





# Digital Deposit Return System Dublin Trial

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# Contents

Contents	.2
1 Executive Summary	.3
2 Background	.4
2.1 How does the Digital Deposit Return Scheme work?	.4
2.2 Benefits of Digital DRS over RVM based DRS	. 5
2.3 Reward4Waste Digital DRS trial in Whitehead	.6
3 Digital DRS trial in Dublin	. 7
3.1 Digital DRS Dublin trial stages	.9
4 Digital DRS Dublin Trial Results1	13
4.1 Consumer engagement with trial1	13
4.2 Customer engagement with the Reward4Waste app1	13
4.3 Recovery of Digital DRS containers in MRF1	4
4.4 Did every customer scan every Digital DRS container?1	17
5. Project Timeline	8
Appendix 1 – Recycling bin not presented for final collection1	.9
Appendix 2 – Recycling bin not included in hand sorting2	23

## **1 Executive Summary**

The IWMA, in conjunction with Panda and Cryptocycle, conducted a trial to prove the concept of a Digital Deposit Return Scheme (Digital DRS) using participants from Panda's household waste collection in Dublin.

The intention of the trial was to build on the learnings from previous trials testing Digital Deposit & Return technology. The key differences with this trial in comparison to others is customers paid a deposit on the items purchased and redeemed the deposit when they placed the containers in their recycling bin at home. The trial also tracked the containers from the point of purchase, consumer, collector, and arrival at a sorting facility.

The goal of the trial was to prove that when using Digital DRS, the percentage return of packaging in the system is comparable to that achieved by the 'return to retail' conventional deposit return schemes (DRS) that uses a combination of reverse vending machines (RVM) and manual take-back.

The trial demonstrated a 94% return rate with 700 containers delivered to customers and 655 deposited in recycling bins using the Reward4Waste App.

## 2 Background

Ireland has an existing kerbside recycling scheme that is available to all households nationally. This system allows the collection of a range of various recyclates, including PET and aluminium beverage containers, alongside paper, cardboard, other plastics and other metal cans in a co-mingled household Mixed Dry Recyclables (MDR) bin. To increase recycling rates and consumer awareness for recycling, there is a move by the Irish Government to deploy a deposit return scheme (DRS) nationally, which will seek to impose a deposit on PET and aluminium beverage containers (drinks bottles). This deposit will be returned to the consumer once the beverage container is returned to a participating retail premises such as a supermarket, convenience store, café, etc. where it can be placed in a reverse vending machine (RVM) or returned manually 'over the counter'.

Digital DRS systems use smartphones to scan items included in the scheme to facilitate return of deposits by using the household MDR bin and other recycling bins in offices, shopping centres, on street, etc. Trials have been carried out previously, with the first public Digital DRS trial held in Whitehead Northern Ireland. These trials gave an important proof of concept when it came to proving the technology worked seamlessly with existing infrastructure. However, at that time the trial objective did not include testing the deposit/return function. Consumers participating were not asked to pay the deposit for the item.

The IWMA wanted to address this by testing the deposit / return function and taking the additional step of proving the items were placed in the recycling bin by recovering the coded items used in the trial at the Materials Recovery Facility (MRF).

## 2.1 How does the Digital Deposit Return Scheme work?

In short, a Digital DRS / Smart DRS works as follows:

- Recycling bins are given a unique code, such as a QR Code, 2D matrix code, or similar.
- Materials with deposits paid also have a unique code such as a QR code, 2D matrix code, or similar.
- Consumers download the free App on to any smartphone or tablet.
- After consumption, the consumer scans the recycling bin with their smartphone followed by the packaging item within a certain time (such as 30 seconds) and redeems the deposit electronically via the App. The consumer is allowed approximately 30 seconds between each item, but many items can be scanned one after another with the smartphone in a short time period.
- Deposits can be reclaimed using smartphones at home, at work, on the street (particularly using Smart Recycling Bins) and at a wide variety of strategic locations. Using Reward4Waste, these deposits can either be cash back into consumers preferred account, loyalty retailer reward points or donating to charity. The rewards are instant upon recycling capture.
- Although recent research highlights that the penetration of smart phones in Ireland in 2021 was 94%<sup>1</sup>, it is recommended that a hybrid model is the most convenient solution, providing

<sup>&</sup>lt;sup>1</sup> A survey by iReach HQ in April 2021, commissioned by IWMA, found that 94% of adults in Ireland have a smartphone, tablet, or other device that allows them to download an app and take a photo. The research conducted is nationally representative by Age, Gender, Region, SES and received 1,000 responses.

