour of trucks matching the recycling bins gave a professional look to the service and made people more aware that 'yellow equals recycle'.
- Punctuality in picking up bins meant less down time and fewer occasions when pickups were delayed.
- There appeared to be a reduction in the number of public complaints with many indicating they had had none so far.
- Consistent use of log books by drivers tracked missed bin presentation and improved community relations and related issues. Drivers could check logs and report whether or not the bin was put out in time.
- There was an increased awareness among stakeholders of the support available to the elderly and disabled for pick ups, which they felt was worthy of further promotion.
- There appeared to be fewer complaints about spillages on the road.
- The transition provided opportunities for some stakeholders to train tenant managers on their knowledge of the recycling system and with fewer subsequent problems.

Despite the general endorsements from stakeholders on improvements to collections, some issues were identified as needing to be resolved before the change-over could be considered a complete success.

Transition and Change-over Problems

There were a number of transition issues at the time of change-over to the new service, some of which continued past the first few months of operation.

Difficulties in the first few months included the following:

- Generally, stakeholders acknowledged the challenges during change-over as being *"a nightmare of logistics problems in the first four weeks of the new service starting with no workforce, no depot and a change of runs despite difficulty it was done quickly."*
- Issues concerning residents' change of habits were noted, including people parking cars in front of the bins and not presenting bins correctly for roadside pick up. Some residents who

previously waited until they heard the collection truck before they put out their bin, missed the collection due to the new quieter trucks operating earlier in the morning.

Bin Dividers

Many stakeholders considered the removal of the plastic bin divider inside recycle bins to be an improvement as the bin was easier to use, however others felt it increased the amount of contamination and wastage at the recycling plant by allowing residents to put in large, unsuitable items which would not have previously fitted into the bin. Such items included computers, TVs, video players, concrete, parts of a cow, nappies, acid, grass clippings, chicken wire, car parts, tumble dryers, electrical goods, oil, sofas, stockings and doonas (which cause breakdowns to plant machinery). One stakeholder *commented "personally I would like to see the dividers back in so the larger unsuitable items couldn't fit."*

An additional issue concerned contamination due to glass breakage because of compaction in trucks but this was resolved with a driver education program. Also, one stakeholder had a concern over a lack of flexibility in the service contract that required the collection service to operate no matter what was presented in the recycling bins, i.e, even if there were large unsuitable items put out for collection. Other stakeholders indicated that this issue was being reviewed.

Finally, problems existed with the implementation of the planned removal of dividers with many not removed and then falling into the new recycling trucks along with the recycled material. Some 5,500 dividers were estimated to have been collected at the MRF from May to October, 2003.

Comments on Information and Education

A number of communication and information distribution strategies were used to inform people about the new service including a brochure, a calendar, bin signage in the form of a sticker to be placed on the lid of the bin when the divider was removed, a customer feedback phone line (Canberra Connect), an email service and ACTNOWaste staff visiting the community and talking to people face-to-face when householders were not complying with the recycle requirements.

Stakeholders were split in their reported levels of satisfaction with the change-over strategies: Two fifths were not satisfied, one fifth was moderately satisfied while the remainder (two fifths) were very satisfied with the provision of information during and after the change-over. More information was requested by stakeholders on what was actually recycled and what benefits were achieved by recycling.

Stakeholder comments about the information provided with the new service included:

- *"The brochure doesn't go far enough and needs input from people in the field. We (the government, educators, recyclers and MRF operators) should get together to produce a better brochure that helps people recycle."*
- *"Some people did not find the brochure or the calendar useful and as a stakeholder I don't look at the calendar - I follow what others in the street do."*
- *"Showing the public holidays on the recycling calendar confuses people. There is pick up on those days but people are not sure looking at the calendar."*

- *"Many bins do not have stickers informing residents of materials that can be recycled. Some bins still had old stickers on them and the community is confused."* A couple of stakeholders indicated their own bin did not have the new sticker informing them about what was recyclable.
- *"The position of the information stickers on bins is wrong. The labels should be on the front of the bin not anywhere on lids."*
- *"Signage on hoppers in multi-unit dwellings was not considered adequate or well presented and often had not been updated."*

Generally, stakeholders considered the community in the ACT to recycle very well, however people living in multi unit dwellings were perceived as less involved than individual householders.

Communication with Unit Managers

Although all stakeholders were aware of the change-over to the system, some unit managers had not been informed and would have been unaware of the new system, apart from the fact that they resided in Canberra.

Multi- unit managers expressed a strong interest in supporting the recycling system including:

- Wanting more information on the impacts of the change-over for clients with questions about the divider being missing from their bin, eg, *"We should have known about it in March and I still don't know what is going on. People don't understand why rubbish can now be put together and don't have a vision of how it is all sorted at the plant."*
- Some unit managers had not heard of: 'Second hand Sunday' and suggested it could be promoted with tenants through newsletters, or the assistance available for elderly and disabled residents.
- Wanting information about the recycling services to be used in newsletters, or in meetings with body corporate committees, or to be sent out to tenants with rent receipts or to give to new clients themselves.

Some unit managers indicated support for the idea of recycling but suggested it was not one of their core responsibilities.

Multi Unit Dwelling Issues in the ACT

People living in smaller complexes were perceived to be better with their recycling than those in bigger complexes. Large multi-unit dwellings with a common recycling hopper were viewed as the most likely source of contamination, with estimates of 30% contamination due to plastic bags and household waste. Stakeholder comments on reasons for this included:

- *"Residents don't feel a personal responsibility for the waste hoppers at MUDs, so people are slacker about it."*
- *"It is only 10% - 20% that have a poor sense of community and it is these people that are poor at recycling - if the recycle bin is full then the material goes into the rubbish bin."*

Another concern was illegal dumping at MUD hoppers. Unauthorised people were known to use the hoppers of MUD residents, with some stakeholders indicating the dumping was well planned.

Problems were also reported with the new collection trucks being involved in property damage and some accidents occurring. One stakeholder commented that *"the trucks have damaged the property of our body corporate members, taken out letter boxes, damaged waste enclosures, broken off branches of trees and hit a parked car."*

Education

Community education about the recycling process was viewed as important by all stakeholders many of whom were aware of the partnership approach to the 'education pool or fund' which was hoped would be used in a coordinated manner to enhance the expertise of all agencies.

Children were considered critical to improvements in community education and information on recycling:

- *"Children are often driving the recycling process at home. Education at school is very important. Older people don't understand about recycling and so don't do it."*
- *"Children are critical to long term recycling. If it becomes a habit they will do it all their lives. All schools should have systems including one for compost where the school scraps can go."*

At benchmark and follow up, half the responses from stakeholders suggested that some form of media (TV or radio) would improve awareness of information about recycling. One fifth of stakeholders suggested face to face meetings with members of the community or the distribution of leaflets and brochures as other methods to improve community education and information.

Motivation for Recycling

All stakeholders agreed that all potentially recyclable items ought to be collected at kerbside with almost half of the responses at benchmark and follow up indicating that the major motivation for householder recycling was that it was their contribution to the environment and part of a duty of care for all community members to reduce waste going to landfill.

Improving the Quality of Recycling

Stakeholders provided a number of suggestions for improving the quality of recycled material and participation in the collection program - using feedback (sanctions and rewards), a greater focus on partnerships with industry and reduced packaging, as well as structural approaches relating to new and existing multi unit dwellings.

Feedback – Sanctions and Rewards

There was considerable support for the community being better informed about their recycling behaviour, both good and bad. Stakeholder comments on this issue included the following:

- *"We should let people have some feedback about the amount being recycled and contaminated."*

- *“If the government is serious about their 2010 target they need to introduce fines and sanctions for non-compliance as fines are the only way to get non-recyclers to do it. I don’t think there would be objections”.*
- *“Currently residents can do the wrong thing twice before any sanctions are applied and then rubbish is picked up from them again after 3 months has passed”.*
- *“There should be a system of rewards for good use of bin systems and people who consistently do the right thing”.*

Partnerships with Industry

Stakeholders commented that housing developers could be assisted by government to ensure waste minimisation facilities were not left as an ad hoc consideration in planning leading to a lack of space for bins. One stakeholder commented *“in new units there should be a requirement (regulations) for a two chute system, one for rubbish and one for recyclables.”*

A number of stakeholders suggested industry could work with government to reduce the amount of packaging in products which would have a much bigger impact on reducing waste than household recycling.

Structural Changes

Adjustments to the structure of collections were suggested by a number of stakeholders, including an increase in the rubbish volume allowed to MUDs and households with large families; consideration of a weekly pickup for recyclable material as there was not enough room for it all in the bins; separate collection areas for cardboard boxes in MUDs because people were constantly coming and going using a lot of boxes; and, more regular disinfecting and cleaning of hoppers and the waste area to encourage people to use it more.

Knowledge and Use of the Service – Household & Stakeholders

Householders were asked some basic questions including how often the recycling service operated, and responsibilities for waste disposal practices and putting out the bin.

