

Report

Spring 2015

Recycle and Reward Pilot Project Report Whitmuir the Organic Place



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

Find out more at zerowastescotland.org.uk

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1 Executive summary

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.

Whitmuir the Organic Place (Whitmuir) participated in the Recycle and Reward pilot project, funded by Zero Waste Scotland, and introduced a deposit-refund scheme for single use drinks containers sold at the shop, including home delivery and online customers.

A single Tomra Uno Promo machine was installed at the site, in the entrance to the main building, which includes the shop and restaurant. The machine provided a 10p voucher for every container returned, allowing the original 10p deposit to be redeemed. Target materials of this pilot project were aluminium cans, polyethylene terephthalate (PET) plastic bottles and glass bottles. Evaluation and monitoring of the pilot project was conducted by SKM and Nicki Souter Associates (NSA), to provide an independent assessment of the performance and public acceptability of the system. The pilot period covered by the independent evaluation was from mid-March to the end of September 2013. The machine complemented the existing recycling and general waste infrastructure on site.

In terms of overall pilot performance:

- A total of 3,422 items were sold with a deposit, the vast majority being glass bottles and cans.
- Between ~597 and 697 were returned for a deposit refund at the tills (17–20% of sales).
- The absolute quantities of material collected by the scheme were ~511kg, of which ~504kg was glass.
- The machine capture rates (returns vs relevant sales) by materials, however, were quite significant, at ~25% for cans, ~31% for plastic bottles (although very few of these were sold) and ~20% for glass bottles.
- About 86% of the deposit vouchers from the machines were redeemed, indicating that the 10p deposit/reward was sufficient to encourage a claim in the shop once people had used the machine. Some 35% of deposit claims were by home delivery customers, the deposit being credited to the customers' account.
- The small online customer survey was not conclusive in terms of customer views of the scheme, as the response rate was very low. Both positive and negative comments were received.

Implementation issues, particularly around the machine rejecting containers with poor bar code labels up to May, appear to have negatively affected scheme performance and perceptions. The staff and several of the survey respondents did not want to see the scheme continue, seeing it as unreliable and overly complex compared with existing recycling facilities. Staff also felt that it imposed a significant additional workload, although this view was undoubtedly influenced by the fact that they were involved in a publicly funded pilot with data reporting needs, and the need to add scheme specific bar codes.

Pilot and implementation issues aside, however, it seems that this type of deposit-refund arrangement is not well suited to this very particular type of site in isolation, because:

- it is a single and remote site, hence making it difficult to physically return empty containers (except for home delivery customers); and
- the vast majority of customers are 'green' by nature and already recycle at home or through the other recycling facilities at Whitmuir.

The staff at Whitmuir would take a more positive view if the system were part of a more widespread scheme in Scotland, whereby customers could return any type of container and redeem deposits anywhere in Scotland.

2 Pilot description

This section describes the pilot site at Whitmuir the Organic Place, the population targeted by the pilot, the 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

Whitmuir the Organic Place (Whitmuir) participated in the Recycle and Reward pilot project, funded by Zero Waste Scotland, and introduced a deposit-refund scheme for single use drinks containers sold within the shop, including home delivery and online customers.

Whitmuir is an organic farm and shop located approximately 16 miles south of Edinburgh, off the A71, in the Scottish Borders. The farm also has a licensed restaurant on site and sells meat and eggs produced on the farm, as well as a range of food and drink and other products. Whitmuir has a website that allows online retail sales and offers home deliveries of products sold in store.

Whitmuir is located in a rural area with very few houses within walking distance so the majority of its on site customers come to site by car, for example as part of a day trip from Edinburgh or while on holiday. The shop and restaurant are open from 10:00 until 18:00 on weekdays and 10:00 until 17:00 at the weekends all year round (closing for only two days at Christmas and New Year). The restaurant is also open for dining on Saturday evenings and for private hire.

Whitmuir also has a farm supporter scheme (~250 farm 'members'), with around 50–60 of these members (also account holders) placing regular orders. Non-members can also make online purchases. Members set up a standing order for regular orders and are eligible for discounted rates on farm events, courses and facility hire as well as earning 'ICE' points on purchases for redemption against purchases in the shop or with other 'green suppliers'. Whitmuir delivers to East, West and Midlothian, Edinburgh and the Scottish Borders. Members are also able to have their purchases on site added to their account.

2.2 Waste management arrangements before the pilot

Whitmuir collects mixed dry recyclables (commingled plastic bottles, paper, card, aluminium and steel cans) and segregated glass produced on site from its kitchen, restaurant, shop and office. The mixed dry recyclables are collected in orange sacks (90 litres) for weekly uplift by the waste contractor, Scottish Borders Council (SBC). The contract with the council was previously for provision and uplift of 90 sacks per year (and all of these were used) but this was increased to 180 sacks per year in expectation of higher recycling levels during the pilot.

SBC also collects the site's residual waste bin (360 litres) weekly. Weight data for recyclables or residual waste were unavailable from SBC for 2012.

Glass waste generated from the site operations is placed in three colour-segregated glass banks (each estimated at 2,500 litres' capacity) located in the car park. These are also made available for customers to recycle containers bought on site or brought from home. The glass banks are uplifted every four weeks by Viridor but the company was unable to provide weights for the site. There are no other waste or recycling facilities on site although Whitmuir does offer to accept customers' recyclable materials at the till for recycling (it is not known how much is collected through this route).

Containers included within the pilot project deposit-return scheme (aluminium cans, PET plastic bottles and glass bottles) are bought in the shop or online. It is likely that the majority of the drinks containers

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bought in the shop would normally be taken off site to drink in the car or at home and placed in recycling or residual waste at a later point off site. It is worth noting that there is nowhere really to sit and drink, other than in the café/restaurant, where drinks would be bought separately and decanted by the café/restaurant staff.