Reverse Vending Machines at strategic locations such as civic amenity sites, shopping centres, train stations, airports, sports arenas. Using CryptoCycle's platform, Reward4Waste, also brings a 'home scan' option for those who can't or don't wish to use the app but still want to take part in the Digital Deposit Return Scheme at home.



The following infographic shows the Digital DRS step-by-step in simple terms:

## **2.2 Benefits of Digital DRS over RVM based DRS**

- CryptoCycle brings the Reward4Waste Digital DRS platform, which allows for any size / type of drinks container can be coded and included in a Digital DRS. The scheme can be expanded to include any type of container (drinks or otherwise) which should be placed in the recycling bin.
- Deposits can be weighted so less recyclable packaging incur a larger deposit, some of which can be directed to deal with the cost of materials which are difficult to recycle.
- Digital DRS can accommodate supermarket multi-packs by allowing smaller deposits to be paid on smaller packages or even allow concessions for multi-pack offers.
- The scheme utilises the existing domestic collection infrastructure. It is a viable low-cost alternative to the roll-out of RVM across retail stores.
- Digital DRS requires significantly less effort on behalf of the consumer. It requires a behavioural change to scan the item and redeem the deposit but standard DRS via RVM requires a substantial behavioural change and the inconvenience of bringing a bag of empty bottles and scanning them individually into a machine.
- A relationship can be built by the local authority / waste provider / brand and the recycler, educating, and prompting the consumer towards better recycling behaviour.
- The Digital DRS Working Group (IWG), a group of nine trade bodies across the drinks value chain (including BIFFA, Alupro and Ocado) delivered a high level impact assessment by Resource Futures, which reported that the all-in Digital DRS model has the potential to

reduce the cost of DRS implementation by £3,344 million over 11 years and provide a benefit-to-cost ratio more than twice as good as the 'all-in' more traditional DRS model. This is because a Digital DRS would require fewer reverse vending machines as it is app-based, and so able to utilise the collection points that already exist at home as well as public recycling bins.

A recently published carbon-assessment report by SLR Consulting<sup>2</sup> concluded that the traditional 'return to retail' DRS model has a much higher carbon impact, using circa 20,000 more tonnes of carbon dioxide per annum in Ireland when compared with Digital DRS option. This quantity of CO2 emission is equivalent to unnecessarily burning 10,000 tonnes of coal each year or burning 46,000 barrels of oil when opting for the 'return to retail' model.

## 2.3 Reward4Waste Digital DRS trial in Whitehead

Cryptocycle collaborated with Bryson Recycling and MEA Borough Council with support from Britvic Ireland, PepsiCo and Encirc, to test a proof of concept for the Digital DRS technology in Whitehead NI. The whole community of 2,000 households were invited to take part, with SPAR Whitehead selling participating stickered items. The trial took place over 4 months from October 2020 to January 2021.

Household kerbside bins were uniquely coded and residents who purchased drinks containers (plastic bottles, milk bottles, glass bottles and cans) from the SPAR in Whitehead, were invited to download the Reward4Waste app to take part in the trial. Over 25% of households took part in the trial. Queens University Belfast independently assessed the trial which gained high consumer acceptance and engagement. Results of this trial are available here: <a href="https://reward4waste.com/our-trials/whitehead-trial">https://reward4waste.com/our-trials/whitehead-trial</a>

The objectives of the trial were met with regard to Reward4Waste working with existing waste infrastructure. After the proof of concept, there was a need to run a trial to test true deposit & return consumer behaviour, which is a critical factor in a DRS, and tracking packaging items back to the MRF.

<sup>&</sup>lt;sup>2</sup> SLR Report entitled "HIGH LEVEL STUDY TO ASSESS THE CARBON IMPACTS OF SMART DRS", commissioned by the IWMA and published in May 2021.

# **3** Digital DRS trial in Dublin

The aim of the trial in Dublin was to bridge the gaps from the previous Whitehead trial in the following way:

- 1. Optimising full Digital DRS functionality to prove consumer behaviour towards deposit and return using an app-based digital solution.
- 2. Tracking packaging from purchase, recycle, back to MRF.

