2022 Greater Seattle Plastic Film Recycling Circularity Pilot Report

Results show good quality and quantity of post-use plastic film collected through retail takeback programs, demonstrating the value of this material and the viability of these programs to support plastics circularity.

Prepared by Encorp Pacific/Return-It™ for The American Chemistry Council (ACC)

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Introduction

This pilot was directed by Return-It, a non-profit recycling organization, and funded through the American Chemistry Council's (ACC) Wrap Recycling Action Program (WRAP), an outreach initiative to increase the recycling of plastic (polyethylene) film packaging. The sponsors of the pilot included Dow, NOVA, General Mills, and PAC Worldwide.

The ACC contracted with Return-It to implement a pilot program delivering the requisite services that could serve as a template for use in multiple jurisdictions or nationally across the U.S. The five-month pilot program tested the effectiveness of a system for recycling polyethylene (PE) film packaging in Seattle and King County (aka Greater Seattle) using a return-to-retail circular economy approach.

Film Recycling Pilot Program Overview

Pilot Planning

The collection partners were identified and included a transporter, baler/sorter, and several retailers. Cascadia negotiated the initial agreements with the partners. Return-It was commissioned to complete the planning and implement the pilot. To complete the circular material approach to the pilot, Return-It contracted with Merlin Plastics to purchase the plastic film collected and recycle the material into pellets or flake that were then sold to manufactures of new products.

A steering committee was established consisting of ACC resin company members, a local film manufacturer and a major brand company to provide oversight and guidance in the development of the program plan, implementation, and subsequent evaluation of the pilot.

Members of the steering committee are listed below:

- John Bartell – PAC Worldwide
- Shari Jackson – American Chemistry Council
- Patrick Keenan – General Mills
- Anna Rajkovic – Nova Chemicals
- Jennifer Ronk – Dow Chemicals

The retail collection partners consisted of:

- Town and Country – Joel Larway
- PCC Markets – Aimee Simpson
- Madrona Grocery – Steve Mullen
- Marketime Foods – Bill Stimey

The collection and recycling partners included:

- Commercial Waste Reduction and Recycling (CWRR) – Dave Ambur. CWRR serves as the collector of plastic film from participating grocers located throughout King County. The material collected by CWRR was delivered to Seadrunar for sorting and baling.

- Seadrunar – Seth Little. The plastic film received by Seadrunar was processed through a sorting system to remove contaminants and then baled and shipped to Merlin Plastics.
- Merlin Plastics – Tony Moucachen. Merlin was the final processor of the plastic film, including the sorting, grading and final production into resin or pellets.

Pilot Goals and Objectives

The goal of the pilot was to develop and implement a program, using best practices learned from previous pilots while incorporating new elements. The program could operate as a stand-alone voluntary program or as a complementary cost-effective program to any future multi-material stewardship or Extended Producer Responsibility program (EPR) established in the United States.

The key pilot objectives included:

- Establish an effective system for the collection and recycling of film (bags/wraps/other packaging) in Greater Seattle using a return-to-retail circular economy approach. This included driving demand and customer participation to support the collection of sufficient and consistent volumes of post-use film for Merlin Plastics.
- Integrate effective program elements and develop a retailers guide containing uniform standards and best practices, including:
    - The collection bins, signage and standard set up to be deployed at retail locations.
    - Clear and consistent consumer awareness and educational materials, and a toolkit to increase consumer participation and engagement.
    - The transportation and auditing of material collected.
- Increase the long-term demand and value for the film packaging recycled through the program.

Pilot Strategies

To achieve these goals, the pilot focused on:

- Reinvigorating current return-to-retailer programs.
- Expanding retailers and grocers' participation.
- Supporting independent grocers' participation (and other low-volume collection points).
- Encouraging public participation through proven **Wrap Recycling Action Program (WRAP)** public outreach return-to-retail campaigns and resources.
- Identifying new end markets to support post-use film collected beyond the current supply.