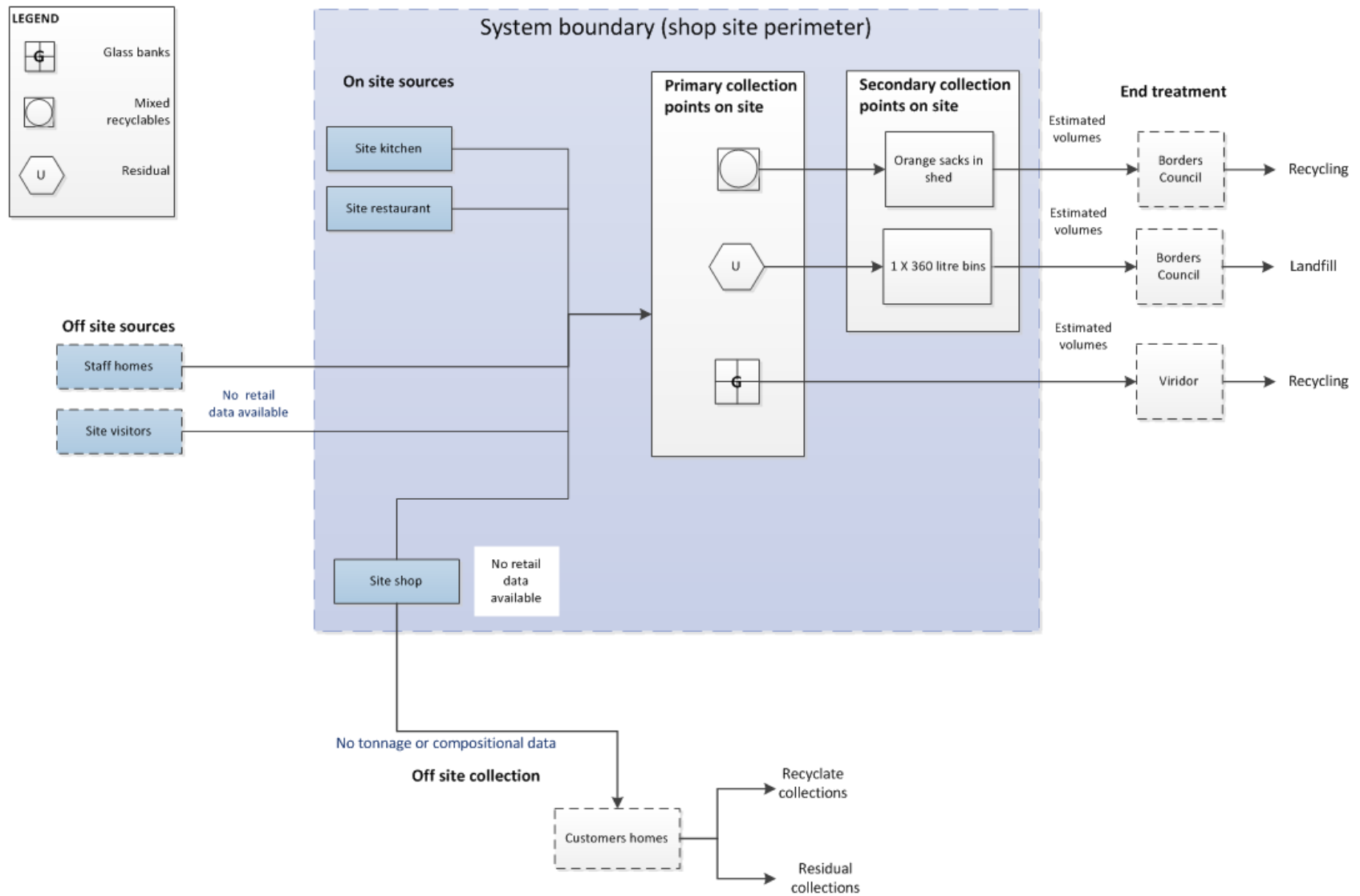


Figure 1 Material flow diagram before Recycle and Reward pilot implementation

2.3 Target population

The pilot aimed to target shop customers and online/home delivery customers alone, as these people would potentially have an empty drinks container to recycle. Restaurant customers were not included, since drinks were either decanted before being sold to customers or, in the case of wine and water bottles, removed by staff when clearing the tables.

Whitmuir estimates that it had approximately 72,000 visitors in 2011. This is an average of ~197 people per day, although in practice there are many more at weekends and in holiday periods than at other times. Approximately 1,200 account holders subscribe to a weekly newsletter and order online. The demographic breakdown of these customers was not established, though the shop customers are thought to be largely families and retired people rather than younger single people. Anyone visiting the site would need their own transport, as it is not served by public transport.

2.4 Recycle and Reward approach

The aim of this pilot project was to test a simple deposit-return system for single use drinks containers. In this type of system a small (10p in this case), fully refundable monetary deposit is charged for each drinks container sold on site and, when the container is returned for recycling, the deposit is refunded. To measure return rates of the containers, the project had a number of site-specific requirements, which would not normally exist in a wider system.

Only containers sold in the shop or online were included in the scheme, and could receive a deposit when returned in store for recycling. All drinks containers sold in the shop and online, and made from the target materials, including glass bottles, PET plastic bottles and aluminium cans, were labelled with an add-on bar code to identify them as part of the scheme and that a 10p deposit had been added to the purchase price. The value of deposits paid was clearly marked on each till receipt.

To facilitate participation by home delivery customers, recycling bags were provided and customers asked to fill these with empty containers for return to the shop by delivery drivers during their next home delivery. The deposits were then added back on to their account, once the items were received. The bags were re-used, being returned to the individual customers. Bottles from drinks sold in the restaurant were not included in the scheme, as the staff decant these into glasses for customers and recycle the empty containers as part of the organisation's normal waste management.

To assist in the take-back of empty containers, an automated Recycle and Reward machine, a Tomra Uno Promo (see **Figure 2**), was installed in the vegetable store, next to the main entrance. The Tomra Uno machine installed is a basic model and has a single opening to accept containers and one storage container for all deposited materials, with no sorting or compaction. The machine was emptied by staff as required and the containers were added to the dry recycling sacks or put into the glass banks, as appropriate. Returned recycling bags from home deliveries were also emptied and sorted by Whitmuir staff. The machine was programmed to recognise the add-on bar code on target items and to issue a 10p voucher for each container deposited, to be redeemed at the shop in cash or as money off the customer's next purchase. Items without the bar code, or where the bar code could not be read by the machine, were rejected.

Where items within the scheme were rejected for any reason, staff provided a deposit refund to maintain good customer relations. Whitmuir's website also stated that the site was prepared to accept other items at the till for recycling, which were not part of the scheme, but that a deposit refund would not be made.



Figure 2 The Tomra Uno Promo machine in situ at Whitmuir the Organic Place

The scheme was launched officially on 1 March 2013 by Christine Graeme, MSP, and went live in mid-March, when the scheme was phased in over a number of weeks. The delay was due to staff availability constraints and problems printing the additional bar code labels, applying these labels to the containers and getting the till system set up to recognise them.