The trial was carried out using milk as milk is perishable and fast moving. The Whitehead trial ran for 4 months as they waited for coded items in stock from the Spar store to be purchased. Milk must be used in 7 days or discarded, either way the packaging will hopefully be recycled.

The trial in Dublin utilised a milk delivery service. Delivery of Digital DRS coded packages of milk were delivered to participants' doors. The milk delivery person effectively became the equivalent of the Spar supermarket in Whitehead.

Participants signed up to the scheme, installed the app on their smartphones and labelled their bin with a compatible code before they could order and receive a delivery of coded milk containers.



Example screenshots from the User interface (R4W Dublin App)

The trial was offered to a selection of Panda's domestic bin service customers in South Dublin. Customers were invited to participate by sending them a letter and the target was to get 200 customers to install the app and commit to ordering milk from this refrigerated delivery service.

Participants were charged for the milk, 75c per litre, and they paid a 25c deposit on every container delivered to their household. Milk was delivered 2 times per week for 4 weeks and the cost of the milk was added as a separate line item to the participant's Panda services bill as below.

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Example Customer Invoice

Customers were offered 1 Litre Full-fat, 1 Litre Low-fat and 1 Litre of Skimmed milk for delivery. Return of the 25c deposit was clearly shown on the next Panda invoice once the milk is consumed and package is returned to the domestic recycling bin.

234 trial participants were sourced from one Panda collection route. Panda sent a dedicated truck with crew to collect these bins separately on the normal day participants expected to put out their bin. This facilitated package recovery and verification at the MRF as it reduced the amount of material which had to be hand-sorted to recover the coded packages.

The material was tipped in Panda's MRF in Ballymount where it was sorted by hand to recover the packages and verify that users used the scheme correctly.

The aim of the trial is to prove consumers will use the Digital DRS properly and that the recovery rates align with those possible by RVM based DRS.

In full scale Digital DRS, such hand-sorting and verification at the MRF will not be required as the return of the coded items will be recorded when the customer scans the QR code. The combined weight of these items will be compared against the weight of baled target materials after mechanical sorting, using a known weight for each package and this will provide verification that scanned items were placed in the MDR bins.

## **3.1 Digital DRS Dublin trial stages**

#### **3.1.1 Customer initial engagement**

The welcome letter outlined how Digital DRS works and why a trial was needed to prove the system has the potential to be applied across an array of recyclable materials. The welcome letter was followed up with a call from a Panda representative to ask if the customer wanted to receive a trial welcome pack which included the Digital DRS bin code that was required to complete the sign-up process.

Once the welcome packs were distributed, a second letter outlined how to install the app and complete registration with the trial. Customers were encouraged to visit <u>www.r4w.ie</u> which is a webpage with links to the Apple and Android compatible version of the Digital DRS smartphone application. 234 customers agreed to participate in the trial and were issued with a welcome pack.

Within 2 days of issuing the welcome packs more than 50 customers had installed the app, input their details (including their Panda customer account number), and scanned the code that was included in the welcome pack for the bin. The phone application has a "Helpdesk" feature so those having problems could send an email and a company representative would help them through the process.



Digital DRS bin stickers and milk container stickers

#### 3.1.2 Milk delivery

Panda's operations team provided the resources needed for milk delivery, including personnel, and hiring of a refrigerated van for the 4-week trial duration.

Cryptocycle developed a second smart-phone application which was used for delivering the milk. As milk was delivered, the codes on each container were scanned and linked to the delivery address. This crucial part of the mechanism for this trial allowed customer by customer analysis of how they interacted with the technology. It also allowed a review of which customers returned some or all containers, and what coded containers were outstanding when the trial ended.

Milk was delivered twice per week for 4 weeks on a Tuesday and Friday in July/August 2021.

On Sunday and Wednesday each week, customers participating in the trial received this text message:

"Please text your milk order now for delivery by 6.30am this Friday morning to 0861020509. Please note that due to supply issues we will be using Tesco or Dunnes Stores own branded milk for this trial. For fresh full fat milk in 1 litre containers please text the number of litres followed by FF. For fresh low fat milk text LF and for fresh skimmed milk text SK. Example: 1FF, 2LF, 1SK.