Similar to benchmark outcomes, respondents at follow up displayed a very clear understanding of when the recycling bin was collected with the vast majority of householders making regular use of the fortnightly collections. MUD householders were more likely to be unsure about when collection occurred, with MUD respondents living in a complex with hoppers slightly more so than those with 240l bins, not surprising since they were not responsible for placing the bins out for collection.

When visiting residences, surveyors requested participation from those most involved in recycling if they were home. Again, similar to benchmark, most respondents 55% reported that they were the main person with knowledge of waste disposal practices in their household, with 51% reporting they were also the main person involved in putting material into the recycling and garbage bins; 45% indicated they were one of the people in their household who shared these responsibilities.

The task of putting bins out for collection was carried out by 46% of SD householders themselves, with 40% sharing this task with others. Most MUD householders (76%) reported placing material in the hoppers more than twice a week. There was no difference between men and women in terms of

their knowledge of the collection system or in putting material into the bin, however, as for benchmark, men were much more likely to report it was their responsibility to put the bin out for collection.

What Items Can Be Recycled Through the Service – SD Residents

Survey respondents were also asked what they thought was able to be recycled through the kerbside collection service as shown in Table 7. Highlighted rows indicate those items not able to be collected at kerbside, with figures in bold indicating a reasonably significant change between benchmark and follow up, i.e, improvements in knowledge.

Table 5 SD Householder’s Identification of Recyclable Items¹

Item	Benchmark Interviews Proportion of SDs with the Correct Answer	Follow Up Interviews Proportion of SDs who were		
		Correct	Unsure	Wrong
Glass jars	95	92		
Glass drink containers	95	92		
Window glass	48	68	15	17
Ceramics	60	75	8	17
Ovenware	56	65	18	17
Newspaper	99	99		
Cardboard drink containers	91	92		
Other paper products	93	98		
Corrugated cardboard	45	75	5	18
Waxed & coated paper	32	86	5	9
Plastic bags	82	77	7	16
PET bottles	94	97		
Coloured plastic containers	60	70	12	18
Other plastics containers	41	74	6	20
Plastic toys	71	66	19	15
Rubber items	80	83	9	9
Poly pipe, hose	80	81	13	6
Timber off-cuts	88	88		
Cans - Aluminium	87	92		
Aluminium foil (clean)	35	55	9	36
Steel cans	68	86		
Spray cans	31	40	5	55
Car parts	87	93	93	
Clippings - grass	95	93	93	

*Highlighted items are those that cannot be recycled.

Confusion existed on whether some items could be recycled or not. For example, prior to the introduction of the new service, spray cans, aluminium foil, waxed and coated paper and corrugated card were items which were accepted by the service, however for over half of householders it was unclear whether these items were accepted or not. Following the introduction of the new service, only spray cans were still a major source of misunderstanding, with 55% either responding incorrectly or being unsure about this item. This was followed by aluminium foil at a rate of 45%.

¹ Note that percentages less than 4% have not been shown for clarity of presentation.

Although some other items were still prone to confusion about their recycling status (eg, window glass, ovenware, coloured plastic containers and other plastic containers), these levels had reduced somewhat since the introduction of the new service.

Some large improvements in correct understanding about the recycling status of many items was also apparent at follow up, particularly for window glass, ceramics, waxed and coated paper, corrugated cardboard, coloured and other plastic containers, aluminium foil and steel cans.

What Items Can Be Recycled Through the Service – MUD Residents

At benchmark, there were a variety of item types that MUD residents were either incorrect or unclear about when it came to their recycling status. These included, window glass, ceramics, ovenware, corrugated cardboard, waxed and coated paper, plastic bags, other plastic containers, aluminium foil and spray cans. Following the introduction of the new service, confusion had abated dramatically for ovenware, waxed and coated paper and other plastic containers. Improvements were also evident for corrugated cardboard, ceramics and plastic bags. In contrast, the situation had deteriorated with respect to plastic toys and rubber items and spray cans. Results for aluminium foil and window glass remained unchanged.

Table 6 MUD Householder's Identification of Recyclable Items²

Item	Benchmark Interviews Proportion of MUDs with the Correct Answer	Follow Up Interviews Proportion of MUDs who were		
		Correct	Unsure	Wrong
Glass jars	90	82		
Glass drink containers	93	84		
Window glass	40	46	26	28
Ceramics	53	60	24	16
Ovenware	41	62	18	20
Newspaper	100	93		
Cardboard drink containers	90	85		
Other paper products	93	96		
Corrugated cardboard	61	71	5	24
Waxed & coated paper	25	83		
Plastic bags	50	67	3	30
PET bottles	96	94		
Coloured plastic containers	64	72	9	19
Other plastics containers	27	70	11	19
Plastic toys	68	56	22	22
Rubber items	64	56	20	24
Poly pipe, hose	64	72	19	9
Timber off-cuts	73	74	19	7
Cans - Aluminium	87	83		
Aluminium foil	52	50	15	35
Steel cans	73	65	11	24
Spray cans	40	28	16	56
Car parts	78	78	11	11
Clippings - grass	76	85		

*Highlighted items are those that cannot be recycled.

² Note that percentages less than 4% have not been shown for clarity of presentation.

These mixed results covering a wide range of item types clearly indicate that MUD residents are far less likely than SD residents to know what should and shouldn't be put into the recycling bin. Although reasons for this are unclear, the relatively shorter time that MUD residents had been living at their address may partly account for this. In any case, it is evident that no matter what type of service is involved, increased educative effort and support needs to be provided to MUD residents in order to improve their knowledge of what items can be recycled.

What Items Can Be Recycled Through the Service – Stakeholders

Stakeholders also appeared to experience some confusion about the recycling status of some items. Prior to introduction of the new service, stakeholders were either incorrect or unclear about the recycling status of a variety of item types - corrugated cardboard, waxed and coated paper, other plastic containers, aluminium foil steel cans and spray cans.

Table 7 Stakeholder's Identification of Recyclable Items³

Item	Benchmark Interviews Number of Stakeholders With the Correct Answer (n=11)	Follow Up Interviews Number of Stakeholders (n=12) who were		
		Correct	Unsure	Wrong
Glass jars	11	12		
Glass drink containers	11	12		
Window glass	8	9	1	2
Ceramics	11	10	2	
Ovenware	10	11	1	
Newspaper	10	12		
Cardboard drink containers	11	12		
Other paper products	11	12		
Corrugated cardboard	3	10		2
Waxed & coated paper	5	4	2	6
Plastic bags	11	10	1	1
PET bottles	11	12		
Coloured plastic containers	7	10	1	1
Other plastics containers	5	9		3
Plastic toys	9	8	2	2
Rubber items	8	8	3	1
Poly pipe, hose	11	10	1	1
Timber off-cuts	11	12		
Cans - Aluminium	10	12		
Aluminium foil	5	7	1	4
Steel cans	7	10		2
Spray cans	6	6		6
Car parts	11	12		
Clippings - grass	11	12		

³ Note that results have been presented using frequency of responses due to a sample size of only 12 stakeholders.

As shown in Table 7, following introduction of the new service, confusion had largely been resolved for corrugated cardboard, coloured plastic containers, other plastic containers and steel cans with most stakeholders correctly able to categorise these items. Lack of clarity about the recycling status was still evident for aluminium foil and spray cans however. Finally, only four stakeholders correctly assessed waxed and coated paper as being accepted by the recycling service.

These results indicate a level of complexity associated with the recycling service that makes it difficult for even experienced workers in the industry to get it right all of the time. This points to the need to develop realistic education targets in relation to the community, as well as the need to provide more than 'one off' information on what is accepted by the service, particularly to cater for those moving into the ACT from other places. Further educational efforts should begin with stakeholder and other key groups as potential champions for correct use of the service.

Linking Demographics, Attitudes and Behaviour

Linked audit data was available for 105 SD households so that behavioural data could be matched to survey responses. A comparison of overall recovery rates (diversion of recyclables) and those according to material type demonstrated that surveyed households were broadly representative of audited areas in the ACT, as shown in Figure 1. That is, the recycling behaviour of surveyed households was very similar to that of all households included in the audit.

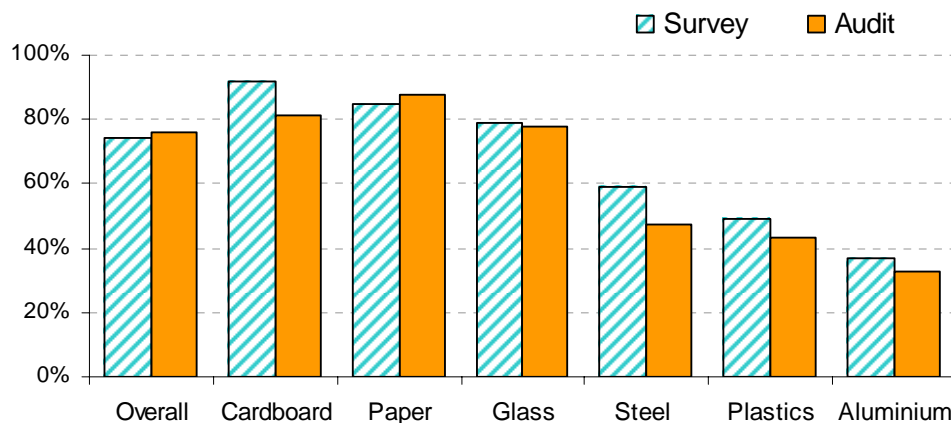


Figure 1 Comparison of Recovery Rates for Households Audited and Surveyed

Cardboard and paper were the items accounting for most recovery of materials, with steel cans, aluminium and all plastics at the lower end of recovery rates.