Other strategies included:

- Encouraing grocers' participation in a circularity initiative (e.g., participating retailers purchasing waste container liners made from the recycled film collected at their locations).
- Encouraging local business, industry and trade associations, and non-governmental organizations (NGOs) to amplify the WRAP campaign messaging.

Pilot Operational Flow

The program focused on PE film products and packaging, including plastic bags, overwrap, bread bags, shipping pillows, poly mailers, dry cleaning bags, bubble wrap, case wrap, etc. Transparent collection bins were provided to retail participants and placed near the front entrance area of the retail store. The bins included customer information and instructions to encourage collection of a clean stream of material.

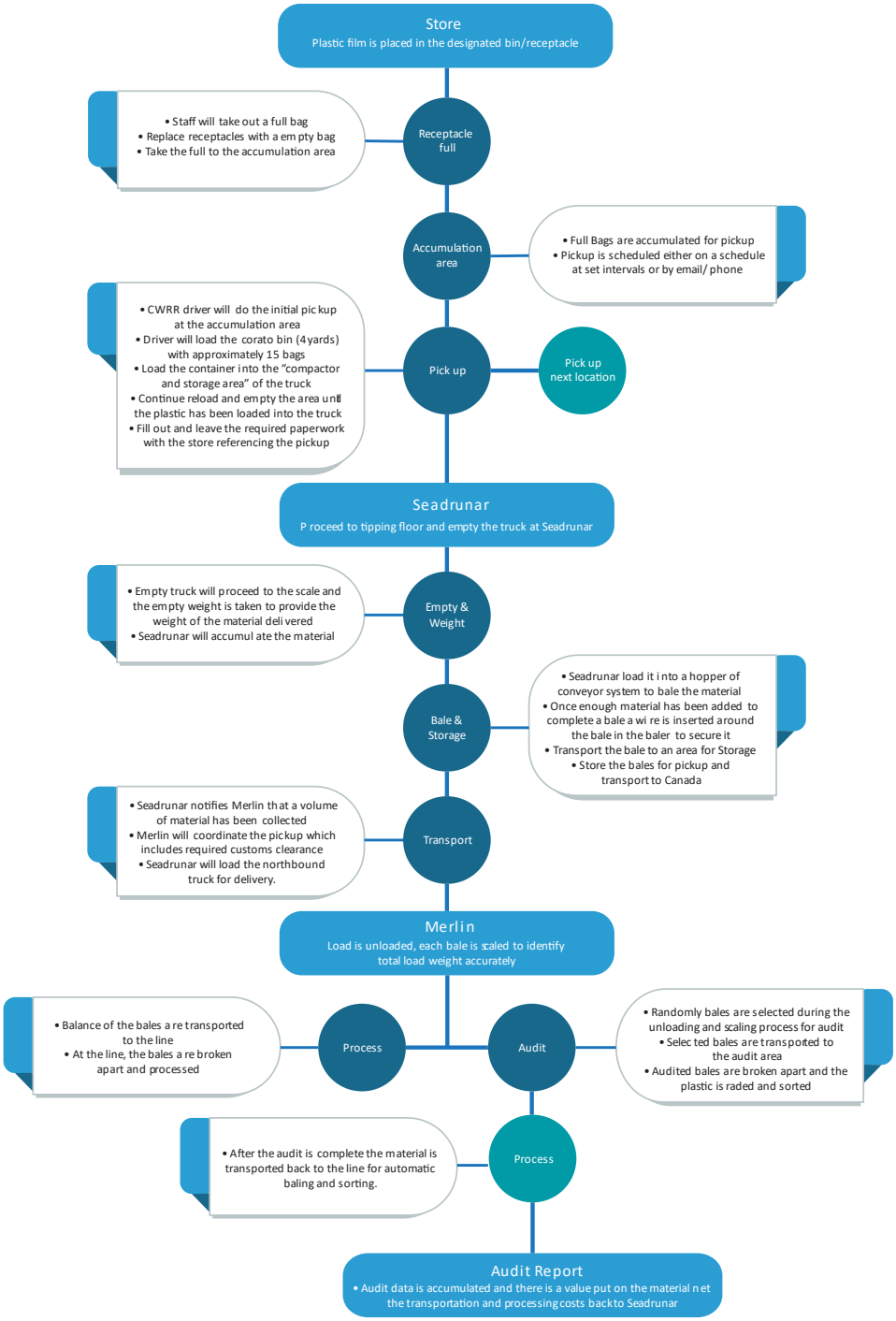


Figure 1: Outlines the operational flow of the pilot processes.