There is no minimum order required to stay in the trial and we thank you for participating over the coming weeks"

A member of the operations team compiled a list of milk to be purchased, coded, and delivered from the texts received in the 36 hours after issuing the text message.

Delivery orders were compiled on Monday and Thursday nights and given to the driver of the refrigerated van. We assured customers that the milk would be delivered before 6am in the morning so the delivery team started at midnight. Scanning the milk as it was delivered is time consuming, so the delivery team was made up of a van driver, person to prepare the order and scan to an address, and a runner to deliver the order at the doorstep.



Refrigerated delivery van stocked with Digital DRS coded milk bottles and cartons



Digital DRS coded milk containers delivered

#### 3.1.3 Recovery of containers in MRF

The main benefit of Digital DRS over a conventional DRS is the ability to use the existing domestic recycling bin infrastructure. Each item is uniquely coded, it can only be recycled once, so consumers can only collect their deposit once, reducing fraud.

One criticism raised at Digital DRS is whether there is a potential for a consumer to scan an item, scan a bin code, and not deposit the container in the recycling bin. The technology can potentially identify poor behaviour and take relevant action. If a customer were to scan the item, scan a bin code and discard the items on the street, the item will later be collected by someone else who will try to redeem a deposit. The system can flag the original user and suspend or penalise from future deposits.

An important part of proving consumer behaviour with this trial was to separately collect the recycling bins from these customers and to sort by hand the material to recover the coded containers. Recycling bin collections were completed on 27th of July, 10th and 24th of August and hand sorting of the material was completed the same day.

The collection truck drove the route and collected trial customers only, using an empty truck. The truck drove the same route again, collecting all other bins on the route. Hand sorting was carried out only on the first collection so a driver in a van followed the collection truck to capture Digital DRS trial customers who did not put their recycling bin out the first time the truck passed but put it out the second time. The van driver had plastic bags large enough to contain the entire contents of a 240L recycling bin. He returned each collection week with material from 3-5 household and added the material for hand sorting.

Once the containers were retrieved each one was scanned using the Digital DRS customer app. A special account was set up for this purpose. Almost all items were scanned before they were placed in the recycling bin but those that weren't were allocated to this user account. Since the delivery app recorded each container delivered to a particular address, we can ascertain which customers placed containers in the bin but didn't scan them.

Panda has Radio Frequency Identification (RFID) chips in the recycling bins, and these identify the customer as the bins are emptied into the refuse collection vehicle, so once the collection truck completed the route it was possible to see when each customer's bin was collected. Panda's systems showed if a Digital DRS trial customer did not present a bin and the time that each bin was collected was recorded. Visibility of Panda's collection system information is important when comparing the number of items scanned to the number recovered when hand sorting in the MRF.



Digital DRS Containers recovered by hand sorting

# **4 Digital DRS Dublin Trial Results**

## 4.1 Consumer engagement with trial

234 Panda customers agreed to participate in the trial and were issued with a welcome pack (as stated in section 3.1.1). 146 customers installed the Reward4Waste Dublin App, scanned the bin code, and added their details to set up a deposit return account. Once a customer registered their account and scanned the bin code, they were included in the list of customers prompted to place a milk order before each delivery (wording of text sent to participants is in section 3.1.2).

122 customers ordered milk during the trial. One customer ordered 35 litres of milk over the 4-week duration, but the average per participating household total was 7 litres of milk.

At the time of first milk delivery, 115 customers were fully registered with the app and 104 customers placed an order on that occasion. The first delivery was the most difficult as the delivery team tried to establish an efficient method for driving, scanning, and distributing the containers. Once the routine was established and the driver was familiar with the area, subsequent deliveries were easier to complete.

At the end of the trial, 122 customers were ordering milk and others were not actively encouraged to sign up at that stage. A commitment was made to deliver the milk to the doorstep by 6am and with 100+ deliveries per night that deadline was tight on several occasions.

Interestingly, the Reward4Waste Dublin app was downloaded to 172 individual handsets so 26 people downloaded the app just out of interest from outside of Ireland.

Out of 146 Irish downloads, 85 were to Apple iPhones (IOS) and 61 were using the Android version of the application.