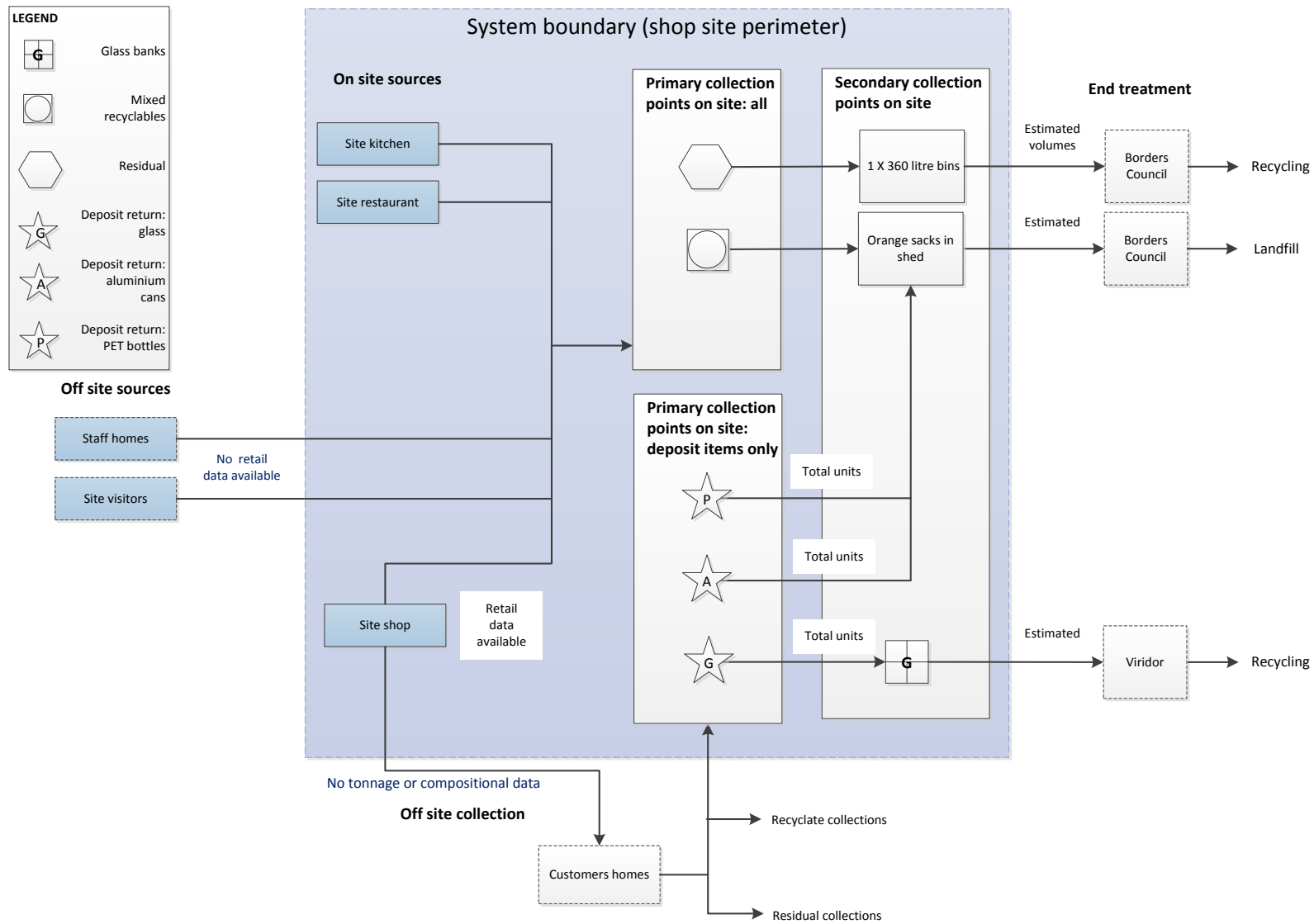


Figure 3 Material flow diagram following Recycle and Reward pilot implementation

2.5 Promoting the scheme

Zero Waste Scotland provided communications support and resources to assist Whitmuir to develop a communications plan and timetable of activities for the pilot project. The plan was approved by Zero Waste Scotland, as were all graphics materials and supporting text.

The purpose of the communications strategy was:

- to identify for customers the products which can be recycled using the scheme;
- to explain how to use the reverse vending machine;
- to explain which products carry deposits and which ones do not;
- to explain that only deposits paid in the shop can be refunded;
- to explain what the deposit money is used for and, more importantly, what the recyclates are used for;
- to alert all customers to the benefits of recycling; and
- to give the customer a clear understanding of why all of this matters and the contribution they are making.

2.5.1 *Communication channels*

- The Recycle and Reward machine itself carried the message approved by Zero Waste Scotland.
- Near the machine, copies of the information leaflet explaining the scheme and how to use the machine were displayed.
- Every product sold in the shop in a recyclable material was identified on the shelf and carried an identifiable sticker.
- The receipt from the till or online displayed the amount paid on deposit and any deposit refunded.
- An electronic version of the information leaflet was attached to the weekly Mailchimp customer email, which goes out to 1,200 people each week.
- Leaflets and signs were on display and available in the shop, both next to the machine, at the till and on other display boards.
- All shop account holders received a leaflet explaining the deposit and return scheme and benefits.
- Customers receiving home deliveries were given details (face to face and in a leaflet) about how to use the system.
- Details were posted on the website on the online shop page explaining how the scheme works.

2.5.2 *Promotional materials*

- Machine branding;
- one thousand leaflets, one third of an A4 sheet in size, available in the shop, posted out to account holders and sent with home deliveries;
- A4 information cards;
- shelf talkers;
- posters;
- receipts showing deposits paid;
- receipts showing deposits refunded; and
- website presence.

2.5.3 *Launch*

The launch of the project was held on 1 March 2013 with a photocall and attendance by Christine Graeme, the local MSP, which was featured in the local newspaper, the *Peeblesshire News*. Whitmuir produced a media briefing and invited Zero Waste Scotland volunteers to demonstrate how to use the Recycle and Reward machine and demonstrate the benefits of recycling waste materials.

2.6 Changes during the pilot period

The operation of this pilot site was not static, and there were some operational changes over the pilot period that may have affected pilot performance, in terms of both the user experience and the number of containers collected. In particular, two aspects of the project were operationally challenging.

The first was the alignment of the till operating system to automatically add the 10p deposit to product lines included within the deposit system and to show this information on till receipts. Originally, the system allowed Whitmuir to print the add-on labels in-house, but the quality of the printing degraded in time and caused problems with accurate bar code recognition in the automated Recycle and Reward machine and led to eligible containers being rejected. Labels were subsequently printed by a specialist contractor, which eliminated this problem. The nature of the machine was such that when containers were inserted they were not automatically rotated, meaning that, even when the adjusted bar code was correct, the machine did not always see it first time if the bar code was not presented in the correct orientation. For users unfamiliar with machines of this type, this could compound the problems of item rejection.

The second challenge was in relation to the sensitivity of the equipment to changes in product container shape and weight. Any changes required the machine's database to be updated so that it could continue to accept these containers. These operational problems were resolved following visits by a Tomra service technician or a diagnostic report by Tomra.

3 Study method

The appendix gives greater detail on the methods selected for monitoring and evaluating the pilots 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*

Telemetry data from the machine (number of items accepted by material, number and value of vouchers issues, number of customers, machine uptime) were provided to SKM by Tomra on a weekly basis for comparison with till data from Whitmuir (deposits issued and refunded).

3.1.2 *Waste and recycling data*

Before the start of the pilot, SKM visited the site and visually assessed the composition of a sample (two of eight) of the 90-litre mixed dry recyclable sacks. The breakdown by material is shown in section 5.1.2, on the pilot's impact on waste and recyclate collected. Further observations of the dry recycling sacks were made by a Whitmuir member of staff on five occasions between December 2012 and March 2013 (before the start of the pilot), each on the day before collection. No weight data were collected but volume was converted to an estimated weight using Waste & Resources Action Programme (WRAP) bulk density data (Material Bulk Densities Summary Report, WRAP, January 2010).

During the pilot, materials from the Recycle and Reward machine were added to the dry recyclables sacks or the glass banks for collection with material collected through other routes. Where practical, throughout the pilot period, a member of staff (usually the same person) recorded weekly visual inspections of the dry recyclables storage shed, recording the number and average fullness of the dry

recyclable sacks and noting the presence of aluminium cans. PET plastic bottles are sold in such small numbers that neither Whitmuir nor SKM staff thought it practical to track these. Again no weight data were collected but estimates were made using volume and the WRAP density data.

The fullness of the glass banks was visually assessed on four occasions before the pilot period. Given the design of the green glass bank (which obstructs the view other than when almost full), its contents were visible on only one of these occasions. Where practical, throughout the pilot period a member of staff (usually the same person) recorded weekly visual inspections of the glass banks, recording fullness of the brown and clear banks and the time since they were last emptied. Fullness allowed a volume to be converted to an approximate weight using bulk density data as for the other recyclables. No observations were made of the green glass bank because of its design, which made fullness hard to assess.

