Report

Recycle and Reward Pilot Project Report
South Ayrshire Council – Marr College

ZERO WASTE SCOTLAND

Contents

Zero Waste Scotland works with businesses, individuals, communities and local authorities to help them reduce waste, recycle more and use resources sustainably.

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1 Overview

Zero Waste Scotland supported a number of Recycle and Reward pilot projects in 2013. Each site has a separate report on its performance, and an overview report is also available.

South Ayrshire Council participated in the Recycle and Reward pilot project, funded by Zero Waste Scotland, to pilot how incentivised recycling facilities may affect recycling of packaging (drinks containers) and recycling behaviour within Marr College. The college installed one Recycle and Reward automated machine, which provided a reward in exchange for empty drinks containers returned for recycling through this facility. The target materials of this pilot project were aluminium cans and polyethylene terephthalate (PET) plastic bottles. The project ran from May 2013 until the end of September 2013.

In terms of overall pilot performance:

- A total of 4,995 containers were returned to the machines.
- The quantities collected by the scheme were 0.099 tonnes.
- This represents 158% of the containers estimated to have been sold on campus during the period (recognising that containers recycled have been brought from elsewhere, and that, conversely, this figure does not reflect containers recycled via other routes).
- The weekly capture rate (by sales) via the machines fluctuated significantly over the pilot, from 27% to 2,626%.
- Of the total reward value, 16% was redeemed. The redemption rate currently appears artificially low as many pupils and staff may be accumulating vouchers to redeem later, which is likely, given the number of vouchers needed to claim a reward.
- The capture rates appear particularly excessive in the first three weeks of the pilot. If these weeks are excluded, the figures show 2,154 units returned at a capture rate of 74% with a redemption rate of 28%.
- User surveying suggests that 49% had used the scheme at least once.
- Most students' (67%) purchasing behaviour remained the same following the introduction of the machines in the schools, although 21% of students at Marr College said they bought more in school than before.
- Of students at Marr College who had used the machine, 63% used it to recycle all of the plastic bottles and cans that they used in school.
- The majority of pupils who used the machines had previously put their cans and bottles into rubbish bins at school (79%).

The interview research suggested that the most effective means of promoting the pilot was through word of mouth, assemblies, teacher briefings and seeing the machines. It also suggested that the users were happy with the rewards scheme chosen. The pilot has undoubtedly led to improved recycling behaviours and it is evident that a large number of users brought materials from home to recycle through the pilot machine.

The legacy of the pilot is very positive. Of the pupil survey respondents, 63% wish to see the pilot remain; only 6% do not want it to remain. All staff interviewed during in-depth interviews were pleased with the scheme and would like to see it made permanent.

The scheme continued after September, with Zero Waste Scotland continuing to receive data until February 2014. Data were not received weekly (as during the formal pilot), which limits the additional analysis that can be done, but the weekly level of returns remained consistent with that seen in September during the SKM monitoring period.

2 Pilot description

This section describes the pilot site at Marr College, and the population targeted by the pilot. It then considers waste management systems in place before and during the pilot period, and then the detail of the Recycle and Reward scheme put in place, including sections on the communications and site resourcing requirements of the pilot. A final section describes any changes to the above introduced during the pilot period.

2.1 Background and context

Located on Dundonald Road on the west side of Troon, Marr College is a state secondary college with 1,300 students and 100 staff. The college sits on its own campus; the adjacent area comprises golf courses, residential properties and woodland. College facilities include a canteen which sells food, drinks cans and drinks bottles, and there is also a vending machine on site operated by DC7 Ltd. The catchment area for the college covers Troon, Barassie, Muirhead, Loans, Dundonald and surrounding rural areas, and it is associated with Barassie, Dundonald, Muirhead, Struthers and Troon Primary Colleges. The location in relation to Troon itself is shown in Figure 1.

Figure 1 Location of Marr College, South Ayrshire, in relation to Troon town centre (reproduced with permission)

2.2 Waste management arrangements before the pilot

Two dry mixed recycling bins accepting plastic and cans are located in corridors within the college: one in the main foyer (the Recycle and Reward pilot location) and another in a central area corridor away from the main foyer. Paper and cardboard are collected from classroom and office recycling bins. Cardboard is also collected from kitchens.

Waste for recycling from the main internal bins and other collections is then bulked in two 1,280-litre external bins, one mixed (plastic and cans) and one for paper and cardboard, both of which are collected weekly by the council.

Residual waste is collected in primary containers throughout the college. These include bins in classes, offices and the canteen, and a number of black litter bins in external areas. Residual waste is bulked in eight 1,100-litre bins that are collected twice weekly by the council. Waste is not weighed as part of the waste management practice on the site.

Figure 2 shows how the materials targeted by the Recycle and Reward scheme flow through the site. This is a site with relatively open boundaries (given its proximity to the town centre and other retail outlets), and other possible waste management routes. The material flows onto the site could not be monitored, and information on the use of other waste management routes was dependent on how waste was managed and recorded by the different parties involved, and varied across routes.
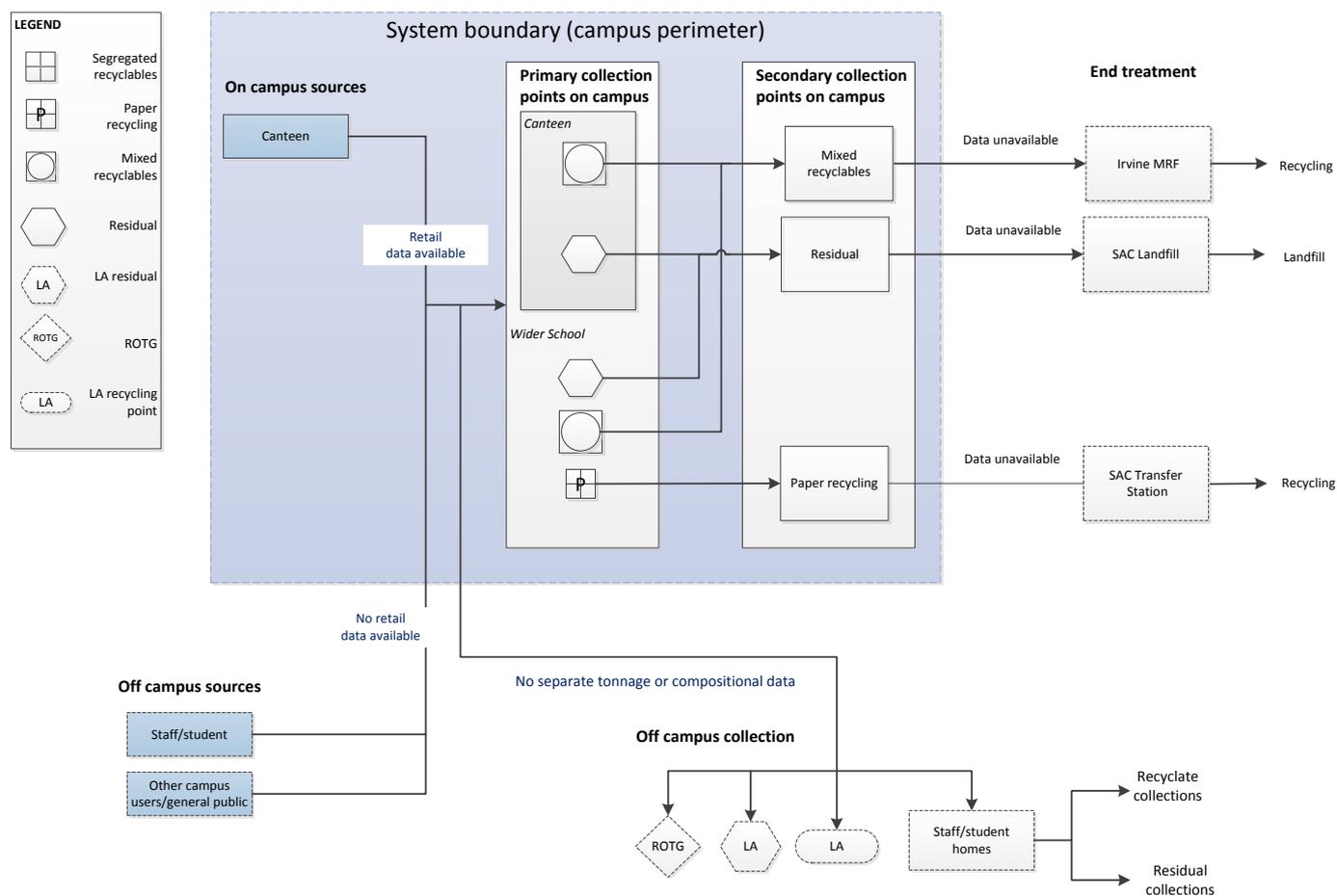
Figure 2 Flow of waste and waste data before Recycle and Reward implementation

2.3 Target population

The target population for the Marr College pilot comprised the 1,300 students and 100 staff on the site. The scheme was designed to collect containers sold on the premises; however, it was appreciated that some students would bring drinks in from sources external to the site, and there was also some evidence that students also brought empty containers from outside with the aim of recycling them for a reward. A separate reward scheme was piloted simultaneously in Troon, based at the local household

waste recycling centre (HWRC) and open to the entire community. There may thus be some overlap of communications for the two schemes.

2.4 Recycle and Reward approach

The machine installed at Marr College was a Revendit Ecovend and accepted empty drinks containers, targeting aluminium cans and PET plastic bottles. It was located in the foyer of the college extension just outside the college canteen. This location was chosen because of the high footfall of students passing through on a daily basis. There were no recycling facilities for plastic bottles or aluminium cans in the immediate areas surrounding the machine.

The machine at Marr College was basic in design, using a simple sensory mechanism to detect the placement of empty containers into the opening. It did not include technology to identify bar codes or the shape or weight of materials. At the end of the transaction the ticket (voucher) was automatically issued.

Figure 3 Revendit Ecovend machine in situ

The Marr College pilot rewarded recycling with tickets for leisure activities, in this case swimming or cinema tickets. A voucher was issued for each unit (bottle or can) put into the machine. Forty unit vouchers were required for a swim voucher and 100 unit vouchers were required for a cinema voucher. The management of vouchers was handled by the Eco Committee and Community Police Officer.