## 4.2 Customer engagement with the Reward4Waste app

The primary objective of this trial (as stated in section 3) was to bridge the gaps from previous trials such as Whitehead. Customers in the Dublin trial were charged a deposit for milk containers received and the deposit was redeemed using the Reward4Waste app.

Analysing the data collected requires some data cleaning. The overall dataset shows 752 items were delivered and 655 deposits were returned using the app. It is important to remove a small number of items from the 752 total delivered before calculating the final result.

During the first delivery on 16<sup>th</sup> July 2021, the delivery team encountered a different milk delivery vehicle in Merrion Park (Blackrock). The driver of this delivery vehicle approached the Panda vehicle in an extremely aggressive manner. He accused Panda of offering a competing milk delivery service without permission. It was explained to him that the Digital DRS technology showed that there were only about 150 milk containers in the refrigerated van and that the team were coding and scanning each one to track them from consumer back to the recovery facility.

The following day there were numerous calls from customers in Merrion Park claiming that they did not receive their milk order. The Panda team then made contact with the regular milk delivery service provider and explained in no uncertain terms that if milk was stolen during the trial that evidence would be sought from Panda customers and presented to An Garda Siochana. Following this incident, the items delivered to Merrion Park on this first delivery were removed from the dataset that informed the results of the trial.

There were several more calls from customers during the 4-week delivery period who claimed they didn't receive their milk order. Again, if the item we delivered wasn't deposited, we removed these from the overall analysis.

The final result for items delivered compared to items deposited through the app was;

	Delivered	Depe	osited
After removing missing items	700	655	94%

A complete list of items removed is included in Appendix 1 and 2 for transparency of data cleaning.

## 4.3 Recovery of Digital DRS containers in MRF

The secondary objective of this trial (as stated in section 3) was to bridge the gaps from previous trials by confirming that once a consumer redeems a deposit using the app, they place the container in the recycling bin at home.

This part of the trial utilised information from CryptoCycle's app technology and Panda's waste collection technology.

Panda committed to sorting by hand the mixed recyclables placed in the Digital DRS trial customers' household mixed dry recycling (MDR) bin. Panda separately collected these bins to reduce the amount of material from which Digital DRS coded containers were recovered. The bin truck drove the full collection route servicing only Digital DRS trial customers who presented their bin. This material was tipped in a dedicated area in the Materials Recovery Facility in Ballymount. The truck drove the same route again to service every other customer from this route. It was anticipated that some Digital DRS trial customers would miss the first collection and present their recycling bin when the truck drove the route for a second time. Therefore, a van followed the collection truck with bags large enough to empty the contents of an MDR bin so it could be added to the material for hand-sorting.

This system was not perfect. A small number of customers on the Digital DRS trial had their bin serviced by the bin truck when it drove the route for a second time (complete list in Appendix 2). Often neighbours leave their bins together at the end of a cul-de-sac making it difficult for the operators to identify MDR bins specific to an address. Panda's collection system identifies the RFID chip in each bin, so the time of collection was compared against the list of customers in the Digital DRS trial. This allowed identification of the Digital DRS containers that were expected to be found when hand sorting the material in the MRF and allowed removal of containers that were collected in the bin truck on the second run, i.e., missed by the van that was following the bin truck.

These missed items were then removed from the data when calculating the recovery rate from this stage of the trial. As the customers scanned the items before placing them in the MDR bins, the technology enabled identification of coded containers that were lost to the second run of the bin truck and therefore would not be found in the hand-sorting exercise.

The team also identified 20 customers in the Digital DRS trial who did not present their bin on the final collection which was hand sorted on 24<sup>th</sup> August (list in Appendix 1). Out of these 20 customers,

7 had items deposited between the previous collection on the 10<sup>th</sup> of August and the 24<sup>th</sup> August. These items were also removed when calculating the recovery rate from this stage of the trial.

Based on analysis of the issues identified above, it was determined that out of a total of 655 items scanned and deposited, 83 items were removed from the total that could be found when sorting material by hand.