The fullness of the residual waste bin was also visually assessed on the day before collection on four occasions before the pilot commenced and, where practical, weekly during the pilot. The level of recyclables in the residual waste stream was not measured, although photographs were taken by a member of staff on one occasion during the pilot (30 April). These show that some recyclable materials were being disposed of with the general waste but no target materials were identified in the waste at that time.

3.1.3 Retail and rewards data

Weekly sales data (relating to deposit items only) and refund voucher redemption figures (as taken at the till) were provided by one of the management team at Whitmuir, in batches, every few weeks. It is worth noting that, where the machine refused a valid container (one with a deposit label), a manual refund was given at the till.

3.2 Social research – quantitative survey and in-depth interviews

The originally proposed social research element at Whitmuir was scaled back because of the relatively small volume of absolute returns seen in the initial pilot data. The social research therefore consisted of:

- in-depth interviews with key staff members; and
- online customer survey (no target; open from 23 August 2013 to 24 October 2013).

3.2.1 In-depth interviews

Detailed interviews took place with the owner and the shop manager of Whitmuir on Tuesday 15 October 2013.

3.2.2 Online customer survey

As user numbers, based on the returns data available, were known to be low, an onsite survey was not felt to be appropriate. However, an opportunity to contact Whitmuir's customer base via an online survey was available. The survey made use of Whitmuir's online mailing list. While this may not represent the full range of their customers, it is likely to represent many of those who shop with Whitmuir regularly, and are those most likely to return containers (as they could do this without revisiting the shop). The online method also offered an opportunity to reach customers spread across the Whitmuir delivery area.

Therefore a short online survey consisting of 25 questions (coded and non-coded) was created. The survey was live between 17 September and 24 October 2013. As well as being emailed to all customers receiving Whitmuir's weekly online newsletter, the survey link was also placed on the

company's website and Facebook page. All customers, both users and non-users, were invited to take part in the survey.

Unfortunately, survey take up was very low, and just 10 responses were received: six users and four non-users.

3.3 Challenges encountered during the fieldwork

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

3.3.1 *Sales data*

The sales data were not split by online versus shop sales. This limited the analysis that could be done. In addition, over March and April (the earliest period for which sales data were provided) there was a larger difference than expected (316 more between the weeks ending 8 March and 26 April) between the sales data (numbers of items sold) and the number of deposits refunded as reported by Whitmuir's till system. This was reported by Whitmuir to be due to a gradual introduction of the new add-on bar code labels to the stock; hence the sales of relevant items were recorded but the items could not be returned, as they did not have the relevant bar code. No exact numbers were available, so the sales data are accurate but the deposit refund data are underestimates compared with the potential.

3.3.2 *Machine data*

Early telemetry data (before 10 May) were provided by Tomra aggregated for the whole period 1 March to 9 May. A number of items (estimated at around 100) were put into the machine during the pilot setup and staff training phase and possibly after the pilot went live. This meant that these items did not have an associated deposit refund claim. Unfortunately, no record was kept of how many items of each type were used as part of these 100 containers. This means that the total machine returns data are likely to be overestimated by ~100 units.

3.3.3 *Deposit refund data*

During the early months of the pilot in particular, there was a higher than expected level of rejection of items from the machine. As discussed above, it was ascertained that this was often due to the poor quality of the printing on the additional bar code label, which meant that the machine was unable to recognise it. Customers were in most cases given refunds for these containers without a redemption voucher from the machine and the items were added to the recycling through the normal route. No records were kept of the frequency of this occurrence or the number of items with deposits which were returned but did not go through the machine. This deposit refund data are a reliable record of the customers' intentions to recover their deposits (machine problems aside), once the initial delays with product labelling (noted above) were resolved.

It should be noted that the items in the pilot were sold from the shop or online and generally for consumption off site rather than for immediate consumption on site. This means that there is a time lag between containers being sold and being returned (if at all) and deposited in the machine. Some items that would have been returned had the pilot continued have not been captured, although given the relatively low volumes of containers returned overall this is not a significant issue.

3.3.4 *Waste data*

No pre-pilot weight-based data regarding weekly quantities of residual waste, dry recyclables or glass were available. The only available data were around frequency of uplifts (number of sacks in the case of dry recyclables) and estimated volumes from observations at uplift, these data then being

transformed into estimated weights using WRAP bulk density data. In terms of recyclables in the residual waste, observations (as noted above) showed that the level of target recyclables was negligible compared with those captured by other means.

3.3.5 *Online survey*

As indicated above, the online survey generated a very small number of responses, severely limiting the value of this research element. However, given the levels of use, this was not surprising, and staff have also provided valuable insight into customer reactions to the pilot.

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 sections 4.4 and 4.5 focus on the users' familiarity with the machines and how often they use them. Finally, sections 4.6 to 4.10 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 data in terms of sales, machine throughput and deposits reclaimed are shown below, using estimated weights for cans (~14g per can), PET bottles (~22g) and glass bottles (~300g). These figures are based on actual weights recorded by SKM and validated through comparison with WRAP and Tomra data. The glass weights are at the bottom of the weight range to take account of small soft drinks bottles as well as wine bottles, which are generally over 300g.

Data category	Details	Total
Deposit items sold	Cans	1,340
	PET bottles	85
	Glass containers	1,681
	Units sold with deposit 1 March 2013 to 26 April 2013*	316
	Total units sold with deposit	3,422
Items returned to machine and voucher issued**	Cans (percentage of known can sales)	330 (24.6%)
	PET bottles (percentage of known PET sales)	26 (30.6%)
	Glass containers (percentage of known glass sales)	341 (20.3%)
Total items returned to machine and voucher issued	Total number of items returned (capture rate: percentage of total number sold with deposit)	697 (20.4%)
Weight of items returned to machine (kg)	Cans	4.8
	PET bottles	1.8
	Glass containers	504.3
Voucher deposits reclaimed***	Total deposits claimed after voucher issued (percentage of number deposited in machine)	598 (85.8%)
	Total deposits claimed after items placed in machine as a percentage of sales	17.5%

Table 1 Summary of the Whitmuir pilot performance, 1 March to 27 September 2013

Notes

**The deposit scheme was phased in so that target items were still being sold without the deposit after the pilot started (up to week commencing 3 May).*

***A number of items (estimated ~100) were deposited in the machine for staff training and system/database setup purposes during the early weeks of the pilot and are included in the overall numbers. The exact number of these 'test' units, and the related container type, are unknown.*

****An unknown number of deposits were returned to customers in the shop without going through the Recycle and Reward machine. This occurred when the machine was out of order or would not recognise the bar code.*

According to the data available, the proportion of the items with deposits applied and sold which were subsequently returned during the six-month pilot period was around 20%, and around 17% if the estimated 100 items used for set-up and training are discounted. This figure can, to a degree, be compared with an overall municipal plastic bottle recycling figure for Scotland of 26%. There is, however, a potential time lag and some home delivery customers, for example, may have stockpiled for subsequent return. Had the pilot continued, it is to be expected that more of the containers could have made their way back to the site. That said, given that most customers are not frequent visitors, and that many will find it easier to recycle the containers through their own kerbside collections at home, it is likely that any extra percentage would not have been significant.