Demographic Features and Recycling Behaviour

Three variables were used to assess factors affecting the impact of the new kerbside recycling service - the proportion of the recycling bin used by the household; how contaminated that recycling bin was; and, the rate of recovery of resources in the household. Results were available for the 105 households where survey responses could be linked to audit data.

Various demographic features of the household were examined in relation to these factors to identify the effect of the following characteristics on recycling behaviour – gender, number of people in the household, family composition, employment status, family income and education level of

survey respondents. A more detailed profile of household waste minimisation and resource recovery has been provided in Appendix A which also includes information for garbage bins, item type and weight.

Gender

There was no appreciable difference in the resource recovery rates for households according to the gender of the survey respondent. In those cases where a woman responded to the survey on behalf of the household, the contamination rate of the recycling bin was found to be 4%, with a rate of 7% when the respondent was male.

Some minor differences were found according to material type. Figure 2 shows the recovery rate (diversion of recyclables) for male and female respondents for those material type differences in the order of 10%.



Figure 2 Differences between Men and Women Respondents and Recycling Recovery

These small differences showed that when the household respondent was female, glass and aluminium items were more likely to be recovered, whereas if the respondent was male, steel was the material more likely to be recovered. Reasons for these differences are unclear, but in any case, they probably indicate the need for all participating members of the household to understand exactly what can be recycled.

Number of People in the Household

The effect of the number of people in the household on recycling behaviour is shown in Figure 3.

As might be expected, people with larger households (of 4, 5 or more) were more likely to have a full recycle bin, simply due to the fact that they were more likely to produce more waste. Conversely, single person households were least likely to have a full recycle bin.

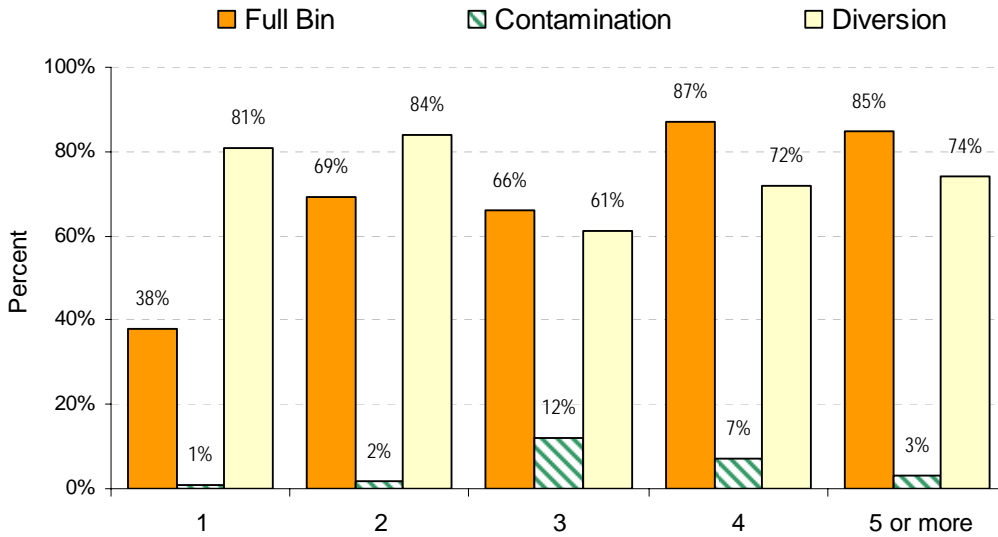


Figure 3 Recycling Behaviour According to Number of People in the Household

Those households with 1 or 2 people had the best recovery and least contamination of the recycle bin compared to other households; households with 4 or more people had somewhat lower diversion rates for recyclable items and higher levels of contamination of the recycling bin. Somewhat puzzling was the fact that the least diversion and most contamination occurred for households comprised of 3 people.

Household Composition

The effect of household composition on recycling behaviour is shown in Figure 4. The 'older family' category refers to family groups comprised only of adults.

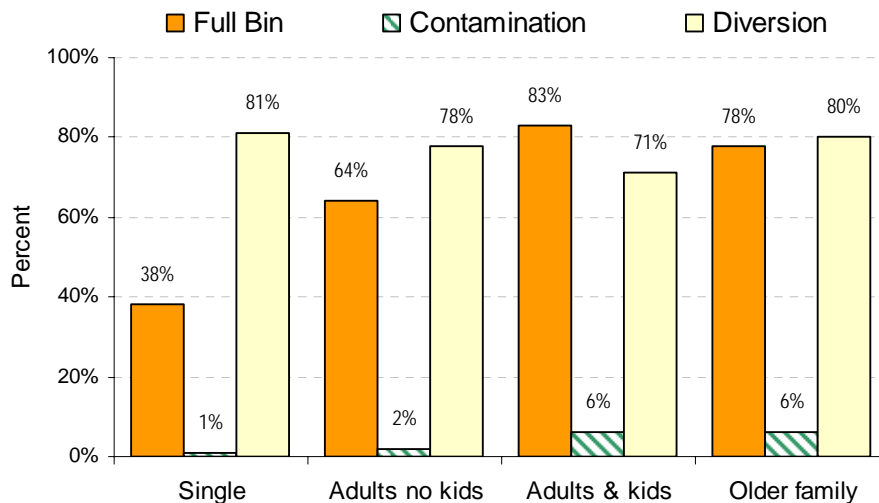


Figure 4 Recycling Behaviour According to Household Composition

Families comprised of adults with kids were most likely to have a full recycle bin, followed by older families, adults with no children and single person households. This pattern is to a certain extent reflective of the number of people in the household, but with the presence of children making it more likely that the family had a full recycle bin, presumably due to increased household consumption.

Diversion rates were highly similar for the three family composition types without children. Somewhat lower rates were evident for families with children. Figure 5 further examines the issue of children present in a household by examining outcomes according to the presence of children at different life stages – preschool, children (school age to teen) and teenagers; results for adults have also been included.

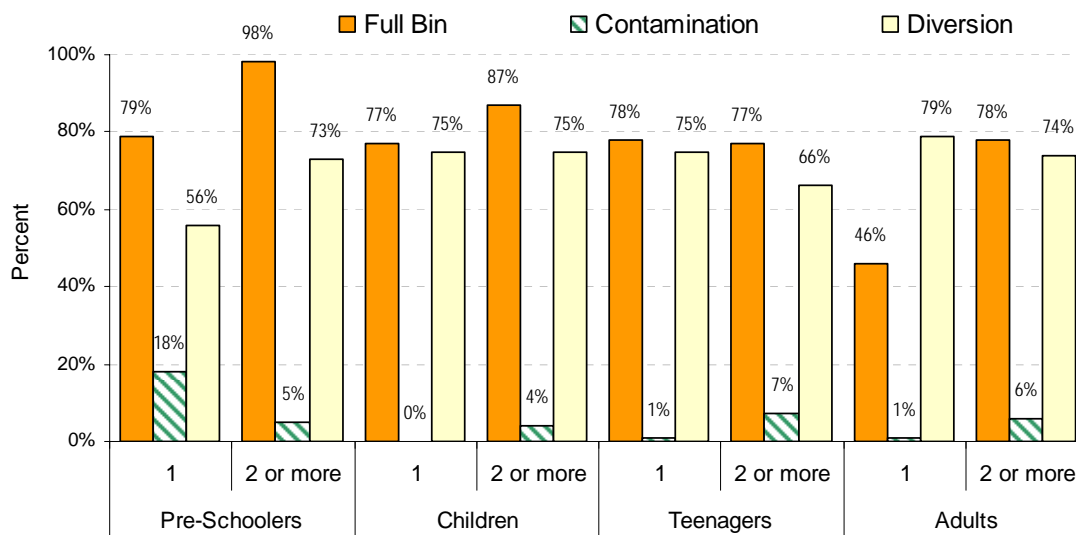


Figure 5 Recycling Behaviour According to Life Stage

Families with 2 or more pre-schoolers were the most likely to have a full recycle bin, followed by families with 2 or more children (school age to teen); single adult households were least likely to have a full recycle bin. Again, these results are most likely due to higher consumption levels related to the presence of young children in the house.