	Deposited	Recovered fro	om MRF during
	items	hand	sorting
After removing items as per Appendix 1 & 2	572	492	86%

It is important to note that hand sorting material in the MRF was extremely difficult. Digital DRS trial customers were separately collected but that still means approximately 1,200Kg of domestic mixed recycling had to be sorted by hand. Customers are instructed to present their material *"clean, loose and dry"* but often Digital DRS coded containers were found in bags, stuffed into takeaway or cereal boxes and some coded containers were damaged. It is likely the team hand sorting material missed some containers. The material was compacted in the back of the bin truck and this also made it difficult to find and identify the crushed coded milk containers.

The objective of this stage of the trial was to confirm that customers would place containers in the recycling bin once the deposit was redeemed and our results broadly confirm this is the case.



Finding Digital DRS coded containers among 1,200kg of mixed recyclables



Examples to highlight the difficulty recovering containers by hand

It is important to note that the difference between the number of items deposited compared to the number recovered is thought to be due to the imperfect nature of hand sorting material in this manner.

Once the customer scans the container with the App, the easiest and cheapest option is to place that container in the MDR bin, as the QR code should be on that bin or next to it and all household kerbside waste collectors must charge their customers in a manner that incentivises recycling over recovery or disposal. This means that the material placed in the MDR bins must be charged at a lower price than material placed in the general (residual) waste bins, so there is a disincentive to place scanned items in general/residual waste bins. In the trial area, Panda charges  $\in$ 3.20 per lift and 27.7c per kg for the general waste bin and a lower charge of  $\notin$ 0.80 per lift and 0.45c per kg for the MDR bin (September 2021 pricing).

## 4.4 Did every customer scan every Digital DRS container?

Recovery of Digital DRS containers through hand sorting in the MRF gave the opportunity to re-scan every item recovered during the trial. If a container has already been scanned (by a customer), it will not scan a second time, so those that could be scanned in the MRF comprised items that were placed in the MDR bins by customers that did not scan them before depositing them in the bin.

Out of 655 items deposited using the app, 34 were scanned after recovering them in the MRF. This represents 5% of items deposited, and in a real-world application of Digital DRS technology, these items represent unclaimed deposits which have the potential to fund a returns scheme.

An analysis of which customers ordered milk and placed Digital DRS containers in the recycling bin without scanning them shows most of these items came from households which used the technology to redeem deposits on other containers, they simply forgot to scan a small portion of the containers received.

Using the Reward4Waste app in conjunction with Panda's collection systems it was possible to ascertain some insight into consumer behaviour. The trial deliberately selected milk as the product for delivery as it is perishable. It was expected that customers would consume the milk in 2-7 days and the analysis below confirms this behaviour. It was surprising initially to see so many consumers redeeming their deposit within a day of receiving the milk but considering this is a new concept for most there is a novelty factor to using the technology. Most items were deposited within a week of receiving the milk and as expected, reminder texts to all participants the day before collection drove engagement.

It was positive to see consumers interacting with the technology as intended. Purchasing items, consuming items, and then recycling using the app.



Graph showing the number of days between receiving milk and depositing the container using the Reward4Waste Dublin app.

# **5. Project Timeline**

The trial was carried out as per schedule below.