In relation to this point, Figure 4 shows the weekly figures for sales of items with deposits, items returned through the Tomra machine and deposits reclaimed by customers (in person or via the home delivery scheme). Because of the variable and potentially long (weeks or months) lag time between items being purchased and the containers being returned, there does not appear to be a strong correlation between the weekly sales, machine throughput and deposits recovered. This may also be because there were two types of customers involved in the deposit return scheme with differing patterns of use.

Visitors to the shop may have deposited their empty containers and used their voucher on the same day but only if they drank the item on the premises. Many will have taken the item away and may have returned it only at a much later date, if at all. Home delivery customers had the deposits applied to their accounts at some point after their next delivery (at least one week later), once the driver had returned the empties and they had been processed by the shop staff.

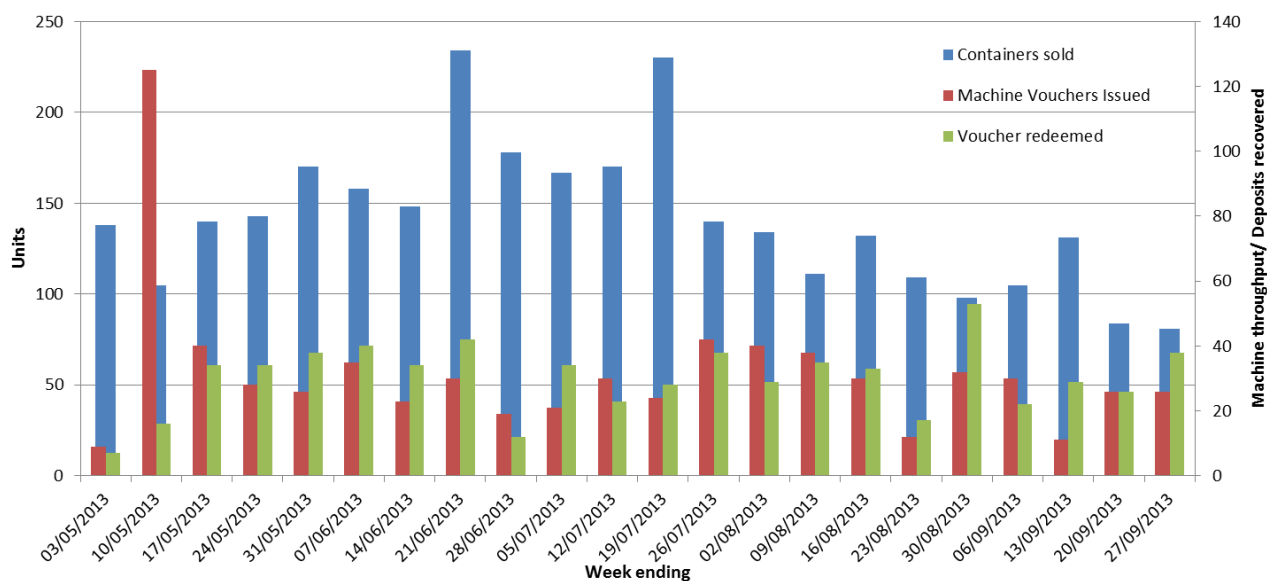


Figure 4 Overall performance of the deposit return pilot between 29 April and 27 September 2013

According to the machine telemetry data, the peak in items accepted by the machine in the week ending 10 May corresponds to 47 individual transactions averaging 27p in value, meaning that on average 2.7 items were returned per transaction. This is significantly higher than the transaction numbers for the weeks before and after and may be because of machine testing by the Tomra technician and further staff training, as there are no corresponding peaks in the sales or reclaim figures that week. From the week ending 10 May onwards, a more stable position was achieved (i.e. all the target items had deposits applied and initial setup issues had been addressed): the machine was successfully used 282 times during which 697 items were returned. This gives an overall average of 2.5 items deposited per transaction and an overall average voucher value of 25p (varying from 13p to 53p on a weekly average basis). There was one week (10–16 May) when the average value of the

9 vouchers issued was £4.44. It is not known whether this relates to one or more customers returning a large number of items or possibly further testing by the Tomra technician or staff.

4.2 Social research insight into items recycled

As noted earlier, very few customer responses were gathered during the online survey. However, two of the customers surveyed (the home delivery customer and one in-store customer) had returned items over 20 times during the pilot, showing a real commitment to using the scheme.

Staff indicated that cans were the most common materials recycled in the machine, followed by glass bottles, with minimal plastic containers recycled. The machine data actually shows that slightly more glass containers (341) than cans (330) were deposited in the machine and, while very few PET bottles were sold and deposited, they actually had the highest return rate, at 30.6%.

4.3 Rewards issued and claimed

Approximately 86% of vouchers issued by the machine were reclaimed for the deposit, suggesting that the financial aspect was important. In terms of store returns, this involved placing the items in the machine and then taking the voucher through to the shop to claim a refund, a process that could take a few minutes at busy times, hence requiring a degree of motivation.

From 29 June until the end of the pilot, the data for deposits reclaimed were split into those transactions carried out in person (i.e. a customer returning to the shop) and those where home delivery customers returned containers in the bag collected by the delivery driver. The data around this are shown in Table 2 and broken down by week in Figure 5. Figure 5 shows no particular pattern, in terms of the trend towards site returns versus home delivery returns or vice versa, as the pilot progresses.

Data for 29 June to 27 September 2013	Total units	% of sales	% of deposit reclaims
Sales of target items (number of deposits paid)	1,692	–	–
Deposits reclaimed in person	263	15.5	65
Deposits reclaimed by home delivery customer (via their account)	142	8.4	35

Table 2 Split of deposits reclaimed by customers in person and by home delivery scheme