The rewards were selected following consultation with the Eco Committee, which decided it was appropriate to include a variety of activities that would appeal to different age groups.

The flow of materials and associated waste data through the campus during the pilot implementation is shown in Figure 4.
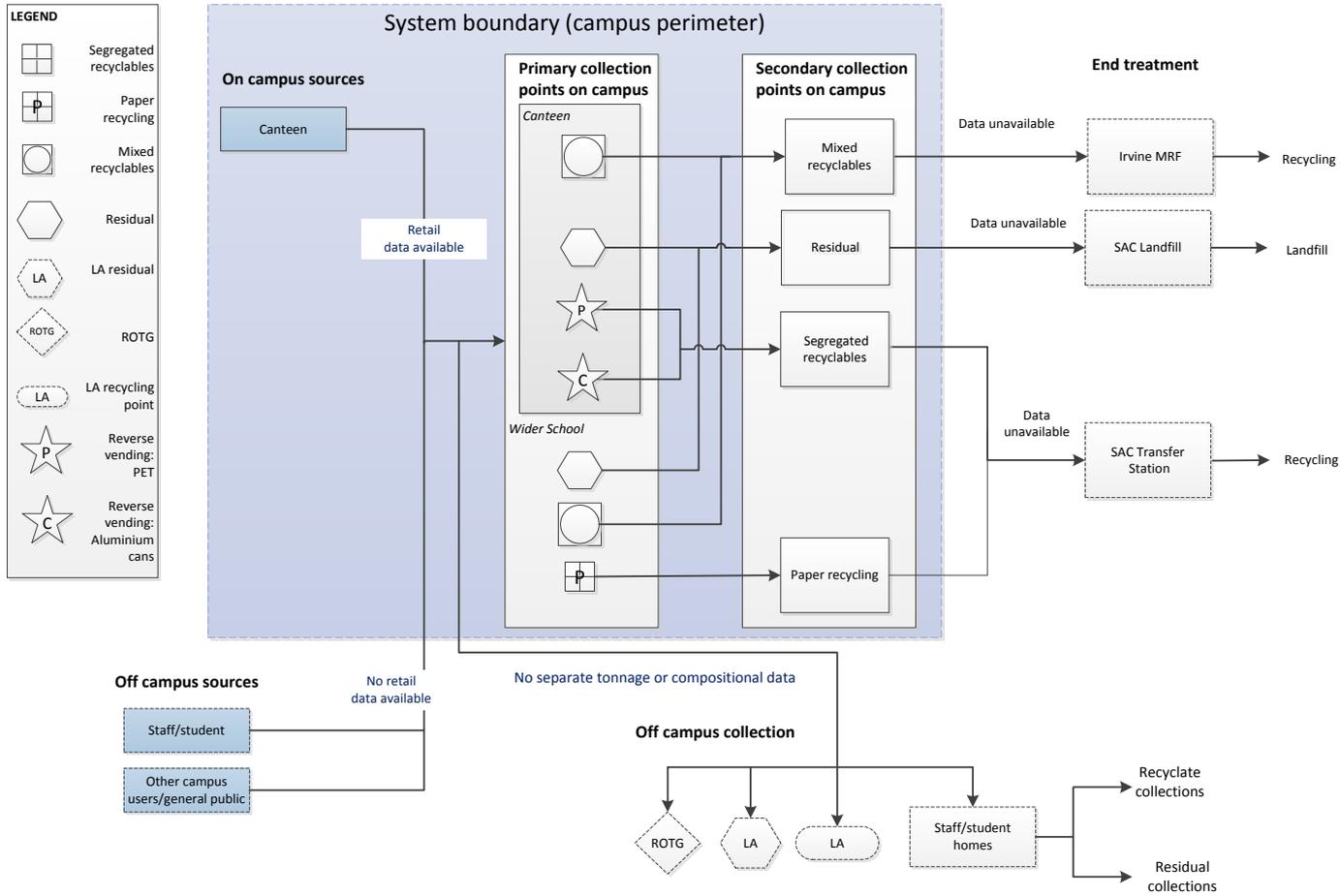
Figure 4 Flow of waste and waste data after Recycle and Reward pilot project implementation

2.5 Promoting the scheme

As two pilots were run simultaneously in Troon – one at Marr College and one (with a different reward structure) at Troon HWRC – some promotional activity outwith the school was not uniquely focused on the Marr College intervention.

Zero Waste Scotland provided communications support and resources to assist South Ayrshire Council develop a communications plan and timetable of activities during the pilot project at Marr College and Troon HWRC. The plan covered both locations and was approved by Zero Waste Scotland, as were all graphics materials and supporting text.

The communications plan more broadly consisted of a variety of communication materials including:

- local newspapers and town magazines;
- posters;
- flyers;
- college publications;
- social media;
- word of mouth; and
- assembly talks.

However, apart from the branding on the Recycle and Reward machines, no other communication materials were observed at the college during the SKM and Nicki Souter Associates visits.

2.5.1 Staff engagement

Specifically for the school, a detailed briefing note was distributed to the employees to ensure they knew the background to the project. Staff training at Marr College was carried out by Waste Aware staff and by the equipment suppliers.

An item on the Recycle and Reward project was included in council-wide emails, which go regularly to all South Ayrshire College staff with email access, to highlight the launch of the project.

2.5.2 Media/public relations

A programme of media/public relations (PR) opportunities was progressed throughout the duration of the project in the wider area. The main target medium was local press, although PR angles were extended to maximise regional coverage. It started with a formal photocall and launch of the Recycle and Reward project in South Ayrshire. This took place on 19 June 2013, at Troon Recycling Centre, and was attended by council staff and local members as well as several pupils from the Eco Committee at Marr College and the Community Police Officer. During the photocall, the machine featured prominently alongside bags of compost and other props to highlight the school's offer. Instructional posters were also available during the photocall.

2.5.3 Advertising

In both cases below, this focused on both reward schemes being piloted in the town, not the Marr College scheme in isolation.

2.5.3.1 Door-to-door publication

Troon has a dedicated monthly publication, *Troon Going Out Guide*, which is distributed door to door to every household in the area. This was undertaken during the week of 25 March 2013. Half-page adverts then followed in this publication on 26 April and 31 May.

2.5.3.2 Local newspaper

There is a Troon edition of the local newspaper. The opportunity was taken to maximise value for money with additional free editorial to sit alongside adverts. Adverts were taken in the weeks of 11 March, 15 April and 13 May.

2.5.4 Marketing communications

2.5.4.1 Flyers

Promotional flyers, one third of an A4 page, were produced and distributed by means of a schoolbag drop to every pupil at Marr College. Around 2,050 leaflets were required for the schoolbag drop.

2.5.4.2 Posters

Tailored instructional posters were also produced for the school and recycling centre, providing clear and simple details of how to use the Recycle and Reward machines and how to claim the reward.

2.5.4.3 Signage

Signage for Recycle and Reward was clearly visible at the machine.

2.5.4.4 Website

A dedicated web page was set up at www.south-ayrshire.gov.uk/recycleandreward to promote the project, highlighting the locations of the machines and the benefits of the scheme, and updating ongoing success. The page was promoted on marketing collateral and in press releases. The web

page went live immediately following project launch and includes a regularly updated frequently asked questions (FAQ) section. This related to both the HWRC and Marr College pilots.

2.5.4.5 Social media

The primary social media route was Twitter, with regular messaging issued from point of launch and then on an ongoing basis. Tweets were issued regularly and linked through to the key web pages.

2.5.4.6 Elected members/MPs/MSPs

The primary route to inform elected politicians was through the weekly information note, which was emailed every Friday with news, updates, attachments and photos as appropriate. Members were also copied into news releases as they were issued, as well as the council-wide emails. This activity covered both pilots.

2.6 Changes during the pilot period

The operation of this pilot saw a varied range of promotional activity over the pilot period. The pilot project also saw a break for the college summer holiday, which then required a new student population to be instructed in the scheme. Both of these may have affected pilot performance, in terms of both the user experience and the number of containers collected.

3 Study method

The appendix gives greater detail on the method selected and the reasons for this. This section focuses on how these were applied in this specific location, first describing the approach to data collection on performance, and then the approach taken to the social research (obtaining user, non-user and staff feedback at the site). A final section considers challenges encountered in practice, and the extent to which this affects the conclusions that can be drawn about pilot performance.

3.1 Performance data collection

3.1.1 Machine throughput

The number of containers placed in the Recycle and Reward machine were obtained using the counting mechanism within the machine, which provided an accumulated total. Readings were taken manually by the Community Police Officer to provide the weekly figure. The machine counted the total number of containers inserted and did not differentiate by material type. On two occasions during the pilot, SKM visually inspected the available seven clear bags of aggregated materials collected and estimated that the quantities of cans and PET bottles were equal. The social research supports this, as it found that 83% of the users recycled cans and 88% recycled bottles.

3.1.2 Waste and recycling data

The school did not weigh waste before the pilot period, so baseline 2012 data were not available. The quantity of waste generated in a typical year for residual and mixed recycling at the school was therefore estimated using estimates provided by the waste contractor for bin numbers, bin volume and fullness, frequency of collection and material type. Density factors were then used to estimate weights.

It was not practical to do actual weighing during the pilot period with the resources available. However, the Eco Committee provided occasional observations of the external bins to assess the amount and type of waste. These visual assessments were, however, too imprecise to use in systematic analysis.

3.1.3 Retail and rewards data

Weekly retail data were obtained during the pilot from canteen staff, and monthly data for the vending machine from DC7 Ltd, the vending provider for Marr College. Data on rewards issued and claimed were obtained from the Community Police Officer and the Eco Committee. The pattern of vouchers being redeemed was not uniform. It seems likely that many users stockpiled vouchers before redeeming them. This stockpiling effect means that the redemption rates calculated here may be premature.

3.2 Social research – quantitative survey and in-depth interviews

The methods used to appraise the attitudes, behaviour and experience of people using the Recycle and Rewards machines at Marr College were:

- online survey of students; and
- in-depth interviews.

Greater detail on the methodologies employed is available in the appendix. This section highlights considerations that are unique to this site.

3.2.1 Online survey

Marr College launched an online survey from 18 to 28 June 2013. This survey was designed to collect the views of a sample of pupils. An online methodology was chosen both for resource reasons and because the college environment meant this was a good channel to reach students. The survey focused on awareness of the machines; promotional activities; year group and gender of the users; types of materials being recycled; user experience; facilitators/barriers; and the rewards.