# **Appendix 1 – Recycling bin not presented for final collection**

Items removed because customer did not present recycling bin on 24th August 2021

Account	Name	House ID	Address 1	Address 2	Had lift 27Jul21	Had lift 10Aug21	Had lift 24Aug21	Potential Items missing	Note
506	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	mm		Booterstown	No	Yes	No	0	Never ordered milk, just registered for trial
506				Booterstown	No	Yes	No	4	6 delivered, 1 scanned before 10Aug but 4 not scanned a all. 1 scanned after finding item in 10Ag collection
505				Booterstown	Yes	Yes	No	0	Never ordered milk, just registered for trial
500		mm	enue	Blackrock	Yes	Yes	No	0	Dealt with on collections spreadsheet
508			enue	Blackrock	Yes	Yes	No	0	Dealt with on collections spreadsheet
506			enue	Blackrock	No	Yes	No	1	2 items delivered and scanned. Second item scanned 11Aug so likely in customer's bin
591			enue	Blackrock	Yes	Yes	No	0	Never ordered milk, just registered for trial
505				Blackrock	Yes	Yes	No	0	Removed from trial as customer said she never received milk
505				Booterstown	Yes	Yes	No	0	Received and scanned 6 but all before O3Aug so likely in early collections
508			<b>IIIII</b> nt	Booterstown	Yes	Yes	No	0	Received and scanned 4 but all before 10Aug collection
504				Booterstown	No	Yes	No	1	Received and scanned just 1 item early in trial but misse 2 collections so potentially not big user of recycling bin o on holiday
503				Booterstown	Yes	Yes	No	1	Received and scanned 6 but 1 was scanned after 10Aug collection
508				Booterstown	Yes	Yes	No	0	Received and scanned 6, all before 10Aug Collection
500				Booterstown	Yes	Yes	No	0	Received and scanned 13, all before 10Aug Collection
508				Blackrock	Yes	No	No	1	Received and scanned just 1 but was after first collection
504				Blackrock	Yes	No	No	3	Received and scanned 5 but 3 were after first collection and bin wasn't presented thereafter
508		mm		Blackrock	No	Yes	No	0	Never ordered milk, just registered for trial
591			ges- enue	Booterstown	Yes	Yes	No	2	Received 8, scanned 7, 6 scanned before 10Aug delivery 2 outstanding
508			IIIIII <sup>1</sup>	Booterstown	No	No	Nö	7	Received 7, scanned 4 but never presented bin during tr
506				Booterstown	Yes	No	No	1	Received and scanned 3, 2 of which were scanned before 27Ju delivery
508	mmm	mm		Booterstown	No	No	Yes		
506	mmm	mm	enue	Booterstown	Yes	No	Yes		
505	<u> </u>	mm	enue	Blackrock	Yes	Yes	Yes		

1 of 4

Account	Name	House ID	Address 1	Address 2	Had lift 27Jul21	Had lift 10Aug21	Had lift 24Aug21	Potential Items missing	Note
50				Blackrock	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
59				Blackrock	Yes	Yes	Yes		
59				Blackrock	Yes	Yes	Yes		
50				Booterstown	Yes	No	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Blackrock	Yes	No	Yes		
50				Blackrock	Yes	Yes	Yes		
59				Blackrock	No	Yes	Yes		
50		mmm		Blackrock	Yes	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Blackrock	No	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
50				Booterstown	No	Yes	Yes		
59				Booterstown	No	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
50				Booterstown	Yes	Yes	Yes		
59				Booterstown	Yes	Yes	Yes		
59				Booterstown	Yes	Yes	Yes		
50				Blackrock	Yes	Yes	Yes		
50		mm		Booterstown	Yes	Yes	Yes		
50		MIIIII		Booterstown	Yes	Yes	Yes		
50		mmm		Blackrock	Yes	Yes	Yes		
50		mm		Booterstown	No	Yes	Yes		
50				Blackrock	No	Yes	Yes		
50		mm		Blackrock	Yes	Yes	Yes		
50		MIIII		Blackrock	Yes	Yes	Yes		
50		mm		Blackrock	No	Yes	Yes		

Account	Name	House ID	Address 1	Address 2	Had lift 27Jul21	Had lift 10Aug21	Had lift 24Aug21	Potential Items missing	Note
50		<u>innn</u>	enue	Booterstown	No	Yes	Yes		
50			enue	Blackrock	Yes	Yes	Yes		
50			Park	Blackrock	No	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		
50			Park	Blackrock	No	Yes	Yes		
50			h Crescent	Booterstown	Yes	Yes	Yes		
50			h Crescent	Booterstown	Yes	Yes	Yes		
50			h Crescent	Booterstown	No	Yes	Yes		
50			h Crescent	Booterstown	Yes	Yes	Yes		
50		MMM.	h Park	Booterstown	Yes	Yes	Yes		
50			h Park	Booterstown	No	Yes	Yes		
50		MMM	h Park	Booterstown	Yes	Yes	Yes		
50			h Park	Booterstown	Yes	Yes	Yes		
50			h Park	Booterstown	No	No	Yes		
50			h Park	Booterstown	No	Yes	Yes		
50			h Park	Booterstown	Yes	No	Yes		
50			h Park	Booterstown	Yes	Yes	Yes		
50		anna a'	h Park	Booterstown	Yes	Yes	Yes		
50		MM	h Park	Booterstown	Yes	Yes	Yes		
50			h Park	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	No	Yes	Yes		
50		IIIIII	Villas	Booterstown	Yes	No	Yes		
50		IIIIII	Villas	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	Yes	Yes	Yes		
50			Villas	Booterstown	Yes	Yes	Yes		
50		MMM	Park	Blackrock	Yes	Yes	Yes		
50			Park	Booterstown	Yes	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		
50		MMM.	Park	Blackrock	Yes	Yes	Yes		
50		uuuu	Park	Blackrock	Yes	No	Yes		
50		uuuu	Park	Blackrock	No	Yes	Yes		
50			Park	Blackrock	Yes	Yes	Yes		