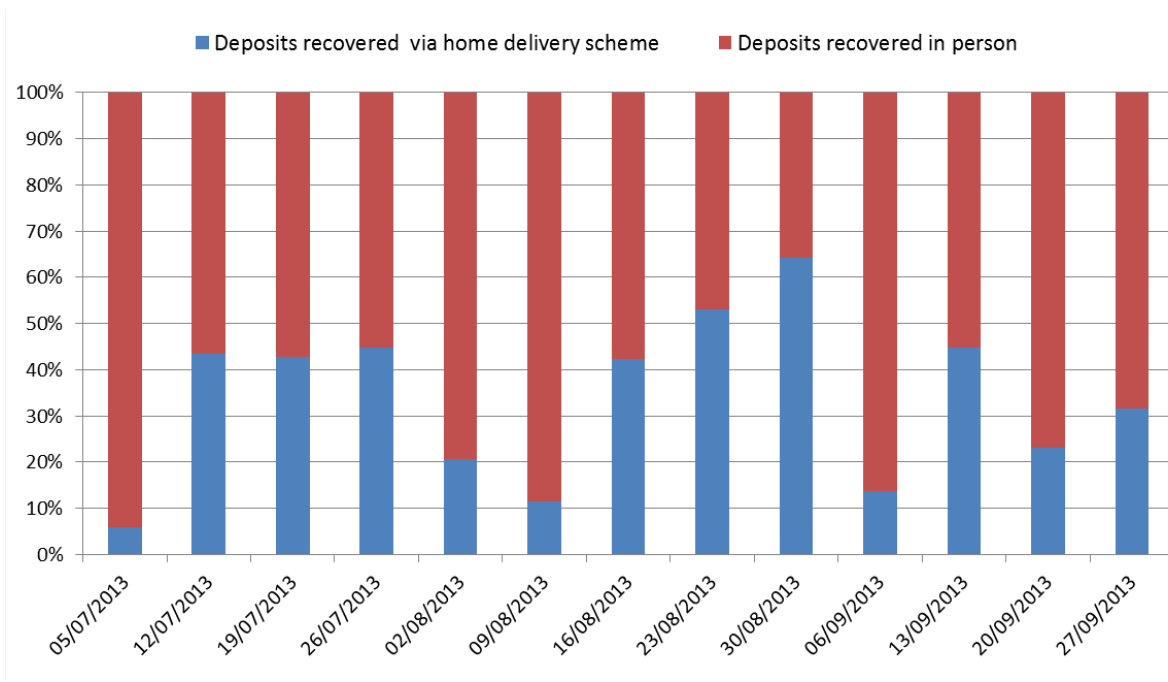


Figure 5 Deposit reclaim routes used between 1 July and 27 September 2013

Interestingly, home delivery customers accounted for only 35% of all deposits reclaimed in this period. This is counterintuitive given that this is potentially a more practical route than physically returning containers to the shop, particularly where the item was not consumed on site. Perhaps seeing and using the machine on site motivated further use. The absolute number of deposits reclaimed in any week ranged from 17 to 53 during the period covered.

4.4 Awareness of the machines and their correct use

The majority of customers who were surveyed (10 in total) were able to recall a range of promotional activities. Just one was unaware of the pilot. Only two customers surveyed were aware that the unclaimed 10p deposits were used to help fund new recycling projects at Whitmuir.

Both members of staff interviewed were fully aware, informed and knowledgeable of how the Recycle and Reward scheme operated. The staff interviewed felt that there was not much else they could have done to promote the scheme and that it had been well promoted and advertised to their customers. Staff had received training from a Tomra technician on the basic functions of the machine, and how to clean and perform basic maintenance. They were also provided with a training manual, which was stored within the machine.

4.5 User groups and usage practices

Staff believed that, although the majority of customers accepted the idea of a deposit scheme to encourage recycling, the way the scheme operated, including the perceived reliability of the machine, had proved unattractive in practice. Overall, the staff indicated that the Recycle and Reward machine had not been well used by either in-store or home delivery customers. They believed that fewer than 10% of the containers bought by home delivery customers had been returned. The actual capture rate of the scheme overall (returns of relevant items sold) was ~20%, although no actual split of routes can be calculated.

Staff also felt that only a small percentage of their customers were happy with the scheme. Levels of use certainly support the suggestion that few customers chose to take part by returning items. Staff

received direct customer feedback that, when some on site users had materials rejected by the machine, this caused immediate dissatisfaction. The attitude of customers who chose not to return items is, however, hard to ascertain on the available evidence.

Items were generally purchased from the shop to be consumed off site, e.g. in the car or at home or, possibly, given as gifts. This may have had a deterrent effect on purchasers' choice of items to buy but, conversely, could have given an added incentive to return to the store and make further purchases sooner than might otherwise have been the case. Although speculative, it seems reasonable to assume that, given the relatively small size of the deposit, most customers would not see this as a sufficient incentive to make a trip that they would not otherwise have made.

Without the data regarding the percentage of sales/returns made by home delivery customers, it is not possible to determine the greater likelihood that their containers were returned. However, given that they are able to reclaim their deposit simply by keeping the containers until the Whitmuir delivery driver next returned, their return rate may have been higher than for 'physical' shop customers. Kerbside recycling collections (although not for all materials in all cases) operate in all the areas served by the home delivery scheme (East, West and Midlothian and part of the Scottish Borders), so even here customers may have found it simpler to recycle the containers the conventional way. This is speculation, however, as there is no evidence of the reasons for customers not returning items.

4.6 Impact on litter

Whitmuir staff reported that they did not notice a reduction in litter, and at times said there was actually an increase because rejected materials were left around the machine rather than brought through to the shop next door. In general, the nature of this scheme and site would not be expected to significantly influence littering.

4.7 Impact on overall waste

Accurate weight-based data for waste or recyclates were not available, either before the pilot as baseline data or during it. As noted earlier, data are based on qualitative assessments of container 'fullness', which provided a volume estimate from which a weight was then calculated using WRAP density factors.

4.7.1 Mixed dry recyclates (plastic bottles and cans)

Before the start of the pilot, the composition of a sample of the mixed dry recyclable sacks was visually assessed. The estimated breakdown by material is shown in Table 3.

Sample	Fullness	Card	Aluminium cans	Paper	Plastic bottles (including non-target types)	Other plastics	Contaminants (non-recyclable material)
Sack 1	90	49	0	35	8	8	0
Sack 2	90	23	20	25	30	1	1
Average	90	36	10	30	19	5	1

Table 3 Assessment of sample dry recycling sacks on 12 December 2013 (%)

A member of Whitmuir staff made further observations of the dry recycling sacks on the day before collection on five occasions between December 2012 and March 2013 (before the start of the pilot). There were between eight and 15 bags awaiting collection; on three occasions aluminium cans were not noted and on the other occasions they occupying 3% or 10% of two bags.

Visual assessments of the dry recycling sacks were made most weeks during the pilot but, given their subjective nature, these do not provide a robust data set. The low number of cans and plastic bottles in the recyclables, combined with the low density of the material, means that the machine quantities (6.6kg of cans and plastic bottles in total across the whole pilot) are very small in overall weight terms.

4.7.2 Glass

Visual assessments of the 'fullness' of the glass banks were made before the start of the pilot, in January to March 2013. These data were used to provide a volume estimate and a weight was calculated using WRAP density factors. These pre-pilot checks gave an estimated generation of 0.12t/week brown glass, 0.18t/week clear glass and 0.43t/week green glass, a total of 0.73t/week. (Rates of glass collection have been calculated based on fullness and number of days since last collection date. A density of 694kg/m³ was used based on data in Summary Report: Material Bulk Densities, WRAP, January 2010.) It should be noted that these figures are based on a very low number of estimated measurements (only one in the case of the green glass), so the data can be considered only indicative.

Quantities of brown and clear glass through the pilot period were similarly estimated based on the fullness observations and time since the banks were last emptied. Note that green glass estimates were not possible because of the nature of the bin, as noted earlier. As can be seen from Figure 6, the total amounts of these materials were very variable, with peaks in early May and during July and August.