Diversion rates were broadly similar for all groups with the exception of households with either 2 or more teenagers, and those with one preschooler. Although highly speculative, reasons for this latter result might include an increased likelihood for households with one preschooler to contain a first baby, with adults having less energy to devote to household chores such as recycling. More difficult are explanations for households with 2 or more teenagers, although reduced diversion rates for this group are fairly small.

Similarly, households with one preschooler had the highest contamination rate of recyclables – almost 20%. All remaining groups demonstrated much lower levels.

Employment Status

Recycling behaviour was examined according to employment status as shown in Figure 6.

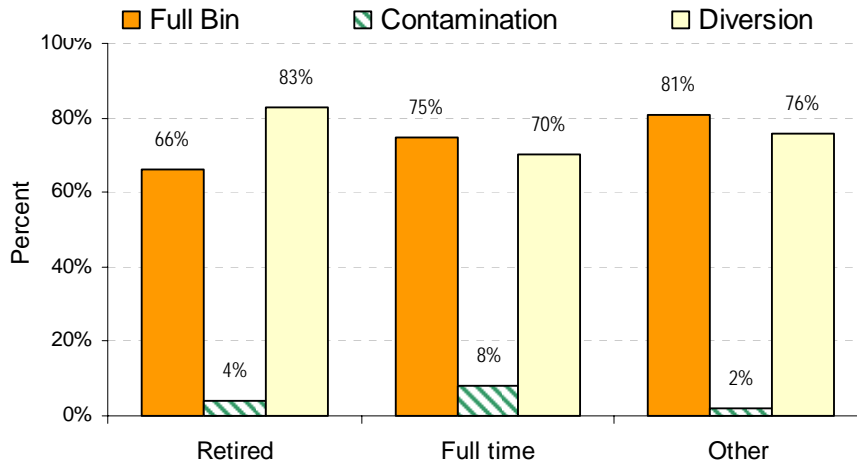


Figure 6 Recycling Behaviour According to Employment Status

There were no clear differences in relation to recycling behaviour and employment status. As might be expected though, respondents in full time and 'other' work were somewhat more likely to put out a full recycle bin than retired respondents, who were also less likely to be part of a larger family grouping with higher consumption levels.

Households with a retired respondent also demonstrated higher levels of resource recovery than other employment groupings, with those in full time work most likely to live in households with higher contamination rates. One speculative reason for this may be the result of less competing demands on time and attention for the retired group.

Household Income

The effect of household income on recycling behaviour is shown in Figure 7.

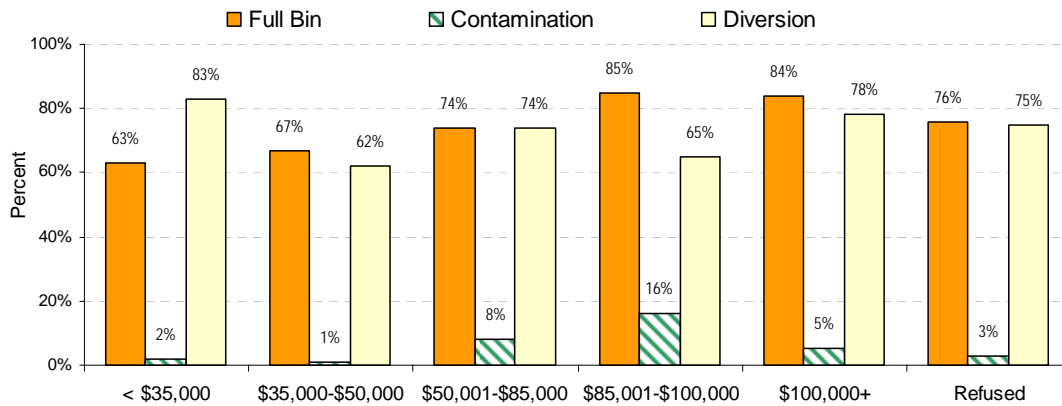


Figure 7 Recycling Behaviour According to Family Income

Although no systematic pattern of behaviour was evident for recovery and contamination rates according to family income, there were some isolated differences. For example, those households earning less than \$35,000 per annum had the highest recovery rates, with those earning \$85,001-\$100,000 exhibiting the highest contamination rates. These differences however were most likely to be the artefact of small numbers in some categories.

The only clear pattern in relation to household income was the increasing likelihood for households to put out a full bin as income increased, again most likely to be the result of increased consumption within the household.

Education

Recycling behaviour was also examined in according to education level of survey respondents as shown in Figure 8.

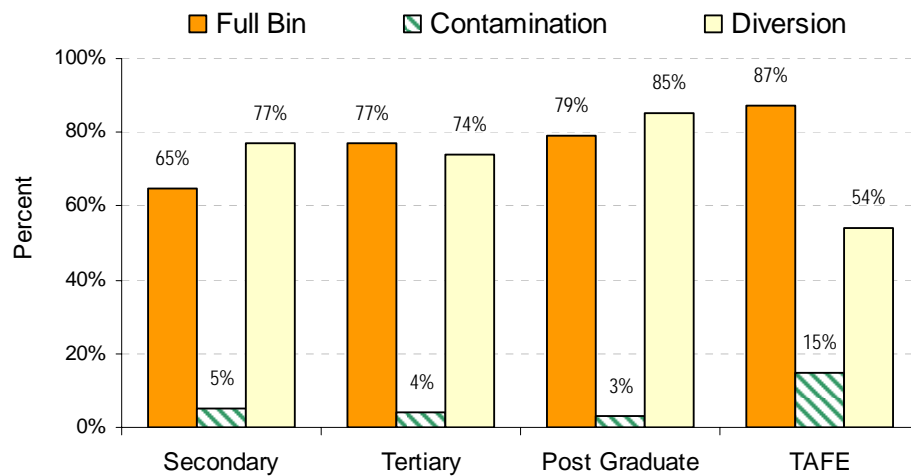


Figure 8 Recycling Behaviour According to Education Level

Those respondents with TAFE education lived in households who were more likely to put out a full recycling bin, had by far the worst recovery rates and the most likelihood of contaminated recyclables, although why this should be the case is very puzzling.

Those respondents who had post graduate education had the highest recovery rates and lowest contamination rates, but these differences were, on the whole, extremely small.

Summary Profile of Demographic Features and Recycling Behaviour

Those households most likely to put out a full recycling bin demonstrated the following summary characteristics:

- Households of 4 or more people
- Families comprised of adults with children
- Families with two or more preschoolers
- Survey respondents had full time or other employment
- Higher family income
- Survey respondents had a TAFE education.

Those households most likely to have the highest recovery rates demonstrated the following summary characteristics:

- Households of 1 or 2 people
- Households without children
- Survey respondents were retired
- Family income of less than \$35,000 per year
- Survey respondents had a post graduate education.

Those households most likely to have the lowest contamination rates were households of 1 or 2 people. Those groups with the highest contamination rates were households with one preschooler and those with a TAFE education.

In conclusion, demographic features associated with good resource recovery and low contamination included a household composition with low numbers of people living in the house and no children present. Putting out a full recycling bin was strongly related to consumption factors, ie, those households with greater numbers of people (particularly young children) and those with more financial resources at their disposal were much more likely to put out a full recycling bin.

Effects of Information Strategies on Recycling Behaviour

Three key methods of information distribution were used to improve resource recovery at change-over – an education brochure, calendar and bin sticker.

Brochure

The relative effects of the *brochure* on resource recovery and contamination rates are shown below in Figure 9. The yellow bars on the chart ('sample') refer to the proportion of the respondent sample who either received the brochure, felt the brochure was useful or who didn't get it.

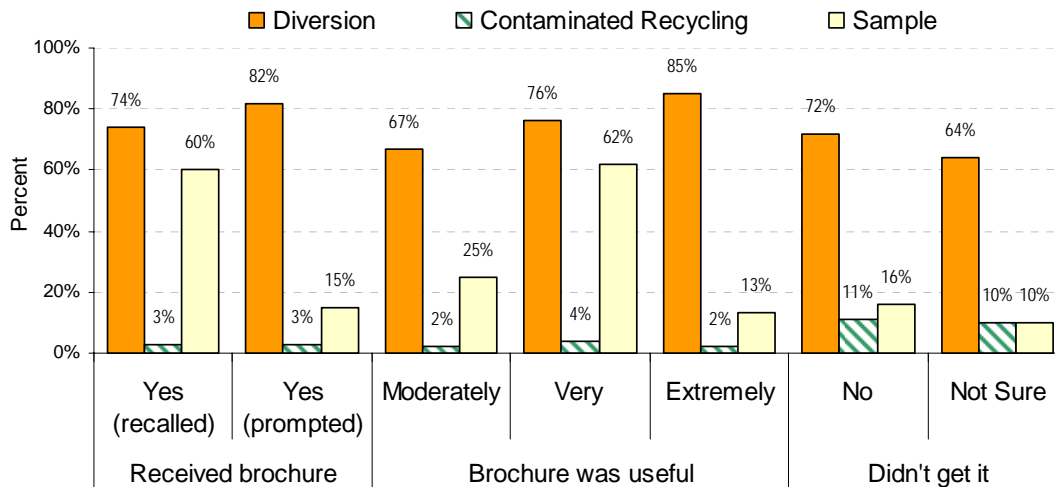


Figure 9 Effect of Brochure on Recycling Behaviour

The majority of respondents reported receiving the brochure, with most claiming that it was 'very' or 'extremely' useful (there were no responses for 'not at all useful or 'slightly useful'). Receiving the brochure and level of satisfaction with the brochure were not associated with resource recovery though. However, those households with respondents who reported not receiving the brochure or who weren't sure if they got it, demonstrated higher levels of contamination of recyclables.