Account	Name	House ID	Address 1	Address 2	Had lift	Had lift	Had lift	Potential	Note
		mm			27Jul21	10Aug21	24Aug21	Items missing	
59			Park	Blackrock	No	Yes	Yes		
50			ark	Booterstown	Yes	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	No	Yes	Yes		
59			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	No	Yes	Yes		
50			ark	Blackrock	No	Yes	Yes		
50		IIIIII	ark	Blackrock	No	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50		//////	ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	Yes	Yes	Yes		
50			ark	Blackrock	No	Yes	Yes		
50			ark	Booterstown	Yes	Yes	Yes		
50			ht Court	Booterstown	Yes	Yes	Yes	-	
50		IIIIII	ht Terrace	Booterstown	Yes	Yes	Yes		
50			i Park	Booterstown	Yes	Yes	Yes		
59		IIIIII	i Park	Booterstown	Yes	Yes	Yes		
50		IIIIII	i Park	Booterstown	Yes	No	Yes		
50			Park	Blackrock	No	Yes	Yes		
50			ets	Blackrock	No	Yes	Yes		
50		MMM	Ullbunt	Blackrock	Yes	Yes	Yes		
							Total	21	

# **Appendix 2 – Recycling bin not included in hand sorting**

Items removed because bins containing Digital DRS containers were not included in hand sorting

			Collection		Potential	
Account	Name	Address		Time	Items	Notes
					missing	
503		Co Dublin	24/08/2021	11:05:49	5	2 out of 3 collections missed first time - customer ordered 7 but deposited only 5. Both were found and scanned after first collection on 27Jul21
503		Trock, Co	24/08/2021	12:20:31	14	3 out of 3 collections missed. Customer late putting bin out each time
503			24/08/2021	12:13:26	4	3 out of 3 collections missed. Customer late putting bin out each time
50-		krock, Co	24/08/2021	10:45:20	7	2 out of 3 collections missed first time
505		Ullin	24/08/2021	10:45:44	0	Never ordered milk, just registered for trial
508		ublin ublin	24/08/2021	10:15:33	0	Customer claims they never received milk ordered during trial
50		Dublin	10/08/2021	08:41:57	0	2 items deposited but in first 2 weeks of trial. Likely they were collected first/second collection
502		Co Dublin	10/08/2021	09:58:28	0	As note for collection 24th August
503		rock,Co	10/08/2021	11:06:16	0	As note for collection 24th August
503			10/08/2021	11:00:01	0	As note for collection 24th August
503			10/08/2021	10:14:22	7	5 out of 8 scanned before 10Aug collection. 2 not scanned but delivered 22Jul. 1 item scanned 14Aug so should be in collection on 24Aug
50		krack,Co	10/08/2021	09:36:09	0	As note for collection 24th August
505		Ullin	10/08/2021	09:36:36	0	Never ordered milk, just registered for trial
506		Weblin Dublin	10/08/2021	10:15:49	5	5 items delivered and scanned before 10th Aug
508		Dublin	10/08/2021	08:42:31	6	Customer ordered 8, scanned 6 before 10Aug delivery.
592			10/08/2021	11:29:14	12	Customer ordered and scanned 12, all before 10Aug collection
503		rock,Co	27/07/2021	11:22:04	0	As note for collection 24th August
503			27/07/2021	10:54:30	0	Never ordered milk, just registered for trial
503			27/07/2021	11:15:34	0	As note for collection 24th August
506			27/07/2021	10:29:52	0	As note for collection 10th August
500			27/07/2021	10:42:18	2	3 ordered and deposited during trial. 2 deposited before 27Jul collection
59:		Willing Dublin	27/07/2021	09:08:57	0	Never ordered milk, just registered for trial
591			27/07/2021	11:46:50	0	As note for collection 10th August

Total 62