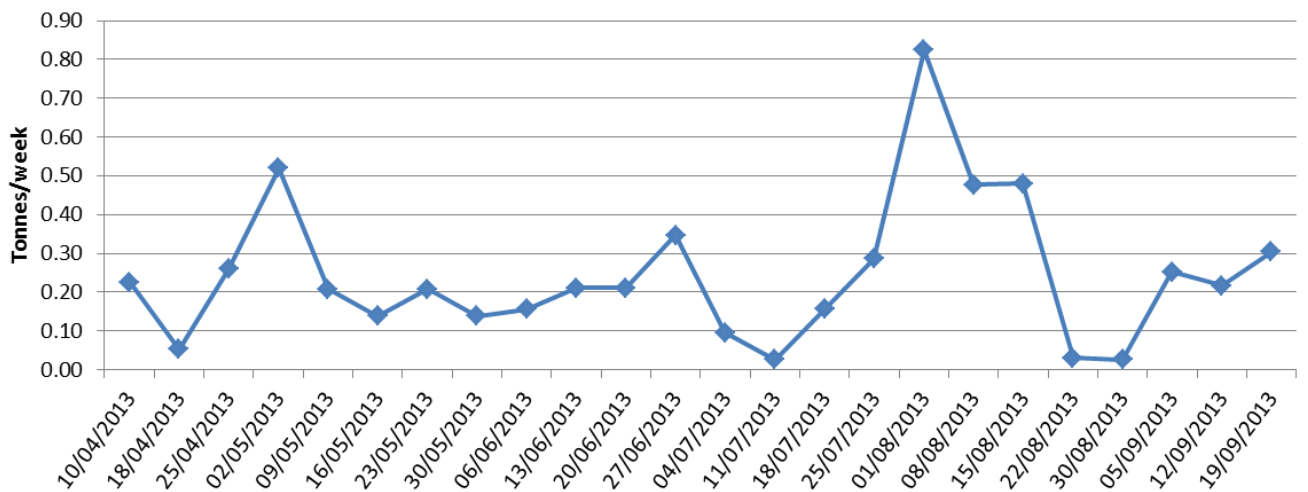


Figure 6 Estimated weekly brown and clear glass collections between 10 April and 19 September

The average over this period (brown and clear glass) was ~0.245 tonnes per week, indicating a drop from the pre-pilot estimate of 0.3 tonnes per week based on the estimates from January and March. It has to be noted that we do not have sufficient data to understand variation over time and hence to understand whether this change is real or not. If it is real, it is counterintuitive, as extra recycling through the Recycle and Reward machine should have increased the overall figures, although the main change should have been for green glass (the major colour for the bottled products, e.g. wine, sold at Whitmuir), for which there are no comparable figures because of the problems noted above.

The Recycle and Reward machine took an estimated 504kg of glass across the whole pilot period of six months, hence around 19.4kg a week or only ~6.5% of all the glass collected before the pilot (clear, green and brown). This is essentially because the glass is generated mainly by the restaurant, which was not involved in the pilot. The relatively small amount of glass collected in the machine is therefore 'lost' in the wider waste quantity and hence provides no evidence of an overall increase or decrease in recycling of glass as a result of the machine being in place.

4.7.3 *Residual waste*

Because of the contracts with Whitmuir's waste contractors, no comparable quantitative data were available for residual waste. On all but one occasion before the pilot implementation, the general waste bin was noted to be 100% full (three occasions), and it was 90% full on the other occasion. The residual waste bin was noted to be 100% full almost every week during the pilot and slightly overfilled during one week in July (ending 25 July) and one week in September (ending 19 September) and when observations were made before the implementation of the pilot. The amount of target recyclables in the general waste is thought to be negligible. The residual waste observations therefore indicate no decrease after the introduction of the Recycle and Reward machine, and given the relative weights of the recyclables versus the residual it would seem unlikely to do so.

4.8 Impact on container sales

The staff interviewed indicated that the Recycle and Reward scheme had no discernible overall impact on sales or footfall at Whitmuir. Unit sales were 6,642 in 2013 (1 March to 27 September) versus 6,172 in 2012 (same period), implying an increase; however, the net sales figures by value were almost identical in both years. Whitmuir does not record the footfall data themselves. Anecdotal comment from Whitmuir, and one customer, suggested that some customers may be put off from buying alcohol there because the deposit increases the cost and recovering the deposit on a subsequent visit is potentially inconvenient.

4.9 Impact on material quality

The Tomra Uno Promo machine was designed to accept only the targeted items (i.e. with the additional bar code label) and had one internal container for all the items returned. Staff manually separated the materials collected before recycling them through the glass banks or mixed dry recycling sacks with the other recyclables from the site. Material quality from the machine, although commingled, was observed to be good, with no residual waste in the target recyclables.

4.10 Operational factors

4.10.1 *Machine reliability*

Staff felt that the machine was unreliable and was often out of order. Staff indicated they felt demotivated by the large number of technical issues associated with the machine, including the following:

- The machine was not suitable for outdoor use. It was located in the vegetable shed at the entrance to the shop (an area which was not heated) and therefore a heater had to be installed to enable the machine to work during the colder months.
 - The machine needed a replacement part after only two months of operation.
 - There were problems with the camera in the machine: the machine would often reject items multiple times before it would accept them, which was frustrating for customers and staff. This last aspect was in part down to bar code printing problems rather than machine problems per se.
-

Whitmuir staff felt that the training received was adequate but they had subsequently relied heavily on the Tomra technicians, who had been called out approximately once a week to help resolve ongoing issues.

Overall, during most of the pilot the machine recorded 99.9% or more uptime each week (0.1% downtime), contradicting the assertion by the staff at Whitmuir. The difference is probably because a high proportion of the problems were actually the result of poorly printed labels (which caused bottle rejects) rather than a machine fault per se. This problem was largely resolved after Tomra provided alternative add-on bar code labels and labelling guns to replace the original poor-quality bar codes.

There were isolated occasions when the downtime was much higher (4–19%). One of these related to the location of the machine in the vegetable porch, which is unheated and open to the elements during shop hours. Once it was discovered that the temperature dropped below the operational range of the machine, Tomra addressed this with a technical fix to the machine (the aforementioned heater at the back of the machine). Unfortunately, this meant that the machine had to be configured with a single container for all three materials, rather than two, and this meant that staff had to sort all recyclables manually.

4.10.2 *Resourcing implications*

Although no additional staff were employed, staff resources (mainly the owner and the shop manager) were required to plan, set up, promote and implement the scheme. In addition, management of the scheme required time, particularly to align the compatibility of the till system with the add-on bar codes, printing add-on bar code labels, providing data for evaluation, and liaison with Zero Waste Scotland, Tomra and the independent monitoring contractors, SKM and NSA. It was felt that using the add-on bar codes and initial technical challenges (e.g. bar code recognition, sensitivity of equipment) added considerably to the workload.

One-off resource/financial impacts included:

- the cost of re-programming the till system;
- publicity/promotion of the pilot pre-launch;
- staff printing and placing price/bar code stickers on all drinks containers in stock; and
- staff training on the new system.

Extra resources required throughout the pilot included:

- ongoing promotion throughout the pilot;
- staff time explaining the use of the machine to customers and, where required, giving manual refunds;
- staff emptying the Recycle and Reward machine and sorting items for recycling;
- staff time sorting and recycling items returned from home deliveries;
- troubleshooting compatibility issues with the till system and using the add-on bar code labels;
- management time to report data on sales and voucher redemption (because this was a pilot); and
- increasing the number of recycling sacks provided by SBC and uplifted over the year.

Some of these investments of time and effort would not be required in an established scheme.

Surplus funds generated from unredeemed deposits were used to help fund new environmental projects at Whitmuir. In many deposit-return schemes, any surplus funds can also be used to support any additional resources required to administer the system.

5 Public reactions to the pilots

In assessing public reactions, this section considers the views of only the target population for the scheme (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

The limited customer feedback received is hard to generalise from – just 10 customers directly responded to the online survey, so their views can only be treated as indicative. Views on whether the scheme was easy to use were mixed. Some had found the scheme easy to use, and one stated it had made recycling easier. Negative comments included that the machine was unreliable and time-consuming, and people preferred more straightforward recycling options.