NOTE: Quality control check at the initial stage of the store management process: When the full collection bag was removed by staff, they were requested to visually exam the transparent bag and remove any easily visible contamination. The most frequently spotted contaminants were organics, non-acceptable plastics (e.g., laminates) and other non-recyclable material.

Participating retailers were responsible for the collection costs of the acceptable material. CWRR invoiced each store directly based on the agreed upon pick-up schedule developed. *NOTE: The costs referenced below were for this particular project and were incurred at the beginning of January 2022. They are for reference only.*

- For each pick-up the initial cost for the first bin: $65.15
- The cost for each additional bin within the pick-up: $32.00

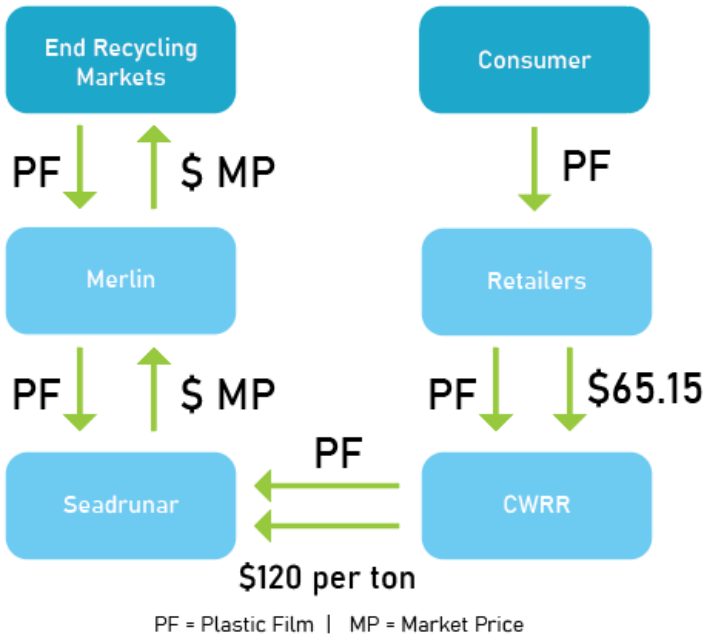
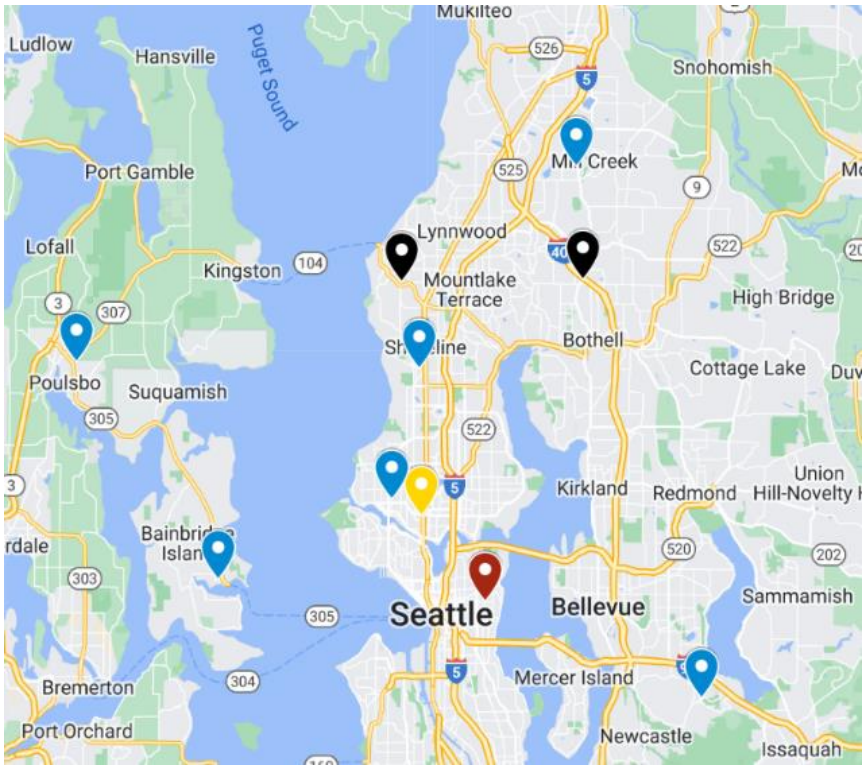