It appeared therefore, that although the brochure did not make an appreciable difference to recovery rates, it yielded some benefits in relation to reducing contamination rates.

Calendar

The relative effects of the *calendar* on resource recovery and contamination rates are shown below in Figure 10.

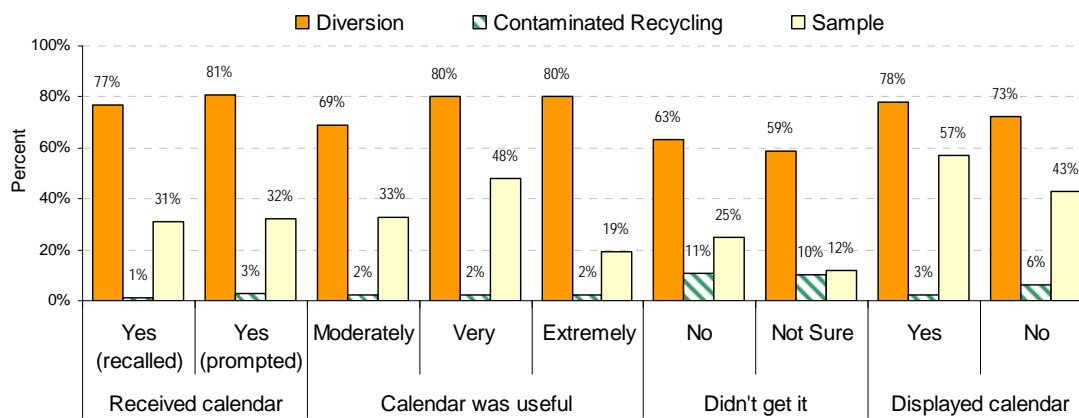


Figure 10 Effect of Calendar on Recycling Behaviour

The majority of respondents reported receiving the calendar, with most claiming that it was 'very' or 'extremely' useful (there were very few responses for 'not at all useful' and 'slightly useful'). Most people who reported receiving the calendar displayed it (58%). Not as many people reported receiving the calendar as the brochure though, with levels of satisfaction for the calendar also being slightly lower.

Unlike the brochure, receiving the calendar and level of satisfaction with the calendar *were* associated with resource recovery rates. Households who reported receiving the calendar had higher recovery rates than those who didn't recall receiving one, with those actually displaying their calendar having slightly higher recovery rates than those who didn't.

Contamination rates were also higher for those who didn't recall receiving a calendar compared to those who did. Also, of those households who received a calendar, there were slightly lower contamination rates for those people who actually displayed their calendar.

The calendar appeared to make a difference to both recovery and contamination rates, with an added benefit if the calendar was displayed within the household.

Bin Sticker

The relative effects of the *bin sticker* on resource recovery and contamination rates are shown below in Figure 11.

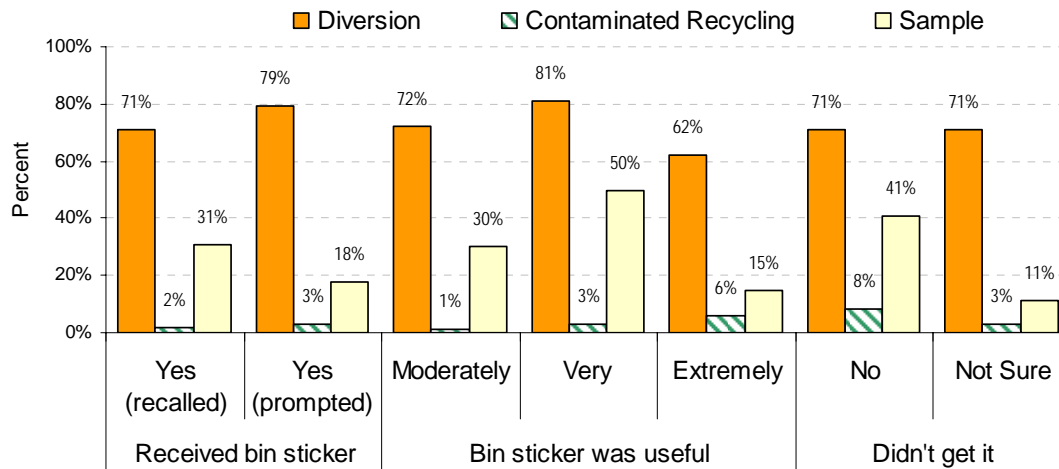


Figure 11 Effect of Bin Sticker on Recycling Behaviour

Unfortunately, about 40% of respondents reported not receiving the bin sticker, with another 10% not sure whether they received it or not. As previously noted by stakeholders, there were problems with the distribution of the bin stickers with many households failing to receive them. Of those who reported receiving the bin stickers, most claimed they were or 'very' or 'extremely' useful, with results similar to that for the calendar.

There was a slight increase (about 5%) in the recovery rates for those who reported receiving the bin sticker to those who didn't, with a small increase in contamination rates for this group also.

The bin sticker appeared to make a very small difference to both recovery and contamination rates, but their incomplete distribution made it difficult to assess whether they would have had more impact if more households had received them.

Householder Perception of Other People's Recycling in Their Street

Householders were also asked how well they thought people in their street recycled, with responses then compared to recovery and contamination rates as shown in Figure 12.

Most respondents reported that people in their street recycled 'very well' (64%), followed by 'moderately well' (25%), and 'extremely well' (11%). There were only two responses in the category levels below 'moderately'.

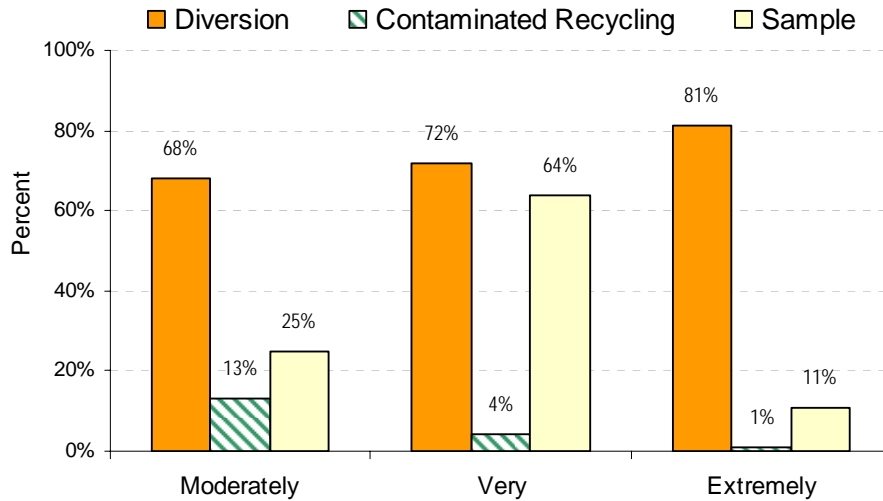


Figure 12 Householder Perception of How Well Other People in Their Street Recycled

These perceptions proved to be accurate, with audit recovery rates steadily increasing for those households who rated their street as recycling ‘moderately well’ through to those who rated it as recycling ‘extremely well’. The converse was true for contamination rates. That is, contamination rates decreased for those households who rated their street as recycling ‘moderately well’ through to those who rated it as recycling ‘extremely well’.

Satisfaction with the Service

Householders were also asked about their satisfaction with garbage and recycling collection and information services as shown in Figure 13.