The students who completed the survey were selected by key staff contacts within Marr College. Staff were asked to choose a sample of 50 students, gathering both male and female participants across all year groups and abilities. The survey was therefore intended to be representative of the student demographic (though the sample is relatively small). It did not represent a randomly selected sample, and some bias cannot be ruled out as a result (for example we know that the gender of respondents did not match that for the college as a whole).

The target was almost met: 49 completed surveys were returned. Table 1 gives a brief overview of the respondent profile.

Year group	Male	Female
S1	2	1
S2	6	4
S3	6	4
S4	8	0
S5	6	1
S6	8	3
Total	**36**	**13**

Table 1 Survey profile by gender and school year group, S1 being most junior

3.2.2 *In-depth Interviews*

In-depth interviews, each lasting about 45 minutes, were conducted on 24 September 2013 and 1 November 2013 with:

- the Community Police Officer;
- a member of teaching staff;
- the cleaning supervisor;
- the catering supervisor; and
- a janitor.

3.3 Challenges encountered during fieldwork

A number of challenges were encountered in delivering the planned monitoring at this complex and comparatively open site. These are detailed in this section, including any implications for what can be concluded from this pilot.

3.3.1 *Returns data*

The machine could not provide a breakdown between cans and PET bottles and instead gave an overall total. To counter this, two observations of bags of materials collected from the machine led to the conclusion that the split between materials is approximately 50:50. Therefore, although data on the overall use of the Recycle and Reward machine are robust, the split by type is only indicative.

3.3.2 *Sales data*

While the canteen staff were able to provide weekly data, DC7 Ltd was unable to do likewise for vending sales data. These data were provided monthly, and were therefore retrospectively divided to give a weekly average for the month. Therefore, although the overall sales data are robust, any comparison at a weekly level is only indicative.

3.3.3 Voucher data

Vouchers collected were saved until mid-September before the Eco Committee distributed reward tickets for leisure activities. The rate of voucher redemption is not, therefore, provided on a weekly basis. Furthermore, South Ayrshire Council did not record when or if tickets were used at participating council facilities. Therefore, overall final use of rewards in the pilot can be assessed, but reviewing that by week is not meaningful.

3.3.4 Waste management data

No empirical data on waste totals are kept, and it was not possible to provide estimates with high confidence. Although observations were made of the ongoing 'fullness' and content of bins, no solid data exist on whether or not the pilot made an impact on baseline residual and recycling data. However, it is unlikely that these data would have been useful in the analysis, as the actual amount of material captured is only a small percentage of the estimated annual base.

4 Pilot performance and operation

The following sections contain detailed quantitative and qualitative analyses of the schemes performance. Sections 4.1 and 4.2 compare the machine data with the reported recycling behaviours from the social research, which are broadly complementary. Section 4.3 considers the rewards issued and claimed in more detail, while section 4.4 focuses on the users' familiarity with the machines and how often they use them. Finally, sections 4.5 to 4.9 explore the potential wider implications of the pilot. This includes consideration of possible impacts on litter, net waste on site, any boost to sales on site, and improvements in recyclate quality. Finally we consider operational aspects of the pilot, focusing on machine reliability (both actual and perceived) and staffing implications.

4.1 Overview

Overall machine throughput data in terms of units recycled and rewards are shown in Table 2.

Category	Number of units, May to September (weight where applicable)	Number of units, June to September
Total sales including vending	3,160 (59.61kg)	2,895
Total units inserted	4,995 (89.90kg)	2,154
Capture rate (%)	158	74
Total rewards issued	4,995	2,154
Total rewards redeemed	793	610
Redemption rate (%)	16	28

Table 2 Machine throughput

Notes:
The weight of returns assumes a 50% split between cans and plastic bottles.
The estimated unit weights were ~14g per can and ~22g per PET bottle.

Over 4,996 units (cans and plastic bottles) were recycled through the machine. This is more than the number of drinks containers sold at Marr College over the same period. The weekly data through the machine are shown in Figure 5. Figure 6 shows the comparison trend of sales and units recycled.

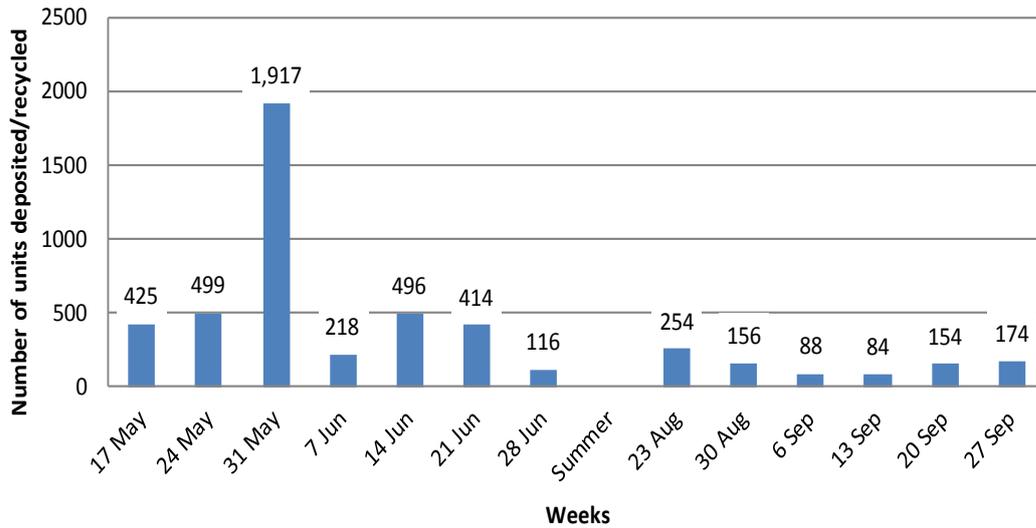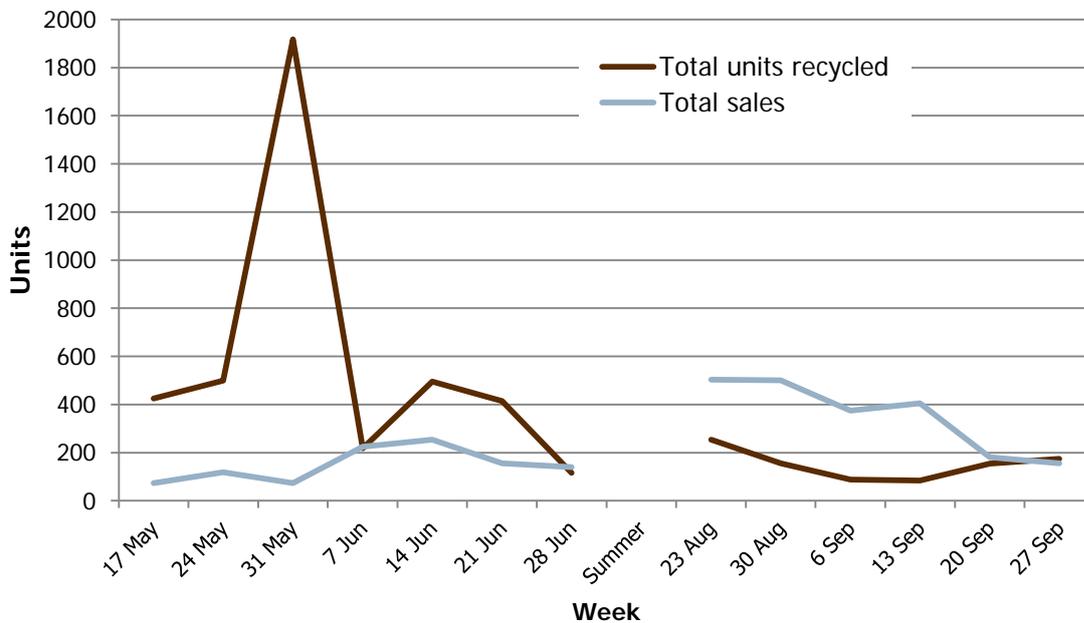**Figure 5 Marr College returns by week weekly units recycled**

Figure 6 Weekly container sales and units recycled

In the early stages of the pilot, students must have brought in far more units from home for inserting in the machine than there were units sold at the school. There were no returns between 5 July and 16 August, as this was the summer holidays. In addition, the weeks preceding the start of the summer

holidays were dominated by exams, with senior students taking study leave. This reduced the daily school population and had an impact on quantities of units inserted.

When looked at as a time trend in Figure 6 it is clear that the recycled units were much higher than weekly sales in May, and remained higher in June but to a lesser extent. After the summer holiday the sales increased, probably because of the increased student population, and the recycling through the Recycle and Reward machine dropped off. When the school term restarted in August, it was necessary to inform and educate new and returning students about the pilot scheme, and it may be habits from the previous term had faded and needed to be reintroduced.

Table 2 shows the data for the pilot excluding the very high figures for May. For instance, in the week commencing 31 May 2013, 1,917 units were inserted, far in excess of the average number of units sold in a week (243). It is not known why this figure is so high. During in-depth interviews, staff explained that there had been issues with potential fraud, e.g. people putting non-target materials into the machine or retrieving and reinserting containers more than once. There was also a note of potential errors in the retail data in May. There is no more detail available on these points, but they could both be contributing factors to that early 'excess' capture rate. Removing these data and looking at June to September gives a capture rate of only 74%.

This level of capture rate is higher than reflected by the social research. The survey showed that half the sample surveyed had used the machine, of whom 79% were regular users, and that 63% of the users now recycle all their plastic bottles and cans through the Recycling and Reward machine. However, the volumes themselves are small. There are in the region of 1,400 students and staff in term time, so with a user rate of 49% the returns represent just over seven containers per student/staff member over the whole pilot period of seven months. This would be one each per month if split equally.