Figure 22: Demonstrates the flow of money within the collection and recycling process. Note that the initial pickup cost was $65.15 but for subsequent bins emptied during the same pickup the cost was $32.

Retailer Information



- Town & Country Markets – six locations (Blue Pinpoints)
    - Ballard
    - Shoreline Central
    - Mill Creek
    - Lakemont
    - Bainbridge Island
    - Poulsbo
- PCC Markets – two locations (Black Pinpoints)
    - Bothell
    - Edmonds
- Marketime Foods – one location (Red Pinpoint)
    - Fremont Ave
- Madrona Grocery Outlet – one location (Yellow Pinpoint)
    - Martin Luther King Way

A map outlining the various store locations can be found **here:**

Each retailer signed a Memorandum of Understanding with Return-It and ACC to participate in the pilot.

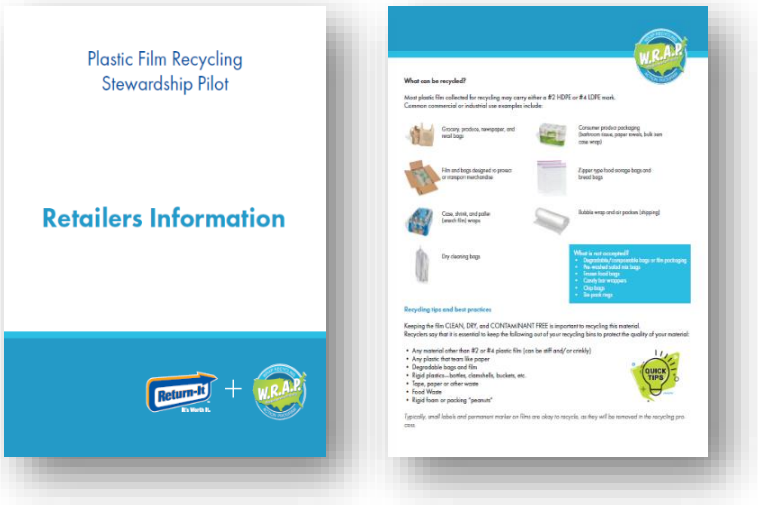
Once retailer participation was confirmed and a pilot date was set, a webinar was conducted to provide retailers with an overview of the pilot. The webinar was then followed by an email outlining how the pilot would work and provided the retailers with an operational plan for the pilot (see Appendix H – Retail Operational Plan). Retailers were provided with a point of contact at Return-It for any questions related to the operations and logistics of the pilot. Retailers were also provided contact information for the transportation partner should they need to schedule additional pickups or adjust the pickup schedule.

Return-It followed up with retailers to ensure bins were delivered and installed per the Retail Operational Plan. Pictures were requested by Return-It of the bins that were installed so they could confirm correct placement of bins and signage. Return-It also answered questions retailers had regarding marketing, signage, and acceptable materials.

COVID-19 restrictions occurred right at the launch of the pilot making it impossible to verify in person proper set up and staff knowledge about the pilot. Instead, Return-It was limited to emails, phone calls, and webinars with stores.