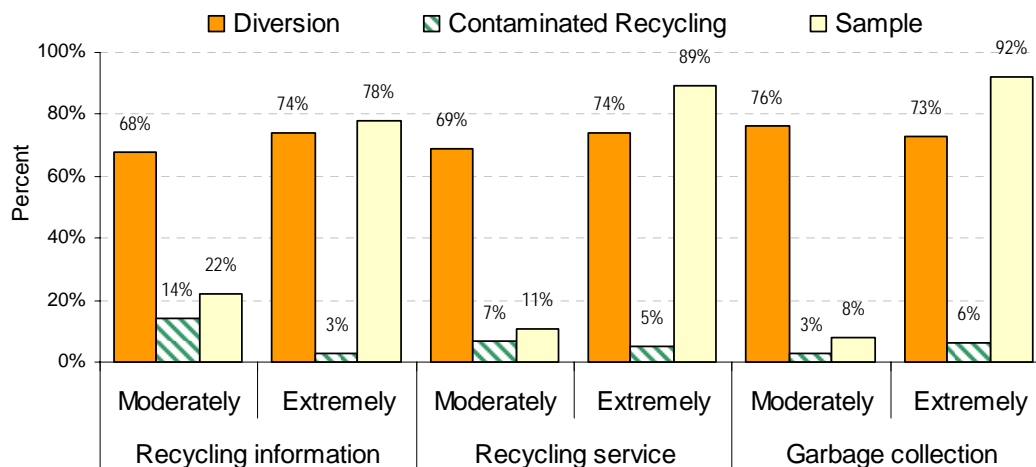


Figure 13 Community Satisfaction with Garbage & Recycling Collection Services

Community level of satisfaction with the kerbside collection services as managed by ACTNOWaste was extremely high. The vast majority of respondents were extremely satisfied with the garbage

collection service, the recycling collection service and the information provided to households on recycling. Apart from the responses reported in the figure above, only one householder was 'not at all' satisfied with the garbage and recycling collection service, with five respondents 'not at all' satisfied with the information provided on recycling.

These results were very pleasing and promote the likelihood that householders will be receptive to continued messages on improving their level of resource recovery.

Accuracy of Self Report of Recycling Behaviour

Householders' report of their own recycling behaviour was examined in relation to their actual behaviour as measured by the waste audit. Community Change's participation scales were used to examine the loss of resources in general garbage and the contamination of recycling streams by comparing what householders *said* about their waste disposal actions and what was *actually found* during audits. It should be noted that MUD households were not able to be included in the audit process, as it was not possible to link individual garbage bin contents with survey responses.

Householders typically find it difficult to estimate weight of materials recycled. Consequently, they were asked to identify the proportions of materials they believed they placed into the appropriate recycling bin. These self-reported recycling participation and recovery rates were compared to the contents of the waste stream as analysed in the bin audit.

The ratings scale for individual items represented the percentage of the total amount of items for each stream in the household that was correctly placed in the appropriate bin. These ratings represent the recovery rate for each material as follows:

- 0 – None of the material is used in the household
- 1 – Material is used in the household but is not placed in the recycle bin
- 2 – A little bit of the material is correctly recycled
- 3 – Some of the material is correctly recycled
- 4 – Most of the material is correctly recycled
- 5 – Nearly all of the material is correctly recycled
- 6 – No idea

Using the above scale, households rated the amount of aluminium, glass, plastic and paper products they recycled. The same scale was then used to rate the *actual* level of the same materials which were found in household's waste stream. The self-reported rating and the audit rating were then compared.

Using a standardised procedure, differences in ratings were grouped into the following categories for each waste stream. 'Accurate' recycling represented people whose self report matched actual audit findings. These people knew what side of the bin to put things in and were fairly clear on how much of their material was used in the household and how much went into recycling. 'Inaccurate' self-reports were assigned to those households grossly exaggerating the amount of material they were recycling. 'Unclear' ratings were used when the material was not present in any bin, despite residents indicating they recycled it.

The categories were:

- **Accurate:** Households know what products they use and where to place them in the kerbside service.
- **Inaccurate:** Households reported that they used products and placed them correctly in the kerbside but actually placed them incorrectly in the kerbside service or were very unclear about what was going into their bin, often overestimating what they were actually recycling in the kerbside service.
- **Unclear:** Households report they recycle products but no products were found in the waste stream.

Audits and Self Report

Examination of the results for all recycled materials and for household's knowledge of their recycling activity showed that 73% of people in single dwellings accurately described their recycling behaviour, while approximately one fifth indicated they were recycling materials at higher levels than were seen during the audits. These levels were highly similar to those found during the first audit.

Accuracy of Self Report and Demographic Features

The first report of results prior to the introduction of the new service examined the accuracy of householder reports in relation to a number of demographic factors. This exploratory analysis was repeated for the second stage of the study, following the introduction of the new service. Unfortunately, due to a lower response rate in the second survey along with some practical constraints with the auditing process, linked results were available for only 105 households compared to 145 households in the first study. This meant that results for some demographic sub-categories had small n's and valid comparisons were not able to be made.

To simplify comparisons between the first and second study, only summary statements have been included below for ease of presentation.

Gender

Prior to introduction of new service: No appreciable gender difference with respect to accuracy with women slightly less accurate (5%) in self report of what happened to recyclable materials in the household.

Following introduction of the new service: Women slightly more accurate in their self report (10%).

Age

Prior to introduction of new service: More than three quarters of respondents 25 years or older were accurate in their knowledge of what happened to recyclable material in their household.

Following introduction of the new service: More than three quarters of respondents over 35 years accurate in their knowledge of what happened to recyclable material in their household.

Education

Prior to introduction of new service: No clear relationship between education level and accuracy of self report.

Following introduction of the new service: Slightly increased likelihood for postgraduate respondents to be more accurate, otherwise no differences were evident.

Employment Status

Prior to introduction of new service: Some preliminary indication that those respondents employed part time demonstrated the highest accuracy levels.

Following introduction of the new service: Respondents employed full time were least accurate (69%) and those retired most accurate (79%).

Home ownership Status

Prior to introduction of new service: Those living in rental accommodation less likely to accurately identify what they did with recyclables.

Following introduction of the new service: Home owners demonstrated a somewhat higher level of accuracy compared to purchasers and renters who were at similar levels.

Years at Address

Prior to introduction of new service: No clear pattern of differences according to length of time at address with respect to accuracy.

Following introduction of the new service: No clear differences with respect to accuracy.

Number of People in the Household

Prior to introduction of new service: Respondents living alone appeared much less likely to be accurate (approximately 45%) than other groups of 2 or more (65-85%).

Following introduction of the new service: Those living alone and those living with two others less likely to be accurate than other groups but not by a big margin.

Household Composition

Prior to introduction of new service: Single parents with children and single people living alone were less likely to demonstrate accuracy in relation to self report. Some preliminary indication that having more than one adult in a household was a mediating factor in improving accuracy.

Following introduction of the new service: Single people living alone demonstrated somewhat lower accuracy rates but rates for single people with children unable to be reported.

Income

Prior to introduction of new service: Those households with family income of less than \$20,000 per annum demonstrated lower accuracy rates, as did those who refused to provide or didn't know family income information.

Following introduction of the new service: Those households with family income less than \$20,000 unable to be reported, but lower accuracy rates for those who refused to provide or didn't know

family income information. Those with family income of \$20,001-\$35,000 and \$100,000+ demonstrated the highest accuracy rates but reasons for this are unclear.

Demographic Features and Accuracy of Self Report - Conclusions

Whilst some clear differences existed in terms of the demographic characteristics of households and their recycling behaviour, no differences were consistently evident in relation to the accuracy of self report of respondents in relation to their household's recycling behaviour as measured by the audit. Two possible exceptions involved respondents 35 years or older who were more likely to be accurate in their knowledge of what happened to recyclable materials in their household, and those living alone who were least likely to be accurate in this regard.

Householder Evaluation of the New Service

Concerns and Satisfaction with the New Service

The large majority of householders were extremely satisfied with the new kerbside *recycling* service (88% for SDs and 71% for MUDs). There was a somewhat higher proportion of MUD residents who were only 'slightly' satisfied with the service (10%) compared to only 1% of SD residents. These levels were similar to those at benchmark when the old service was operating. Results were also highly similar in relation to resident's satisfaction with the *garbage* collection service.

When asked if they had any concerns about the recycling system, again the large majority of householders had no concerns (85% for SDs and 69% for MUDs). Of those MUD residents who expressed concern, six reported that overfilled bins were not emptied, four said that litter was left behind after collection, and two had concerns about service unreliability. All remaining concerns consisted of single responses.

Stakeholder evaluations reported earlier in the report also made mention of the problem of overfilled bins and illegal dumping at MUD hoppers. MUD resident's concerns at benchmark contained no consistent themes, so the reported problem of overfilled bins and litter left behind (possibly through illegal dumping) at follow up is worthy of attention. The problem of illegal dumping is a challenging one and probably requires a joint approach between residents, resident managers, council staff and other stakeholders to address it. Such an approach might also yield a number of benefits in term of education about resource recovery and contamination issues.

Of the small number of SD residents who had concerns, two were uneasy about not knowing what happened to recyclables once they were collected.

Improving Community Education and Information on Recycling

Householders were asked what information they needed to improve their use of the recycling service. Just over half the residents expressed the need for more information about exactly what was recyclable, which was consistent with gaps in householder knowledge as reported earlier in the report. This was followed by the need for information on how to separate waste from recyclables (n=15), outcomes from recycling efforts (n=11), the environmental benefits of recycling (n=9), how to make it easier to get items in bins (n=8), and when collection occurs (n=7).

Barriers to Using the Service

Similar to benchmark, the majority of householders reported that nothing really prevented them from using the kerbside recycling service. The most commonly identified barrier to using the service was 'too lazy' (31% for SD residents and 20% for MUD residents).