The capture rate was 158% overall, 74% excluding May, but varied considerably over time from 419% to 2,626% in May and from 21% to 265% for June to Sept. This is shown in Figure 7.
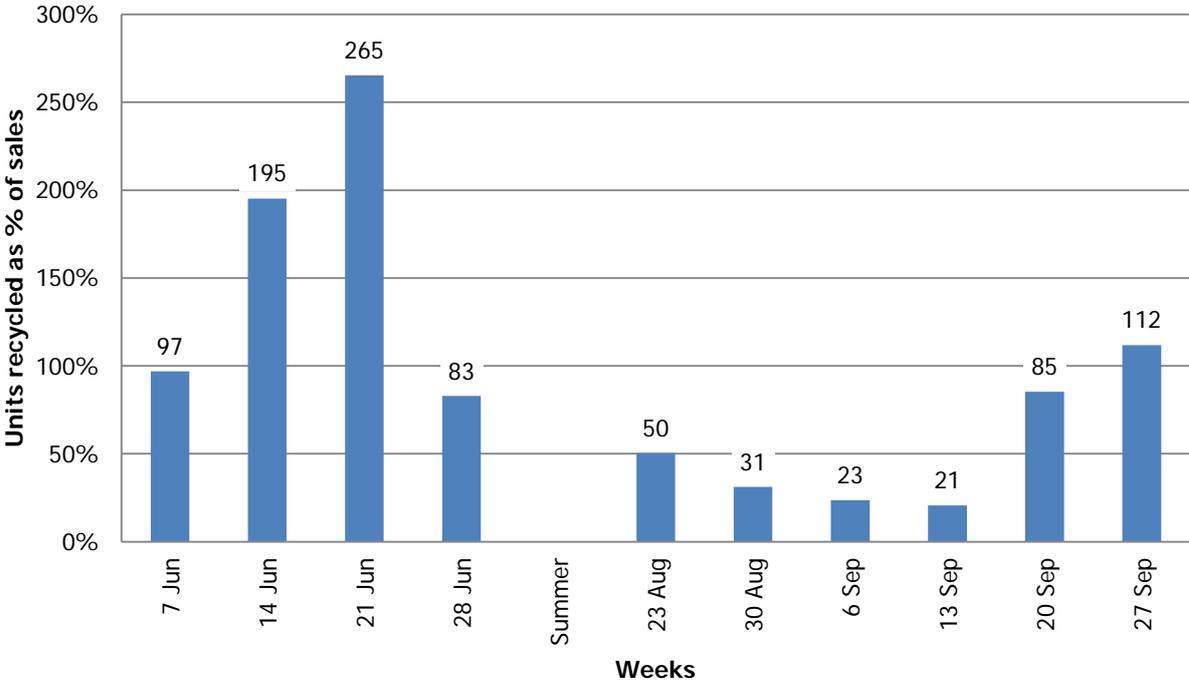

Figure 7 Weekly capture rates for June to September (units recycled as percentage of units sold)

These capture rates indicate that before the summer holidays bottles and cans bought off campus and consumed on site, or simply brought in for recycling reward, exceed those bought on campus and consumed off site or disposed of without recycling. This cannot be assessed quantitatively, as there are no baseline and site-wide waste data. These data are consistent with the fact that the social research found that the most common sources for the bottles and cans recycled through the machines were school and home (both 54% of students overall), while nearby shops accounted for 46%of materials recycled through the Recycle and Reward machine. This is shown in the survey results in Figure 8.
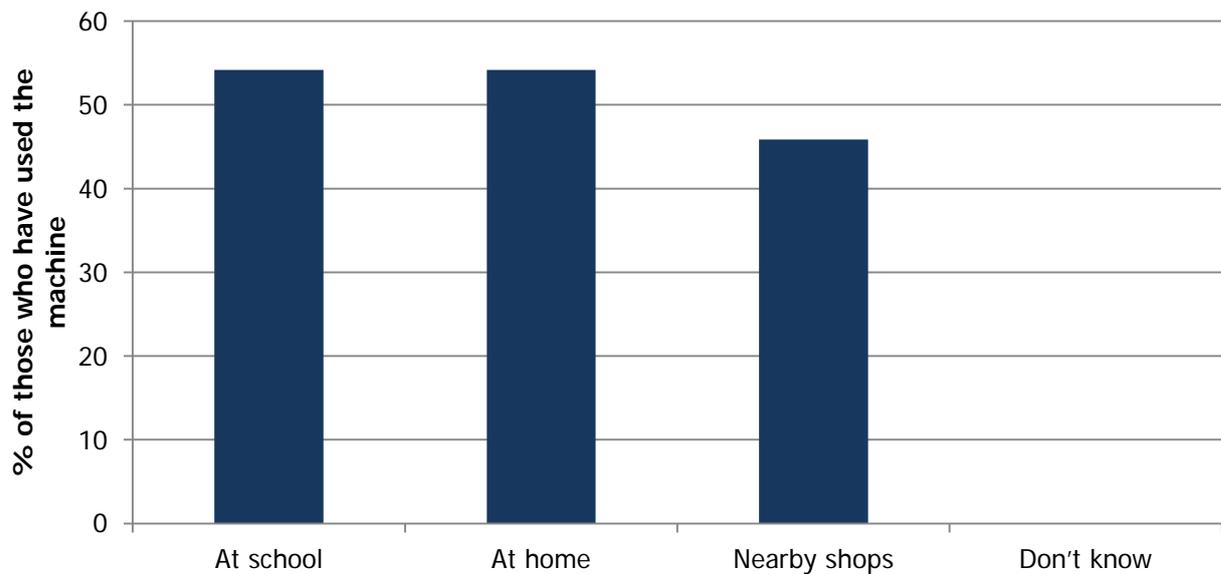

Figure 8 Source of bottles and cans recycled through the machines during the pilot

Essentially, the stated capture rate, even at 74%, is notional and may overstate the container recycling on the site by machine.

It would therefore appear that a significant proportion of bottles and cans collected by the machines are being diverted from home to school, but the impact of this would require further investigation, as it is not clear whether or not these units were previously being recycled at home.

During in-depth interviews, staff explained that there had been issues with potential fraud (as mentioned above). There are no quantitative data on this but it is a point to consider should a Recycling and Reward scheme be rolled out.

The sections below indicate the possible reasons for the performance levels observed.

4.2 Social research insight into items recycled

The main benefits of the Recycle and Reward scheme identified by the pupils in the survey were:

- the reward (31%);
- it encourages recycling (12%);
- it is good for the planet/environment (11%); and
- it reduces litter (6%).

During the in-depth interviews, staff identified the key benefits as increasing awareness of recycling, improving recycling rates and reducing litter around the school.

The majority of students using the machine dispose of almost all their cans and bottles through the machine. The overall breakdown is shown in Figure 9.
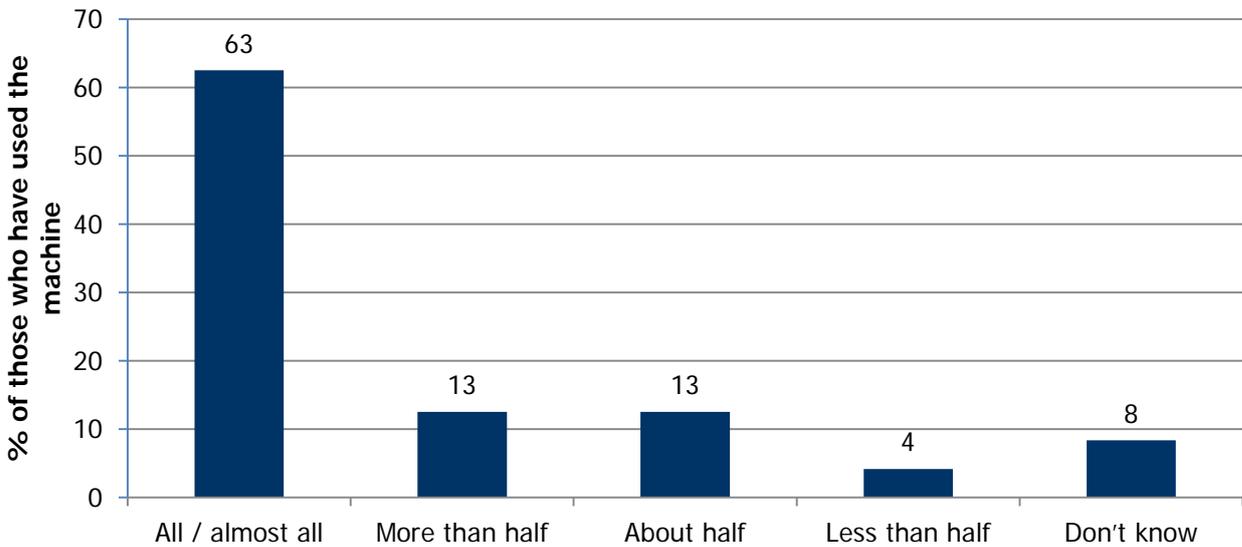
Figure 9 Proportion of users' plastic bottles and cans recycled using the machines

The split of materials recycled by type is relatively even at Marr College: 83% of the users said they recycled cans and 88% said they recycled bottles.

Figure 10 shows the survey results for how users of the machine had previously disposed of their cans and bottles. The majority (79%) of pupils who used the machines had previously put their cans and bottles into rubbish bins at school. This was 19 respondents out of 49 surveyed.

Figure 10 Recycling behaviour before the pilot

The surveys at Marr College suggested the pilot had encouraged increases in recycling behaviour by users, with over 60% saying they recycled more since the introduction of the machine (Figure 11).