Consumer Awareness

Working with ACC, and using a mix of existing and new elements, Return-It developed a standardized toolkit to implement the pilot program and test the effectiveness during the pilot. The toolkit was designed to build program credibility and participation from both collection partners and consumers. Having a standard set of tools helped to efficiently develop consistent content. Personal visits also would have helped to promote a clear and consistent vision and definition for the program and initiatives.



The retailer's information resource included:

- Standardized program information and handling procedures for use by store level staff, including an infographic for quick reference.
    - A copy of the Retailers Information document can be found **here.**
- Public educational print materials and Point of Sale (P.O.S.) templates that could be adapted for various uses and QR code technology to direct consumers to more detailed information.

  Materials included:

  - Collection site signage available in different formats:
    - Poster
    - Window cling
    - Shelf flags
    - Counter display
    - Danglers

- A toolkit with retailer assets available for download, including collection site signage and retailers' information.
    - The toolkit included two different versions of the collection site signage: one with customizable branding areas (i.e., logo placement) for each retailer and a second version ready to print. This allowed us to keep a consistent design and layout across all participating retailers.
- Bins
    - Artwork template for bin wrapping

A copy of all available assets can be found **here**.

- Social media and digital ad templates were included in the toolkit and shared with the participating retailers to be adapted and used on platforms as needed.

The social media toolkit included:

- Copy deck, including different posts (educational, location awareness and materials accepted) to be shared on social media with relevant hashtags.
- Image assets to accompany the copy provided were sized to fit each social media platform.
    - A second version with customizable branding area for logo placement was included.

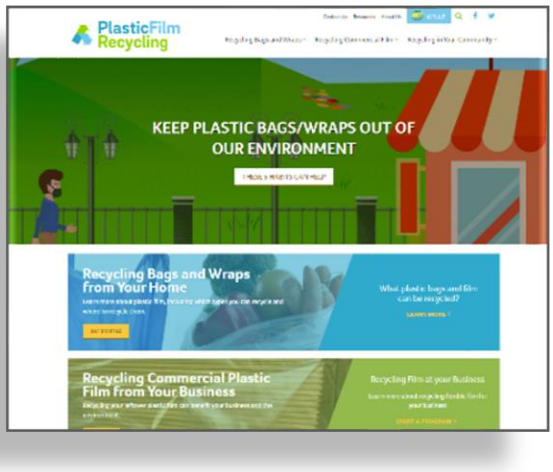
Digital impressions and engagements summary:

	Impressions	Engagements
Facebook Paid Campaign	184,773	21,520
Facebook Organic Posts	2,985	2,701
Nextdoor Posts	29,941	1,647
Twitter	5,667	558
Instagram	544	N/A

Table 1: A detailed report on each social media post can be found on Appendix B

Website landing pages dedicated to the pilot program as well as templates that highlight specific information for each audience (consumer and retailers) were created.

Total estimated organic traffic (March to May 2022): **212,022**



Top performing keywords:

- Film plastic
- Where can I recycle plastic grocery bags
- Plastic film
- Public Relations and earned media opportunities.

Support was provided by Seattle/King County to write and pitch the media release.

The media release was put out by King County and picked up by the following sites:

- Seattle Times
- MYNorthwest
- Capitol Hill Seattle
- WasteAdvantage Magazine

Total impressions: 4,724,600

Consumer Engagement

The following data from Google Analytics demonstrates strong consumer engagement resulting from King County's paid social media campaign during the final weeks of the pilot. The goal was to increase consumer participation in bringing more household film to the designated store drop-off locations to generate sufficient volumes for the end market.

- PlasticFilmRecycling.org - There were 45,757 users total from May 9-31; 7,506 of those were in Greater Seattle area.
- BagandFilmRecycling.org - There were 31,323 users; 4,301 of those were in the Seattle Metro area.

Summary of Supporting Data and Analysis

Data was collected from various specific sources including CWRR's reporting on the initial collections (see Appendix C) and Merlin's reported audit results (see Appendix D).

Recommendations are evaluated based on a combination of tangible data points and an estimation of the current activity as a baseline. For a recommendation, a simulation is created based on known data points and the expected resulting change in the activities is forecasted and applied to the baseline model. The change in the cost per one pound is used to evaluate the feasibility of the recommendation.