Remaining barriers identified were 'don't know enough about it' (n=17), 'too much trouble' (n=13), 'if the service was unreliable' (n=9), 'if I was ill and unable to put it out' (n=6), 'if bins were full' (n=6), 'if bins were damaged' (n=5), and 'if it was likely to cost me money' (n=2). All remaining barriers consisted of single responses. Although not large, the number of people who felt they didn't know enough about the service probably reinforces the need for further information to filter through to this group.

Improving Use of the Service

Apart from suggestions to improve community education and information as discussed above, and comments on the brochure, calendar and bin stickers reported earlier in the report, there were only two additional ideas from residents on how to further improve the service. Seven residents suggested providing a mobile garbage bin to fit all recyclable items (i.e., even very large items) which was in contrast to benchmark surveys, where just over half the respondents wanted a larger bin. It appeared therefore that the introduction of the new service obviated the need expressed by residents for a larger bin.

In addition, three residents wanted a mobile garbage bin that was more durable. At benchmark, 80% of respondents reported that access to a green waste service would improve their management of waste, but this issue was not included in the follow up survey.

Other Things to Reduce Waste

For SD residents, the most common response to other things the household did to reduce waste was reusing items such as plastic containers, bags and glass jars (41%), along with composting grass and garden clippings (41%). MUD residents were also most likely to report reusing items and composting grass and garden clippings to reduce waste, but to a lesser extent (24% for item reuse and 11% for grass clippings).

SD residents were next most likely to report composting and worm farming as a waste reduction strategy (34%) and giving away items to charity or Second Hand Sunday (12%). MUD residents were also next most likely to include donating to charity as a waste reduction strategy (10%). A variety of other methods to reduce waste were reported by residents, but in much smaller numbers. These included (in order) selecting items when shopping that required less packaging or had a higher recycled content or bulk buying; private hiring of a skip or dumpster; council mulching service; selling used items; and, burning paper as fuel at home.

There were no real differences between follow up and benchmark with respect to other things households did to reduce waste, apart more SD residents reporting reusing items at follow up.

Motivation for Recycling

The three most common responses for why households recycled were 'it is our contribution to helping the environment' (31%), 'to reduce waste going to landfill' (17%), and 'its there as a service

that is provided' (17%). This was the case for SD and MUD residents. In addition, 17% of SD residents reported that 'it's our duty to do the right thing'. No MUD residents included this as a response. There were a variety of other responses in relation to householder's motivation for recycling, but again, in smaller numbers. These were (in order) because we were asked to do it; not enough room in the garbage bin for all material; we've always done it; and, its habit/part of our household routine.

A sense of responsibility to the environment was clearly the primary motivation to participate in the recycling program for most residents, as also found at benchmark. Secondary motivators were also similar to those found at benchmark.

Children and Recycling

Since there appeared to be differences in recovery rates according to family composition, particularly those families with children, additional questions were included in the follow up survey about the effect of children on household recycling practices. On the whole, respondents considered children helped make recycling easier, mainly because children thought it was important, they reminded others to separate items, and parents felt the need to provide a good example. Numbers of responses to this question were generally low however, compared to other issues included in the survey.

Conclusions and Recommendations

The linking of attitudes and behavioural audit information both before and after the change-over to a new domestic waste service in April 2003 provided valuable insight into householder perceptions of the new service, as well as effects on behaviour. The outcomes provided in this report provide a solid platform for continued monitoring and ongoing improvement of the service.

The survey response rates achieved in the project were very good, exceeding the original target sample of 100 SDs. Although somewhat less households participated at follow up, results from 119 survey respondents provided a valid basis for assessment of community perceptions and attitudes.

Primary project outcomes demonstrated:

1. People from SDs were more likely than MUD residents to have a greater household income, to have children, and a larger household. MUD residents tended to be younger, with lower total household incomes, had lived at their address for less than five years, and were renting rather than purchasing (both at benchmark and follow up).
2. High levels of participation in the system were evident from the audit, with reasonably good separation of materials. Cardboard and paper accounted for most recovery of material, with steel cans, aluminium and all plastic at the lower end of recovery rates.
3. High levels of basic knowledge and awareness of the kerbside recycling service found at benchmark continued to be evident at follow up. There was some improvement at follow up in householder knowledge of exactly what was recyclable but confusion was still evident in relation to spray cans and aluminium foil in particular. MUD households were far less likely than SD residents to know what should and shouldn't be put into the recycling bin. Stakeholders were also unclear about the status of some items, particularly waxed and coated paper.
4. Demographic features associated with good resource recovery and low contamination rates included a household composition with low numbers of people living in the house and no children present. Putting out a full recycling bin was strongly related to consumption factors, ie, those households with greater numbers of people (particularly young children) and those with more financial resources at their disposal were much more likely to put out a full recycling bin.
5. The brochure distributed to residents prior to the introduction of the new service did not make an appreciable difference to recovery rates but appeared to contribute to some to reduction in contamination rates. The calendar appeared to make a difference to both recovery and contamination rates, with an added benefit if the calendar was displayed within the household. The incomplete distribution of the bin sticker made its efficacy difficult to assess.
6. Whilst some clear differences existed in terms of the demographic characteristics of households and their recycling behaviour, no differences were consistently evident in relation to the accuracy of self report of respondents in relation to their household's recycling behaviour as measured by the audit.

7. Householder perceptions of 'other people's recycling in their street' was accurate in terms of recovery and contamination rates as measured by the audit.
8. Householders were extremely satisfied with the new garbage and recycling collection service and the information provided to households on recycling.
9. When asked what information they needed to improve their use of the recycling service, most householders wanted information on exactly what was recyclable. This was consistent with gaps in householder knowledge.
10. Although minor, concerns about the service included illegal dumping and litter not collected or left behind at MUD hoppers.
11. A sense of responsibility to the environment continued to be the primary motivation to participate in the recycling program. The most common reason for not using the service was laziness.
12. The most common strategies to reduce waste other than participation in the recycling program were reusing items & composting.
13. Stakeholders were also extremely satisfied with the new service but had a number of suggestions for further improvements to waste management, including developing partnerships with industry and structural changes to collection, particularly for MUDs. There was support for providing feedback to residents on recycling outcomes from both stakeholders and residents.

The implications of these outcomes point to a number of recommendations for future consideration:

- A. The high level of participation in, and support for the new service should continue to be actively built upon and improved.
- B. Information continues to be needed on what is recyclable and how to separate items for recycling. Information should be provided on a regular basis to improve resident knowledge and provide updates for people moving into the ACT. Consideration should be given to communicating feedback on recycling performance and using promotional methods that can be prominently displayed within people's homes.
- C. There is a need to build on the community's existing sense of responsibility to the environment by regular promotion and education of the service to reinforce a positive social expectation to use the service correctly.
- D. There is a level of complexity in relation to the items which can and can't be accepted by the service. Ensure that realistic education targets are set for the community and begin further educational effort with community, stakeholder and other key groups as potential champions for the service.
- E. There is a need to improve support & education for MUD households using a cooperative approach between MUD residents, tenant managers, council staff and

stakeholders, particularly in relation to addressing challenging issues such as illegal dumping.

- F. Follow up on stakeholder suggestions for improvement including partnerships with industry and structural improvements to collection.

Appendix A Analysis of Waste Stream and Features of Households

Table 8 Gender of Respondent and Waste Stream Analysis

Respondent Gender	Gender		Overall Average	
	Male	Female		
	N	47	59	106
Total Waste Stream	14510	16813	15792	
Weight of Garbage Bin	8948	10582	9858	
% Full Garbage Bin	71%	70%	71%	
% Recyclables Lost in Garbage Bin	18%	15%	16%	
Weight of Recycle Bin	5561	6231	5934	
% Full Recycle Bin	73%	77%	95%	
% Contamination of Recycle Bin	7%	4%	5%	
% Recovery of Recyclables (Diversion)	71%	77%	74%	
% Recovery Paper	83%	86%	85%	
% Recovery Cardboard	88%	95%	92%	
% Recovery Glass	74%	83%	79%	
% Recovery Plastic	49%	49%	49%	
% Recovery Aluminium	30%	43%	37%	
% Recovery Steel	66%	54%	59%	

Table 9 Respondent Age and Waste Stream Analysis

Respondent Age	< 24 yrs	25-34	35-44	45-54	55-64	65+ yrs
	N	7	16	36	16	11
Total Waste Stream	18765	16304	15762	15258	19547	12323
Weight of Garbage Bin	10935	11603	9656	9477	12517	7020
% Full Garbage Bin	77%	76%	69%	79%	82%	54%
% Recyclables in Garbage Bin	16%	18%	17%	19%	13%	15%
Weight of Recycle Bin	7830	4701	6106	5781	7030	5302
% Full Recycle Bin	80%	81%	81%	72%	67%	62%
% Contamination of Recycle Bin	7%	14%	4%	2%	9%	1%
% Recovery of Recyclables	79%	55%	73%	77%	77%	83%
% Recovery Paper	87%	63%	87%	88%	91%	91%
% Recovery Cardboard	86%	98%	95%	88%	93%	88%
% Recovery Glass	81%	71%	76%	79%	85%	87%
% Recovery Plastic	44%	40%	48%	43%	55%	56%
% Recovery Aluminium	63%	39%	35%	28%	30%	41%
% Recovery Steel	63%	41%	62%	47%	64%	73%