Figure 11 Recycling behaviour after the pilot

4.3 Rewards issued and claimed

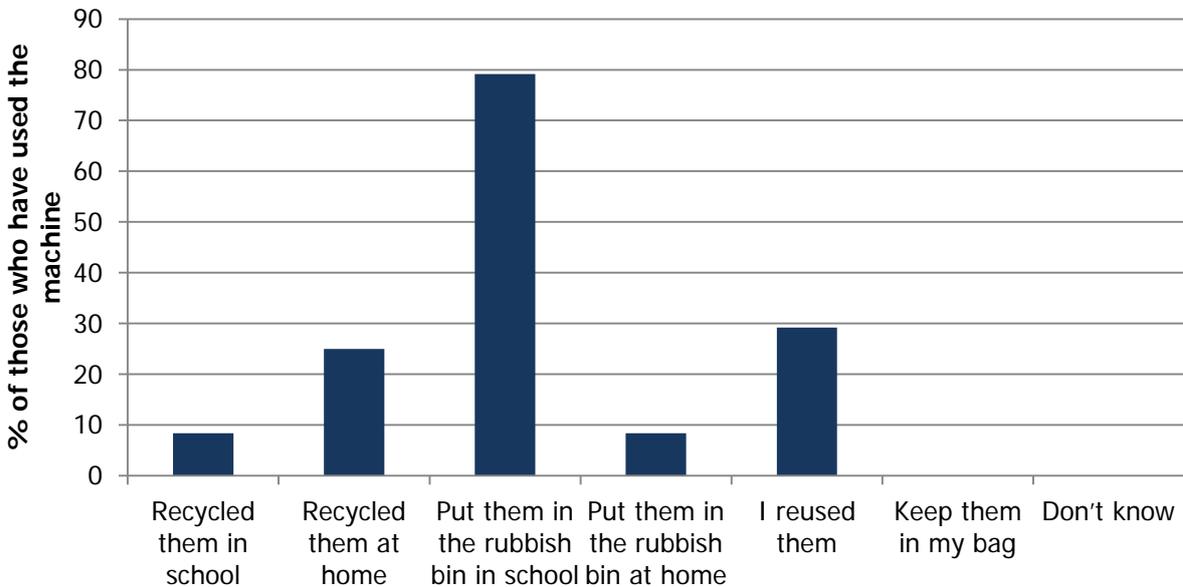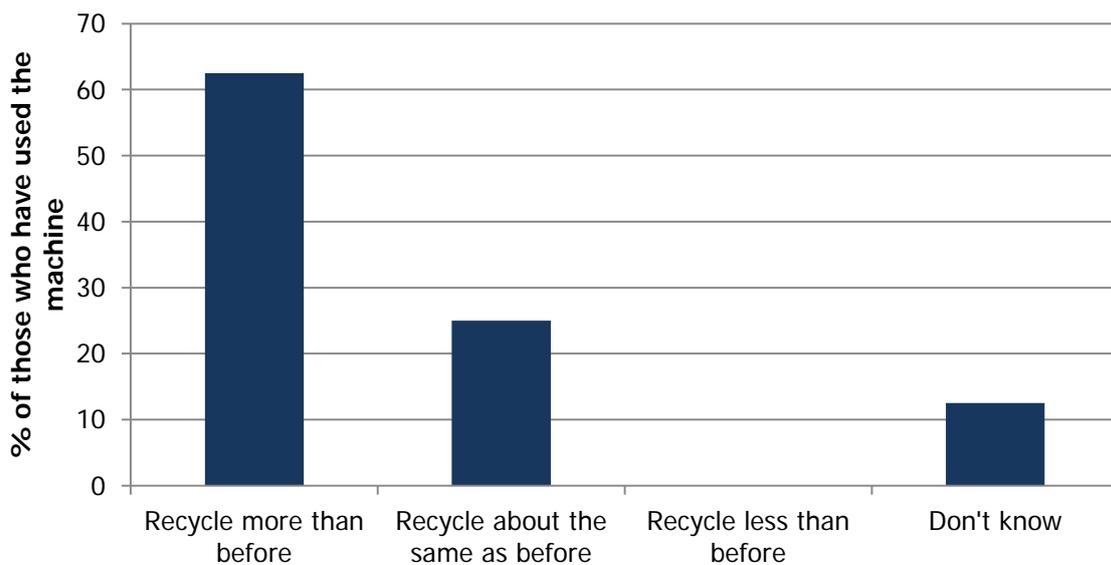Of the 4,995 vouchers issued by the machine, 793 were redeemed through the Eco Committee for leisure activity vouchers. This is a voucher redemption rate of 16%. If only the data from June to September are considered, it is a redemption rate of 28% (2,154 unit vouchers, of which 610 were redeemed). There are no records on how many of the leisure activity rewards issued by the Eco Committee (cinema and swim vouchers) have been used by the recipients.

It is likely that this redemption rate currently appears artificially low, as many students and staff, given the number of vouchers needed to claim a reward, will be accumulating vouchers to redeem later. A more realistic figure for redemptions is likely to be obtained from ongoing pilot monitoring data provided to Zero Waste Scotland after the monitoring period covered in this report.

No dates were put on vouchers issued. It was therefore not possible to undertake a retrospective analysis of when vouchers had been handed in to the Eco Committee in exchange for a reward.

4.4 Awareness of the machines and their correct use

All survey participants were asked what communication materials had encouraged them to use the machines. The most common form of encouragement (45%) was simply seeing the machines (Figure 12). Face-to-face communications were also important; many were told about the machines by a friend (27%). Assemblies (29%), the Community Police Officer (31%) and the Eco Committee (24%) were also common ways that students found out about the Recycle and Reward scheme.

All machine users were asked to rate the machines for ease of use, reliability and appropriateness of reward. Overall, students found the machines easy to use. The majority of the students at Marr College who used the machine (86%) strongly agreed or agreed with the statement 'The machine is easy to use' (Figure 13).
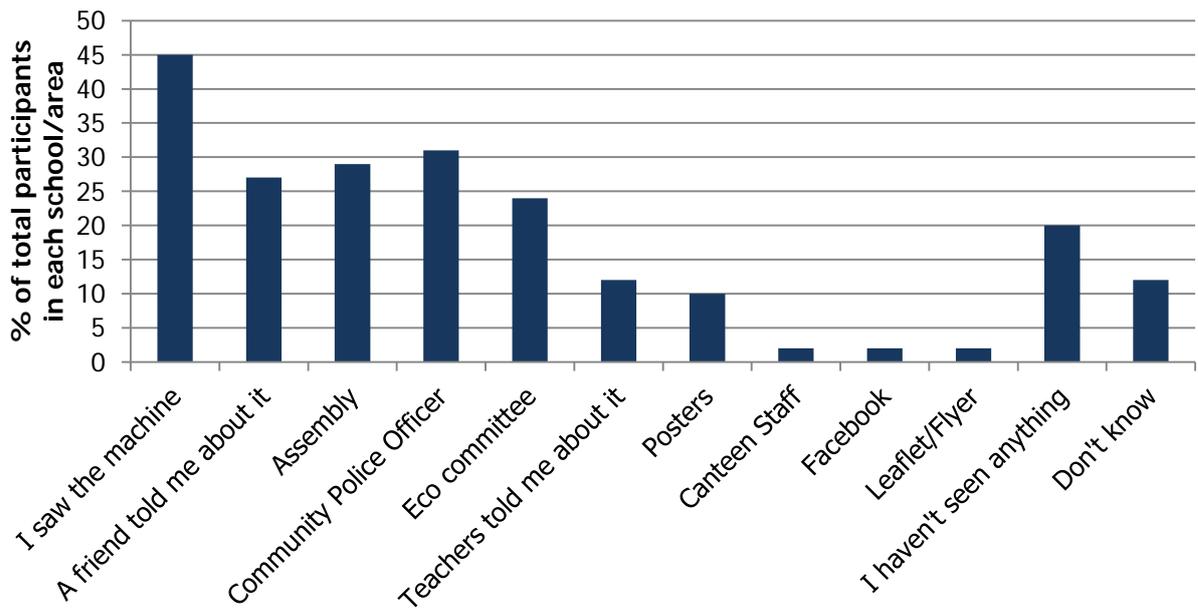
Figure 12 Effectiveness of promotional approaches at Marr College
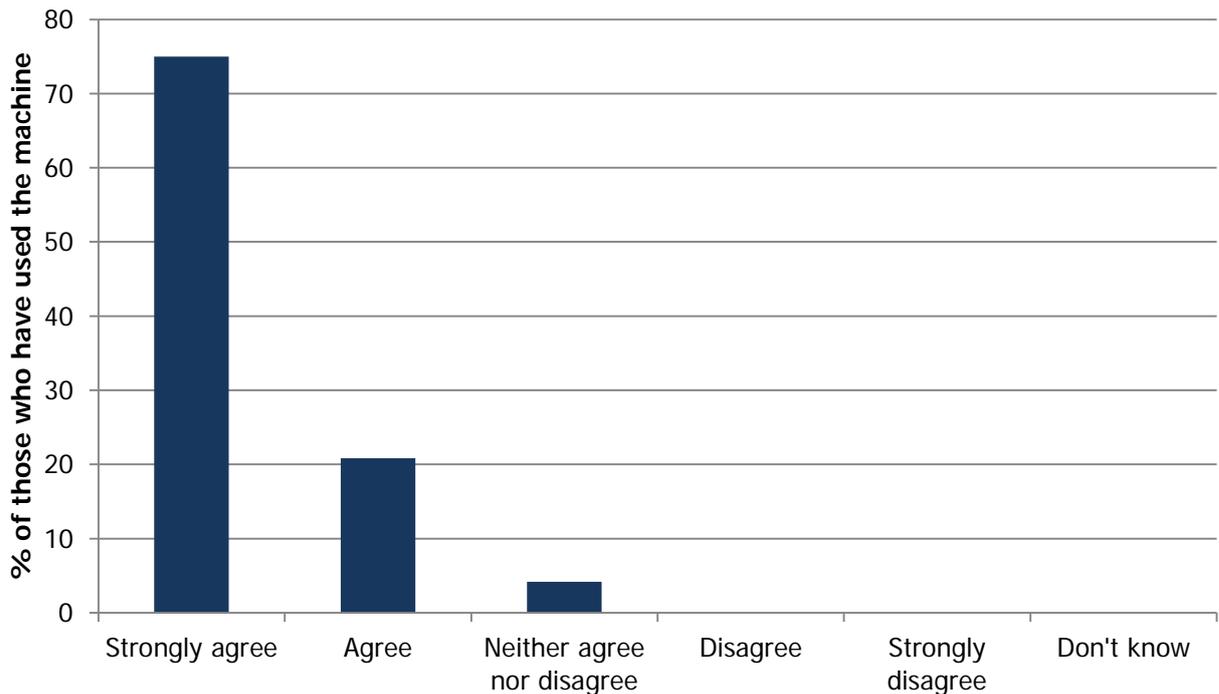
Figure 13 Perceived ease of use of the machine: 'Is the machine easy to use?'

4.5 Impact on litter

There was no quantitative process to assess the impact on litter at Marr College. A qualitative and anecdotal assessment of the bin observations undertaken by the Eco Committee is inconclusive; before the pilot, the observations found that the school litter bins contained an unspecified number of cans and PET bottles, which also appeared to be the case as the pilot progressed.