It would appear from these remarks that technical and practical issues with the machine were a deterrent to using it. It is worth noting that the one home delivery customer who gave (positive) feedback did not need to use the machine, as staff put the containers through the machine and processed the deposit redemption for them.

5.2 Non-user views

Although very few customers fed back in the survey, the views expressed matched the customer responses reported by staff. Several customers said they did not use the machine because they already recycled at home, with another saying they might have used it if they lived closer to the farm. One stated they would have liked to know more about the environmental impact of the scheme and the rationale behind it, and one suggested it was a deterrent to purchasing drinks from Whitmuir.

5.3 Appropriateness of the rewards

The small number of customers who responded to the survey were aware of the deposit charged and its return through the voucher system, but views on whether or not it was appropriate were mixed and detail lacking because a shortened online survey was used rather than face-to-face interviews.

As noted earlier, ~86% of vouchers issued by the machine were reclaimed for the deposit, suggesting that the financial aspect was important to users, at least once they had actually used the machine.

5.4 Legacy of the Recycle and Reward scheme

As already indicated, customer feedback was mixed, and there was little enthusiasm, compared with other pilots, among staff or customers for continuing the scheme, which was discontinued as a deposit system at the end of the pilot period. According to the staff interviewed, recycling as a behaviour was already adopted by Whitmuir customers and staff and therefore the introduction of the scheme did not change recycling at Whitmuir other than quite marginally in terms of the mechanism used. According to Whitmuir staff, the group most likely to have changed its behaviour was the home delivery customer group, but the data are not available to quantify this change.

Staff did not want the deposit and return scheme to continue in its current form due to:

- the perceived unreliability of the machine supplied;
- the staffing resources required to administer the scheme including the application of the bar codes to the individual products;
- the limited range of containers that could be recycled in the scheme (i.e. only those sold by Whitmuir); and
- the overcomplication of the recycling process.

Some of these factors are because the pilot was a pilot rather than part of a wider scheme. The unreliability aspects were mainly about bottle and can rejects, which in turn related to the temporary problem with poor-quality bar codes, something that was eventually resolved. Whitmuir was assisted with grant funding to cover additional staff time to administer the scheme.

5.5 Other observations

Staff believed a benefit of the scheme was that it had helped to increase awareness of recycling among both staff and customers. It is, however, worth noting that Whitmuir was already a very environmentally aware business, and, given the way it promotes the business, it is likely that their customers are also more likely than average to be aware of recycling too.

6 Conclusions

In reading the conclusions it is important to remember the context. While Whitmuir has regular customers, including home delivery customers, it is also remote and a destination for day trips from the Edinburgh and Borders area and a stop-off for holiday makers. The vast majority of customers would not come into the store weekly, let alone daily. It is also important to note that Whitmuir already had a very active recycling programme on site and that the Recycle and Reward machine complemented rather than replaced the existing facilities.

Around 20% of the target containers sold (online or through the shop) were returned for deposit refund (697 out of 3,422 sold), although this would drop to 17% taking into account the fact that an estimated 100 containers were put into the machines during setup and in correcting bar code problems. In terms of use patterns, this was reasonably constant across the pilot period. Some customers returned several containers at once while others returned just one.

The relatively low weight of material collected by the machine compared with the overall waste quantities at Whitmuir (much of it from the restaurant) made it impossible to discern any overall impact of the scheme in terms of a decrease or increase in overall recycling. Waste data could in any case only be crudely estimated based on volume observations.

The scheme at Whitmuir was well promoted and awareness of it appears to have been high amongst customers (although based on a very small sample). While one benefit of the scheme may have been in helping to increase awareness of recycling among both staff and customers, the overall use of the scheme was low.

Among the 10 customers completing the online survey (a very small and hence statistically insignificant sample), views were very mixed on whether the scheme was easy to use and made it easier to recycle. Some customers reported that the machine was unreliable, the process was time-consuming and it was a more complex route to recycle containers. Current recycling provisions at customer homes were identified as being adequate for the majority of customers (again based on the very small survey sample), it being easier to recycle using these existing services rather than returning the containers back to the store (through a return visit or via the return bag if a home delivery customer).

The refund incentive (10p per item) seems to have been inadequate for the majority of customers in terms of changing their behaviour, though scheme convenience may also be a key factor – and containers may well have been being recycled via other routes off site. The staff at Whitmuir felt that the majority of customers for a remote organic farm are already likely to be ‘green’ in their attitudes and hence do not need significant motivation to recycle.

About 86% of vouchers issued by the machine were reclaimed for the deposit, suggesting that the financial aspect was important for the small minority of customers who returned containers. This figure includes the ‘automatic’ refund of the returns from the home delivery side (35% of refunds), although of course customers still need to be motivated to use the return sack rather than their own local recycling provisions. Presumably, if customers are returning to the shop in any case they may as well reclaim their deposit, although the deposit itself may have nothing to do with their motivation to return to Whitmuir.

Interestingly, home delivery customers accounted for only 35% of all deposits reclaimed, although the split between online and shop sales was not established for comparison purposes. Return in a bag via the delivery driver is potentially a more practical route than physically returning containers to the shop, particular where the item is not consumed on site. Perhaps seeing and using the machine on site motivated further use on subsequent visits.

The Whitmuir staff stated that the scheme had not met their expectations and they did not want it to continue. They felt that the machine was unreliable and that the scheme had been let down by the technology provided. This contradicts the machine downtime data, which is very low on average (0.1%). The majority of the problem appears to have been the result of poor bar code printing quality, which caused repeated rejection of bottles and cans. While this was a major stumbling block for a long time, it was purely an implementation problem that was eventually resolved by Tomra providing better-quality bar code labels.

Care needs to be taken in choosing the right machine for the desired location or vice versa. In this case, account should have been taken of the machine’s suitability for a semi-external location with occasional low temperatures and bad weather to reduce technical problems. Again this was an implementation problem that was resolved satisfactorily through use of a heater.

Staff also felt that their involvement was much more resource-intensive (staff time) than had been expected, although it has to be noted that much of this was related to the pilot (e.g. adding bar codes, reporting data) and implementation problems (bar code faults etc.) that were eventually resolved.

It is important to note that the practical implementation issues mentioned above, combined with the pilot-specific factors, seem to have caused such a degree of disappointment for staff that the eventual resolution of problems did not correct this poor impression of the system. Consequently there was no appetite to continue the scheme.

Pilot-specific and implementation issues aside, however, it seems that this type of deposit refund arrangement is not well suited to this very particular type of site, because:

- it is a single and remote site, making it difficult to physically return empty containers (where not a home delivery customer); and
- the vast majority of customers are ‘green’ by nature and already recycle at home or through the other recycling facilities at Whitmuir.

Had this not been the case, and if the shop were a more regular outlet in an urban area, the deposit-refund approach might well have been far more effective, motivating non-recyclers and occasional recyclers to do more.

The staff at Whitmuir felt that if the scheme could be operated at a national level, easily accepting all drinks containers (irrespective of the source of purchase) for recycling, and there were no requirement for staff to apply the additional bar codes to the products, then this type of approach would be more likely to be successful and be more acceptable to consumers.

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 Enviro (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 quantitatively 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 Manager	Supplied weekly by the Hospitality Services Manager and Student Union Manager; 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 recycling 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 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/weighting 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 recycle 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 local 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**