Table 10 Respondent Education and Waste Stream Analysis

Respondent Education					
	N	TAFE 11	Tertiary 44	Secondary 31	Post Graduate 15
Total Waste Stream		17174	16099	15643	13727
Weight of Garbage Bin		12051	10276	9564	7277
% Full Garbage Bin		81%	70%	71%	67%
% Recyclables in Garbage Bin		19%	18%	15%	16%
Weight of Recycle Bin		5124	5823	6079	6450
% Full Recycle Bin		87%	77%	65%	79%
% Contamination of Recycle Bin		15%	4%	5%	3%
% Recovery of Recyclables		54%	74%	77%	85%
% Recovery Paper		65%	84%	86%	96%
% Recovery Cardboard		86%	94%	88%	97%
% Recovery Glass		69%	74%	84%	85%
% Recovery Plastic		36%	46%	53%	56%
% Recovery Aluminium		30%	35%	52%	34%
% Recovery Steel		69%	56%	58%	63%

Table 11 Type of Occupancy and Waste Stream Analysis

Nature of Occupancy				
	N	Renter 14	Owner 60	Purchaser 28
Total Waste Stream		14000	15588	17400
Weight of Garbage Bin		8177	9579	11413
% Full Garbage Bin		71%	69%	76%
% Recyclables in Garbage Bin		18%	15%	21%
Weight of Recycle Bin		5824	6009	5987
% Full Recycle Bin		71%	71%	84%
% Contamination of Recycle Bin		2%	5%	7%
% Recovery of Recyclables		79%	77%	65%
% Recovery Paper		89%	87%	77%
% Recovery Cardboard		89%	94%	91%
% Recovery Glass		70%	83%	73%
% Recovery Plastic		56%	52%	35%
% Recovery Aluminium		35%	44%	30%
% Recovery Steel		54%	59%	58%

Table 12 Respondent Employment Status and Waste Stream Analysis

Employment Groups	Full time	Retired	Other
	N	49	24
Total Waste Stream	15902	14066	17175
Weight of Garbage Bin	10555	8301	9796
% Full Garbage Bin	77%	64%	65%
% Recyclables in Garbage Bin	17%	12%	19%
Weight of Recycle Bin	5348	5765	7380
% Full Recycle Bin	75%	66%	81%
% Contamination of Recycle Bin	8%	4%	2%
% Recovery of Recyclables	70%	83%	76%
% Recovery Paper	82%	91%	85%
% Recovery Cardboard	94%	88%	93%
% Recovery Glass	69%	89%	86%
% Recovery Plastic	43%	62%	48%
% Recovery Aluminium	40%	36%	30%
% Recovery Steel	56%	76%	54%

Table 13 Length of Time Respondent Has Lived at Address and Waste Stream Analysis

Length of Time Living at Address	Less than 3			
	11 + years	years	3 to 5 years	6 to 10 years
N	32	26	20	24
Total Waste Stream	14163	15592	15057	19075
Weight of Garbage Bin	8865	9825	8905	11985
% Full Garbage Bin	69%	77%	73%	67%
% Recyclables in Garbage Bin	18%	17%	18%	13%
Weight of Recycle Bin	5298	5766	6153	7091
% Full Recycle Bin	72%	75%	83%	72%
% Contamination of Recycle Bin	3%	8%	2%	9%
% Recovery of Recyclables	77%	69%	73%	77%
% Recovery Paper	87%	77%	83%	92%
% Recovery Cardboard	90%	88%	99%	93%
% Recovery Glass	78%	72%	80%	85%
% Recovery Plastic	57%	41%	50%	45%
% Recovery Aluminium	39%	35%	39%	37%
% Recovery Steel	60%	67%	52%	54%

Table 14 Number of People in Household and Waste Stream Analysis

Number of People Living at Address					
	1	2	3	4	5 or more
N	8	27	18	33	18
Total Waste Stream	9074	14405	16411	17859	17406
Weight of Garbage Bin	4842	8130	10918	11431	11367
% Full Garbage Bin	31%	61%	73%	81%	86%
% Recyclables in Garbage Bin	15%	18%	14%	18%	17%
Weight of Recycle Bin	4232	6275	5493	6428	6040
% Full Recycle Bin	38%	69%	66%	87%	85%
% Contamination of Recycle Bin	1%	2%	12%	7%	3%
% Recovery of Recyclables	81%	84%	61%	72%	74%
% Recovery Paper	85%	91%	68%	88%	85%
% Recovery Cardboard	100%	83%	97%	96%	93%
% Recovery Glass	94%	85%	71%	78%	74%
% Recovery Plastic	54%	58%	40%	40%	58%
% Recovery Aluminium	33%	32%	41%	42%	34%
% Recovery Steel	62%	72%	46%	50%	64%

Table 15 Children in Household and Waste Stream Analysis

Number of Children in Households	Pre-Schoolers		Children		Teenagers		Adults	
	1	2 or more	1	2 or more	1	2 or more	1	2 or more
	N	11	11	12	22	13	9	9
Total Waste Stream	15876	20197	19440	14034	18613	18897	9809	16540
Weight of Garbage Bin	11474	13683	12061	8426	10901	14167	5568	10384
% Full Garbage Bin	70%	85%	83%	78%	90%	84%	39%	74%
% Recyclables in Garbage Bin	11%	19%	18%	17%	18%	17%	16%	17%
Weight of Recycle Bin	4402	6514	7379	5608	7713	4730	4242	6156
% Full Recycle Bin	79%	98%	77%	87%	78%	77%	46%	78%
% Contamination of Recycle Bin	18%	5%	0%	4%	1%	7%	1%	6%
% Recovery of Recyclables	56%	73%	75%	75%	75%	66%	79%	74%
% Recovery Paper	64%	88%	88%	87%	88%	80%	83%	85%
% Recovery Cardboard	92%	89%	93%	100%	100%	98%	98%	92%
% Recovery Glass	67%	87%	77%	69%	80%	73%	93%	78%
% Recovery Plastic	40%	51%	43%	46%	51%	40%	56%	48%
% Recovery Aluminium	20%	49%	36%	27%	41%	50%	46%	37%
% Recovery Steel	63%	56%	56%	64%	40%	66%	53%	59%

Table 16 Description of Household Type and Waste Stream Analysis

Description of Household	Single living alone	Adults no kids	Adults & kids	Grown family
	N	8	21	60
Total Waste Stream	9074	14852	16749	18009
Weight of Garbage Bin	4842	8889	10733	11147
% Full Garbage Bin	31%	61%	78%	79%
% Recyclables in Garbage Bin	15%	19%	16%	15%
Weight of Recycle Bin	4232	5963	6016	6862
% Full Recycle Bin	38%	64%	83%	78%
% Contamination of Recycle Bin	1%	2%	6%	6%
% Recovery of Recyclables	81%	78%	71%	80%
% Recovery Paper	85%	84%	83%	91%
% Recovery Cardboard	100%	84%	95%	88%
% Recovery Glass	94%	79%	76%	82%
% Recovery Plastic	54%	52%	45%	57%
% Recovery Aluminium	33%	28%	41%	36%
% Recovery Steel	62%	69%	56%	56%

Note Grown family represents relatives living with children over the age of 21

Table 17 Total household Income and Waste Stream Analysis

Total Household Income		\$35,000	\$35,000- \$50,000	\$50,001- \$85,000	\$85,001- \$100,000	\$100,000	Refused DK
	N	9	10	21	12	12	27
Total Waste Stream	14894	11511	14405	14594	17047	18380	
Weight of Garbage Bin	9390	6731	9259	8710	10141	12128	
% Full Garbage Bin	57%	75%	63%	77%	76%	74%	
% Recyclables in Garbage Bin	13%	24%	18%	16%	19%	15%	
Weight of Recycle Bin	5505	4780	5146	5884	6906	6252	
% Full Recycle Bin	63%	67%	74%	85%	84%	76%	
% Contamination of Recycle Bin	2%	1%	8%	16%	5%	3%	
% Recovery of Recyclables	83%	62%	74%	65%	78%	75%	
% Recovery Paper	91%	71%	86%	78%	90%	88%	
% Recovery Cardboard	100%	82%	97%	91%	100%	87%	
% Recovery Glass	88%	62%	78%	65%	87%	81%	
% Recovery Plastic	67%	44%	48%	39%	50%	47%	
% Recovery Aluminium	22%	46%	41%	46%	27%	29%	
% Recovery Steel	72%	41%	71%	51%	44%	63%	