Anecdotal evidence from school staff and the community police officer suggest that the pilot has not had a noticeable impact on littering in and around the school.

When surveyed, 6% of the pupils identified the main benefit of the pilot as reduced litter. Staff in the interviews identified the key benefits as increasing awareness of recycling, improving recycling rates and reducing litter around the school.

4.6 Impact on overall waste

It is difficult to assess the impact on baseline waste because there are no detailed baseline or in-pilot waste management data. At Marr College, no empirical waste management data are kept. As discussed in section 3.1.2, an estimate of waste quantity can be made by multiplying factors provided by the waste contractor.

The results were:

- 314kg per week of residual waste – eight residual commercial 1100l bins, 15% full on average, lifted twice per week, containing waste with an estimated bulk density of 154.2 kg/m^3, for a college open 77% of the year; and
- 52kg per week of recycling – two mixed dry recyclable 1280l bins, 25% full on average, lifted twice per week, containing waste with an estimated bulk density of 53 kg/m^3, for a college open 77% of the year.

The pilot was over 13 weeks, so Marr College would have generated an estimated 700kg of mixed recycling and 4,400kg of residual waste.

Tomra, a provider of Recycling and Reward equipment on other case studies, provided standard container weight figures of 0.0142kg per aluminium can and 0.022kg per PET bottle. This would suggest that 35kg of cans and 54kg of bottles were collected during the full 13 weeks of the pilot, a total weight of 90kg.

The effect of the single machine pilot at Marr College would therefore have been only 13% of the total recycling and 2% of the total waste. Therefore it is unlikely the impact would have been statistically demonstrable even had weekly waste weights been available.

4.7 Impact on container sales

With regard to the impact on container sales, while sales data were available for the pilot period, no comparable baseline monthly data were available for the pre-pilot period. However, the other evidence would suggest that there was no impact.

In the survey, most students (67%) said their purchasing behaviour remained the same following the introduction of the machines in the schools, although 21% of students said they bought more in school than before.

The trend of sales (Figure 6) shows an increase as the pilot progresses but this is likely to have been a natural increase due to the growing population of students, as the pilot spanned an end-of-term exam period through to a full new academic year.

4.8 Impact on material quality

Material quality in the machines was high. The Eco Committee observations of the internal recycling bins (not the Recycling and Reward machine) reported that there was a large amount of contamination

with other litter such as crisp packets. So the wastes coming from the Recycling and Reward machine would be of a higher material quality, as these foreign objects were not inserted.

4.9 Operational factors

This section considers the machines technical reliability, and also how reliability was perceived by users and staff. It also considers the resourcing implications of the scheme for the site, specifically where these diverged from initial expectations.

4.9.1 Machine reliability

No downtime was reported on the machine. This is supported by the social research: staff interviewed at Marr College felt that the machine was reliable and rarely out of service; however, it was mentioned that the machine had to be emptied quite often, as the materials were not crushed and so it filled up quickly. In the survey many students (88%) strongly agreed or agreed with the statement 'The machine always works'. These results clearly show that users were satisfied with the ease of use and the reliability of the machines.

One issue that was noted was the need to keep the machine connected to the power supply, otherwise the digital counter would be reset. After such an incident, an anomalous count was given by the counter, which suggested that far more units had been inserted than had been the case. This did occur but did not affect the pilot, as it was noticed immediately and the counter reset. This would be an issue only if a system were rolled out permanently that required system counts to manage contracts or determine performance.

4.9.2 Resourcing implications

No staff were dedicated full time to the pilot or recruited specifically because of it. The scheme was run with input from the Recycling Officers at South Ayrshire Council, the Community Police Officer, and the school's Eco Committee, which comprises a cross-section of the school population but is led by sixth-form students. Canteen staff also provided drinks cans and bottle sales, and the vending contractor provided sales data for the vending machines located within the school buildings. The community police officer was responsible for emptying containers from the machine, ensuring it was operating effectively and collecting weekly returns and canteen sales data.

While extra work was clearly required, most of this additional work (compared with dealing with a normal recycling bin) was related to the pilot monitoring rather than the essential operation of the machines. In addition, the monitoring was a relatively 'easy fit' with existing practice and job descriptions, making the process less burdensome.

5 Public reactions to the pilot

In assessing public reactions, this section considers the views of only the target population for the scheme – which was also the target population for the social research – plus any staff or site insight into this. This section first considers user and non-user views in isolation, before discussing the extent to which the rewards themselves were seen as appropriate more generally. It then discusses the legacy of the system: the extent to which users and the site wish to see it continue, and whether or not it will. A final section summarises the perceived benefits of the scheme and also highlights any questions raised about the scheme, and user suggestions for changes.

5.1 User views and motivation

Overall, 49% of survey respondents had used the machine.

Participation in the pilots was higher in the lower year groups than in the senior year groups. Table 3 sets out the percentage of respondents in each year group to have used the machine as well as the number of each year group in the survey. Whereas the sample size for S1 was small, S2 had a good sample size.

Year group	Number in survey	% participation
S1	3	100
S2	10	80
S3	10	30
S4	8	38
S5	7	29
S6	11	45

Table 3 Participation in the pilots by year group

In-depth interviews identified that staff were also using the machine, and giving individual vouchers to pupils as a reward for good behaviour in class.

Pupils and staff who used the machine appeared generally to be regular users. The survey results in Figure 14 show that 71% of the users used the machine at least once a week, and just 17% had used the machine only once.
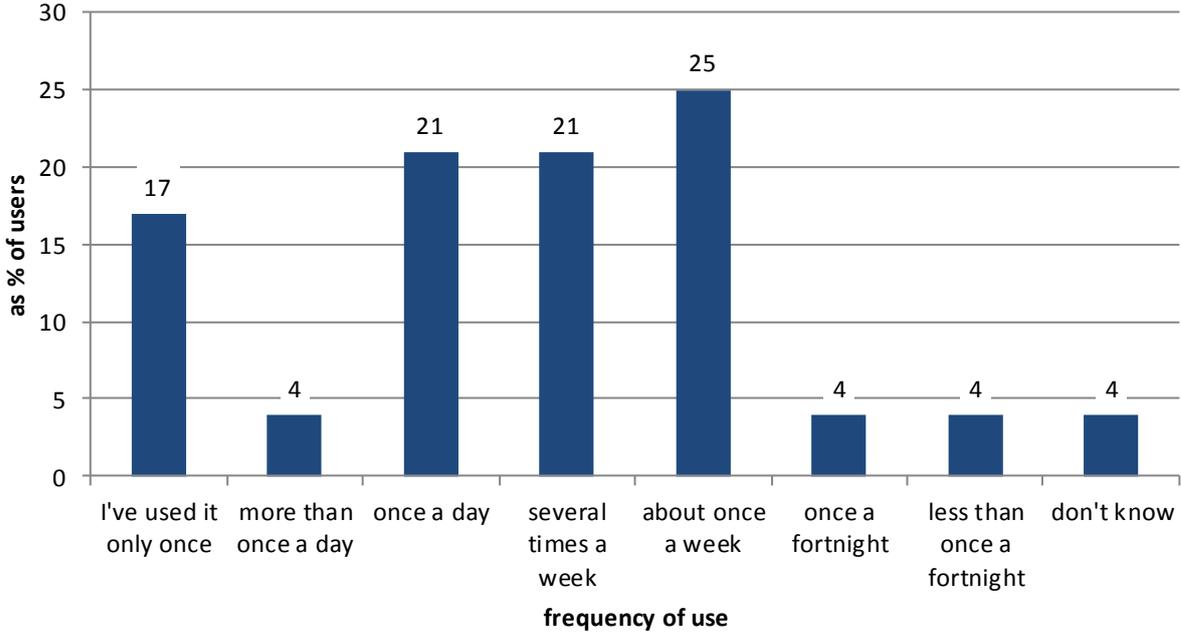

Figure 14 Frequency with which users use the machine

5.2 Non-user views

The most common reasons for not using the machine was that the pupils did not have any plastic bottles or cans (48%). Other non-users said they hardly used the machine because they could not be bothered or were too lazy (24%).

The most common response when pupils were asked what would encourage them to use the machine was a better reward (44%). The suggestion that a better reward may lead to higher usage is contradicted slightly by the analysis below, which found that the reward was appropriate.

Awareness is the more likely driver; 82% of the non-users surveyed indicated that as a result of becoming more aware of the machines and their operation they would now consider using them.

5.3 Appropriateness of the rewards

Of all students surveyed at Marr College, 88% strongly agreed (46%) or agreed (42%) with the survey statement 'I think the reward is appropriate'. Only 8% disagreed and none strongly disagreed. The positive response is likely to be explained by early consultation with the Eco Committee and other students to select the reward at Marr College.

Also, 31% the pupils surveyed said that the reward was the main benefit of the scheme (the most popular answer).

Of non-users, 44% said a better reward would make them use the machine, but 82% indicated that simply knowing more about it (having been in the survey) would encourage use. This would suggest that a better reward is not actually the key motivator.

The data discussed in section 4.1 show that the machine has been heavily used and that, by bringing a significant quantity of bottles and cans from home, students have demonstrated a willingness to use the machine. The pilot has benefited from the enthusiasm of the Community Police Officer and the Eco Committee, and their efforts to promote the machine.

5.4 Legacy of the Recycle and Reward scheme

The scheme was popular in Marr College, with 63% of pupils in the survey indicating they would like the machine in the school permanently (Figure 15). During the in-depth interviews, all staff interviewed were pleased with the scheme and would like it to remain in the school permanently.
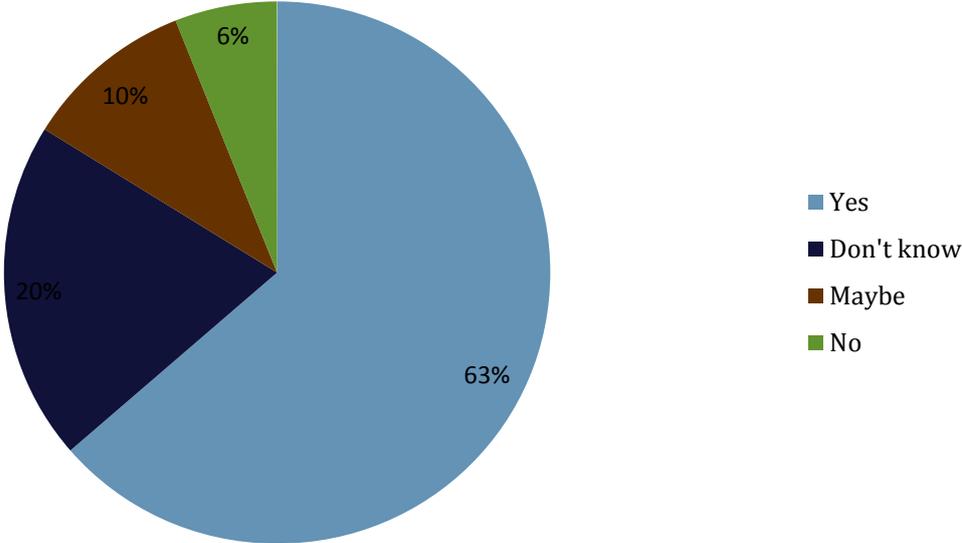
Figure 15 Legacy of the scheme: proportions wanting machines to remain permanently at Marr College (percentages do not add up to 100 because of rounding)

6 Conclusions

The main benefits of the Recycle and Reward pilot identified by the pupils were:

- the reward (31%);
- it encourages recycling (12%);
- it is good for the planet/environment (11%); and
- it reduces litter (6%).

Staff identified the key benefits as increasing awareness of recycling, improving recycling rates and reducing litter around the school.

Half of the survey respondents (49%) had used the machine; the majority of these users stated that they used the machine between once a week and several times a day. Of the students at Marr College who had used the machine, 63% now used it to recycle all of their plastic bottles and cans that they consumed in school. The majority of students (63% of users) using the machine disposed of almost all cans and bottles through the machine.

Over the full pilot period 4,996 units (cans and bottles) were recycled through the machine, representing a capture rate of 154%. The data for May (the first three weeks of the pilot) may have been disproportionate. Excluding this period saw 2,859 units recycled, a 74% capture rate. The survey results (54% of users said the bottles or cans they recycle come from home), and early excess of units recycled through the machine over sales, show that the scheme did encourage users to bring materials from home to recycle. There are no tonnage data to support whether this is a change in, or a continuation of, previous behaviour; however, the surveys at Marr College suggested the pilot had encouraged increases in recycling behaviour by users, with over 60% saying they recycled more since the introduction of the machine.

Although only half of the survey respondents had used the machine, other data suggest that those who did use the machine did so intensively, with the majority stating that they disposed of all their bottles and cans through the machines. Furthermore, the majority of users stated that they used the machine between once a week and several times a day.

While the capture rate appears high, the number of units recycled when compared with the number of pupils accounts for only one bottle or can per month per pupil. Also, the actual weight of material recycled through the machine during the pilot was only 2% of total Marr College waste over the same period (although it was 13% of total recycling). The pilot has suffered from interruptions brought about by summer holidays and study leave reducing the school population, which may explain the variation in capture rate from 21% to 50% at the start of the academic year to 85% and 112% for the last two weeks of the pilot.

The recyclate generated by the pilot was assessed (by survey respondents and interviewed staff) as having less contamination than the contents of the standard corridor recycling bins. There was survey evidence that pupils and staff felt litter had been reduced but no quantitative data to support this. Likewise, the survey suggested that the pilot had not affected purchases of cans and bottles.

The voucher redemption rate was 16% across the whole pilot period, 28% if May data are excluded. As the unit vouchers need to be accumulated (100 per cinema voucher and 40 per swimming voucher), it is likely the redemption rate is artificially low, as many students and staff may be accumulating vouchers to redeem later.

As many as 86% of the surveyed students said that the machine was to use, and 88% that the rewards were appropriate. This is likely to be explained by early consultation with the Eco Committee and other students to select the reward at Marr College.

The most effective means of promoting the pilot were through word of mouth, assemblies, teacher briefings and seeing the machines. This indicates that the work of the Eco Committee, the Community Police Officer and teacher briefings were more effective than the branded communications. For example, at first no explicit instructions were provided on the machines about how the scheme operated, and the college took it upon itself to put up some step-by-step instructions. The pilot has benefited from the enthusiasm of the Community Police Officer and the Eco Committee, and their efforts to promote the machine.

No extra resources in terms of staff numbers were needed for the pilot. The resources needed in the pilot for recording data (units recycled, sales and voucher redemptions) would not be expected to be required of college staff in a permanent scheme. The operators reported that the machine needed to be emptied regularly, since it did not crush units collected, resulting in the machine becoming full very quickly.

The legacy of the pilot is very positive: 63% of pupil survey respondents wish to see the pilot remain; only 6% do not want it to remain. The remainder are unsure or might like to see it remain. All staff interviewed during in-depth interviews were pleased with the scheme and would like to see it made permanent.

7 Glossary of terms

- Capture rate: the proportion of targeted containers that are recycled through the system.
- Collection: the return of containers to the reverse vending machine.
- Deposit: the 10p charge placed on an in-scheme container.
- In-scheme: a container that was sold within the university with a deposit charged.
- Non-user: person who has not used the Recycle and Reward scheme, or has used it but does not intend to again.
- PET: polyethylene terephthalate.
- Reverse vending: accepting an item for recycling in a machine that issues a reward or other incentive.
- Shelf talker: card or sign attached to a shelf to highlight a product or promotion.
- Transaction: a visit to the reverse vending machine by a user placing one or more collected containers in the machine.
- Units/containers: the aluminium cans, PET plastic bottles or cups.
- User: person who has used the Recycle and Reward scheme more than once.

Appendix: monitoring methodology

The monitoring and evaluation work for the pilots was led by SKM Enviros (SKM), working in partnership with Nicki Souter Associates (NSA). At the educational sites, Zero Waste Scotland undertook additional data collection outside the trial period, so a complete dataset could be obtained for the autumn term.

The range and number of data collected varied somewhat by site, reflecting constraints on what sites knew, and the cost-effectiveness of obtaining certain types of data in some contexts. As the pilots progressed, the balance of monitoring was adapted to concentrate on those sites which would be most likely to provide useful learning. This particularly affected strand B, where it was felt that, firstly, concentrating some resources on key sites could help offset some of the limitations on the strand A

data and, secondly, some sites were experiencing relatively low footfall and would be far less cost-effective to target in data collection terms.

Data collected and methods employed included the following. Some differences between sites are highlighted here, whilst the approach for specific sites is in tabular form below.

Strand A

Baseline retail sales data for the site – some sites had only annual data, others monthly and some only partial data. In one case (HebCelt) there were no historic data, and in another (Troon HWRC) no sales data were collected either before or during the trial, as the target area was too broad.

Pilot period retail data – all sites but Troon HWRC provided these data. Typically data were either weekly or monthly depending on the sales systems and number of outlets that were relevant to the site.

Baseline waste management data for the site – some sites had monthly data and one site (Dundee) sought to estimate weekly information. However, several sites had no baseline data. All sites struggled to provide detailed waste information (e.g. the composition of drinks containers by stream, or weights rather than volume-based estimates).

These are common challenges in trials of this type, and could be comprehensively tackled only by a year-long resource intensive pre-pilot monitoring period. In an attempt to improve understanding, in two cases (Heriot-Watt and the North Ayrshire schools) waste compositional analysis was undertaken before and during the trial. Site visits in all cases where it was appropriate also included visual estimates of container fill rates and contamination, and discussion with site staff to understand collection frequency, but, while this improved our understanding of material flows, it was insufficiently sensitive in itself to highlight change over the trial period.

Waste management data during the pilot period was available for all sites, but granularity and quality varied. Most sites knew their overall waste arisings and some knew recyclates within that. In two cases (as noted above) compositional analysis was undertaken to try to understand residual composition. Sites provided data from a mix of volume-based measures, weight information, and site and waste contractor information.

Returns data from the recycle and reward machine(s) and/or manual data during the trial period were collected. Where both were available they were sense-checked against each other. Typically the manual data were preferred in those cases where there was a contradiction (for example, switching the power on and off was found to have led to the machine resetting the count at one site).

Machines recorded transaction data in different levels of detail (daily, weekly or by individual transaction). Most machines recorded data by container type; in one case the machine collected mixed plastics and cans in a single receptacle and in this case the split of material was estimated during site visits.

The level of analysis that these data could be subjected to varied according to the format obtained.

Downtime data during the pilot period – some machines also provided telemetry data when they were offline (either for servicing or emptying, or because of a problem), and some sites provided these data. However, it was not always clear at all sites how long machines were down for.

Redemption rates during the trial period – the machines identified how many vouchers were issued (where this differed from the number of containers returned, e.g. where some containers did not attract

a reward, or rewards were given to charity). Voucher redemption data were collected from the retail outlets either monthly or weekly. The level of analysis that these data could be subjected to varied according to the format obtained, and how closely they matched the machine data in time periods covered.

Site visits were conducted to understand waste management practice, to help gather baseline data and to build a relationship with the sites to facilitate the overall monitoring. SKM staff originally proposed to visit each site (with the exception of HebCelt, which it was sensible to visit only during the pilot) at least twice (once before the pilot and once during it). However, for some sites the number of visits was increased, where it was felt this would enable the collection of better baseline data, addressing some of the gaps in pre-existing records.

Although not formally part of the monitoring process recorded here, all sites (except HebCelt, though other Zero Waste Scotland staff were present) received multiple visits from the Zero Waste Scotland project manager. Especially during the early trial period, these were often weekly for some of the bigger sites. Zero Waste Scotland staff were also available to troubleshoot problems remotely (by phone and email) and this also means we obtained data on much of the learning around set-up and installation. These visits were therefore invaluable both in delivering the pilots and also in providing insight into how they were functioning on the ground, and what was and was not working well. Visits included an assessment of reliability, and material quality, on several occasions. Zero Waste Scotland also made several other visits to sites to assess communications and scheme performance; these included informal 'mystery shopper'-style use of the machines. NSA also visited all sites where they conducted fieldwork at least once, and provided feedback on how well the scheme was functioning at the time of their visits.

Throughout the pilot period SKM, NSA and Zero Waste Scotland liaised closely on issues encountered.

In some cases, site visits included visual (including photographic) inspection of residual bins, recycling bins or the recyclate collected from the machines. In a few cases, site waste management staff were able to supplement data gathered this way independently of a visit from the monitoring team.

Strand B

Focus groups were concentrated on the university sites, which saw relatively high levels of use, and an audience that was accessible for this form of research. Despite the variation in scheme design, these three institutions are of course broadly similar in function, so it was also felt cross-site comparison would add most value to focus groups conducted in these contexts.

Face-to-face (and online) surveying was concentrated on the university sites and HebCelt, as these saw the highest footfall and were thus most appropriate for an in-situ survey technique. Thanks to patterns of use at these sites, an in-situ technique also has a good chance of reaching a representative set of users, and (albeit to a somewhat lesser extent) relevant non-users (i.e. those who use the public areas targeted, but not the scheme). The samples obtained in these cases do allow for quantitative analysis.

At Dundee, an online survey to students managed by the university also asked about reactions to the Recycle and Reward scheme, and the results were kindly shared with Zero Waste Scotland. These provide an interesting perspective, as the respondent base and time period differ somewhat from the external monitoring undertaken.

At the Ikea stores and Troon Household Waste Recycling Centre an interviewer was placed on site for a day in each case, but, as expected, relatively few interviews were obtained because of the lower

footfall. The responses obtained here provide customer insight, but are too small to be analysed quantitatively.

In the school context it was felt that an online survey was a cost-effective alternative to face-to-face surveying (all students can be contacted in this way, and can be encouraged to participate by staff). Numbers were relatively small, but can be considered quantitatively (with caution).

An online survey was made available at Whitmuir (using its customer database), as it was felt that on site surveying would yield too few users to be worthwhile. Very little feedback was obtained via this route (which is also a somewhat selective sampling method, as not all customers are on the database – though regular customers, which the scheme expected to target primarily, were).

Observations were also concentrated on sites where footfall was highest, but were employed to some extent at all sites except Marr (as Zero Waste Scotland considered the schools in North Ayrshire to provide sufficient insight) and Whitmuir (where machine use was very low). The extent to which the observations can be analysed quantitively is dependent on the number of transactions actually observed in each case.

Insight from formal observations is supplemented by the insight gained during site visits by SKM, NSA and Zero Waste Scotland throughout the trial period, and feedback from site staff (about both what they have observed, and what customers have told them). This provides a useful perspective, in conjunction with other sources, both on changing behaviour over time (in particular the extent to which the observed periods at the universities may have been atypical, as they were near the start of term) and on behaviour outwith the monitoring period (for example, use by cleaning staff at some sites particularly in the early morning).

In-depth interviews were carried out by NSA at a smaller number of sites. These sites were selected by Zero Waste Scotland on the basis that they would provide most additional insight. The interviews targeted a range of site staff including management, cleaning and retail staff. The excluded sites were those where Zero Waste Scotland had had particularly extensive contact throughout the trial period, and it was felt staff insight and reactions were already well understood. Zero Waste Scotland has fed into the reporting process in all cases.

General

Although presented as strands A and B in research design, with SKM undertaking the fieldwork and analysis for strand A and NSA doing so for strand B, the final reporting and analysis for all cases, and the overview report, have been led by SKM, working closely with both NSA and Zero Waste Scotland. Throughout the process, the project team across the three organisations met regularly to exchange information and insight, and, particularly in terms of insight into site management and scheme performance, all three organisations gained insight from their respective site visits. The reporting should thus be seen as an integrated report, drawing on both technical data and analysis, and quantitative and qualitative social research.

Key challenges in interpretation and analysis are highlighted in the main report at section 2.4, and where appropriate when presenting specific findings. Table A1 shows the detail of monitoring across sites, including variation.

	Pilot Project	Hard' Performance Data - baseline (pre-pilot)				Hard' Performance Data - during pilot						Strand B				Other information	
		Baseline retail data	Baseline waste management data	RVM data manual record	RVM data telemetry	Retail data	Voucher data	Waste Management data	Machine downtime	Site visits	Other in depth analysis	Focus Groups	Depth interview (days)	Observational analysis (days)	Face-to-face surveys (total number)	Site Specific data limitations	Other supporting information
Universities	GCU	Supplied approximately weekly by the General Manager of Catering Services	Supplied as monthly data by the Sustainability Coordinator	Supplied approximately weekly by the General Manager of Catering Services	Machine supplier provided data approximately weekly.	Supplied approximately weekly by the General Manager of Catering Services	Supplied approximately weekly by the General Manager of Catering Services	Supplied monthly by the Sustainability Coordinator	Limited data from machine supplier (machine ID but not date/duration)	5	Photographic/ observational bin audits (6: 5 by SKM staff; 1 by GCU staff)	2	0	3	250	Early weeks recorded as a total value. No machine downtime data provided by GCU. Procurement of drinks containers based on existing process rather than sensitive to current patterns.	
	HWU	Comparable data not available	Annual data available	N/A	Machine supplier provided weekly; data available at an hourly level	Supplied weekly by the Hospitality Services Manager and Student Union Union Manager	Supplied weekly by the Hospitality Services Manager and Student Union Managers; machine supplier provided weekly data on vouchers issued	Unavailable so waste compositional analyses undertaken	Machine supplier provided weekly	3	2 waste compositional analyses (prior and during trial)	3	1	2.5	500	The data provided by Hospitality Services of units sold in retail outlets was initially understood to be PET bottles only as no cans were sold in retail outlets. However it became apparent in the latter stages of the trial that a small quantity of cans is indeed sold in retail outlets. This has led to an unidentifiable but small number of cans sales being reported as PET bottle sales	
	UoD	Provided by DUSA based on actual sales in the two campus shops during one term-time week, an estimated figure for weekly term-time vending machine sales and an estimate for expected sales (from shops and vending machines) during holiday periods.	Estimated weekly data on segregated recyclables provided by University based on container fullness rather than weight; estimated annual tonnages of segregated recyclables from teaching and admin buildings supplied by University waste manager; also monthly residual data excluding May to July 012	Supplied approximately weekly by the Environment and Sustainability Officer	Machine supplier provided data approximately weekly.	Supplied monthly by the Environment and Sustainability Officer/DUSA Shop and Vending Manager	Environment and Sustainability Officer provided data on the total amount invoiced by DUSA (variable frequency)	Data on for reycling from RotG banks, Halls of Residence supplied monthly by Dundee City Council; University Waste Manager supplied weekly data on University residual waste	Supplied approximately weekly by the Environment and Sustainability Officer; limited data from machine supplier (machine ID but not date/duration)	1	N/A	2	0	3	250		
HWRC	Troon	N/A	No data available	Total units data provided weekly by Council staff; data on bottle:can split only provided as overall ratio provided at end of trial	N/A	N/A	Monthly data provided by HWRC staff at end of trial	Material collected in combination with other recyclates so no data available	No data	2	N/A	0	1	1	1 day		
Schools	Marr College	Baseline vending sales data was available from DC7 Ltd but not from the school canteen	No data available	Weekly data provided by the community policeman	N/A	Weekly data supplied by canteen staff and monthly data for the vending machine was provided by DC7 Ltd	Data provided by the community policeman and the eco-committee	Only estimated data available	No data	2	N/A	0	1	0	50		
	NAC Schools	Monthly data supplied by each school's canteen staff	No data available	Janitor from each school provided a weekly record excluding summer holiday period	N/A	Monthly data supplied by each school's canteen staff	Monthly data supplied by each school's canteen staff	Only estimated data available so waste compositional analyses undertaken	Janitor from each school provided a weekly record excluding summer holiday period	3	2 waste compositional analyses (prior and during trial)	0	0	1	50 per school		
Retail	IKEA Edinburgh	Monthly data for Britvic vending machine sales only	Very little data available; initial visual inspection/weighing of recyclables to provide indicative daily data undertaken by SKM staff but access limited latterly	N/A	Daily data provided by machine supplier	Approximately four weekly provision of weekly data for relevant items sold in the restaurant and the Swedish Food Market by sustainability staff; data for store sales have been provided for PET and glass bottles	Approximately four weekly provision of weekly data for voucher redemption figures provided by sustainability staff	Some data on recyclables for a proportion of the trial period only	No data provided	4	Granular level telemetry data analysis	0	1	2	1 day per store		
	IKEA Glasgow	Monthly data for Britvic vending machine sales only	Monthly average residual waste data estimated based on volumes provided by store	N/A	Daily data provided by machine supplier	Approximately four weekly provision of weekly data for relevant items sold in the restaurant and the Swedish Food Market by sustainability staff; data for store sales have been provided for PET and glass bottles	Approximately four weekly provision of weekly data for voucher redemption figures provided by sustainability staff	Weekly residual data provided	No data provided	1	Granular level telemetry data analysis	0	1	2	1 day per store		
	Whitmuir	2012 unit sales provided for same period as pilot	Very little data available; initial visual inspection/estimation by volume of recyclate and residual bins to provide indicative daily data undertaken by SKM staff; not possible to estimate fullness of glass banks (opaque)	N/A	Machine supplier provided at a weekly level	Weekly data provided by WO staff every few weeks	Machine supplier provided data on issued at a weekly level; weekly data on total redemptions provided by WO staff every few weeks	Weekly observations by WO staff of bags in the dry recyclables storage shed and residual bins where practicable	Machine supplier provided at a weekly level	1	N/A	0	1	0	Online - no target	Machine downtime data conflicting with staff experience due to issues with the quality of barcode stickers applied causing difficulty in machine reading	
Festival	HebCelt	None available	General waste and organics only for the 2012 festival	N/A	Machine supplier provided at a daily level	Hebcelt (beer cups; via Caroline) and 4 other vendors (bottles and cans); Based on stock purchased and left at end	Festival and machine supplier provided data on vouchers issued for prize winners	Council provided weighbridge data; supporting waste data gathered by SKM/Hebcelt team during festival via waste analyses	Manual observations only	Staff on-site the duration of entire festival	General waste analysis from litter pick / general waste	0	0	2	100		

Table A1 Breakdown of monitoring activity undertaken at each site

Zero Waste Scotland works with
businesses, communities, individuals
and locals authorities to help them
reduce waste, recycle more and use
resources sustainably.

Find out more at **zerowastescotland.org.uk**
or call freephone **0808 100 2040**