Data Overview

The Process

The pilot commenced January 18, 2022, with six stores participating; by February, an additional four stores joined, and the pilot continued to May 2022 with those 10 stores. During this period, the total amount of material collected was over four loads, the equivalent of 30-35 bales of material at a total weight of 50,000 lbs. (see Appendix C). Overall, the balance between what was received at the grocery stores from consumers and what was delivered for processing and auditing substantiates there was no material leakage, meaning material was not lost along the processing chain.

For this project, the audit process consisted of the following: When a shipment arrived, one to two bales were selected and a team of two to three people would manually pull the bale apart, grade the material based upon below criteria, and sort the material into designated bags. This process gave an accurate representation of the bale composition. Audit Data can be found in Appendix D.

The aforementioned auditing process was done specifically for this pilot. However, typically the auditors will weigh and then open the bale and visually inspect the material using the following criteria:

Grade	Description
Grade A	Clear LDPE (100%)
Grade B	Clear LDPE, Clear LDPE with some printing (Low composition <10%)
Grade C	Clear LDPE, Printed LDPE, Colored packaging (Low Composition <10%)
Grade D	Clear LDPE, Printed LDPE, Colored packaging (Low Composition >10%) + significant contaminants & garbage (>5%)

The Results

The first three audits included more clear film; the last audit included a significantly higher amount of colored film (post-consumer mix). The change in grade was due to an increase in volume spurred by public awareness messaging. While the increase in volume led to a lower grade, it did not change the value of the material in the end markets due to the larger volume. However, Merlin has provided a more granular level of detail for this by separating and weighing the material. The people auditing this material are well trained and have extensive experience grading and sorting.

The results over the four audits (see Appendix B) show the mixture of the material consisted of approximately 71% clear film, 23% colored film, and the balance ~6% was considered contaminated. In value, clear film for this pilot ranged from $0.10 to $0.15 per lb. and the colored material ranged from $0.01 to $0.05 cents per lb.

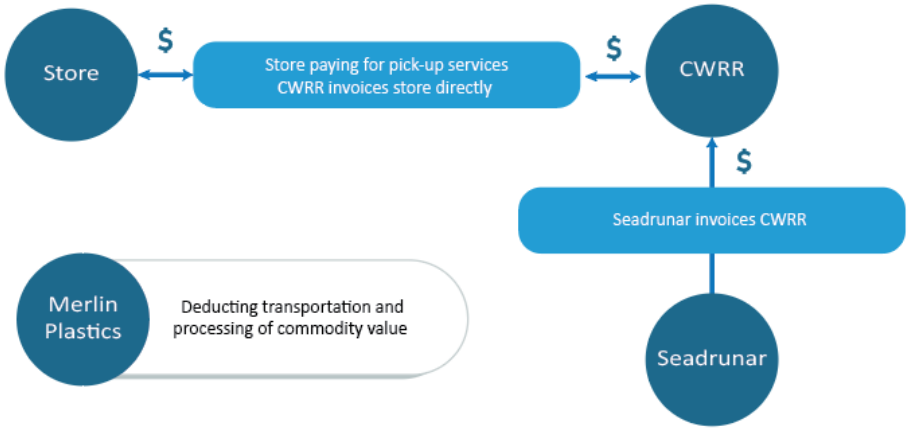
Clear film, Grade A and B, generally has greater access to end markets because it's clear and will not affect the base color of the material it's blended with. The resin can then end up in products such as plastic bags and sheets of plastic, such as building material and shrink wrap.

Color film, grade C and D, extrudes grey or black in color and can be used in products such as piping, drain tile, black garbage bags, and some blends for storage containers.

Throughout all the audits, the contamination levels within the samples were consistent with approximately 94% of the bale having useful plastic.

Value Chain

This diagram illustrates the revenue flow:



The initial direct logistics and setup costs for this pilot were approximately $0.43 per lb., which supported the comments that this program was very expensive. Factors that contributed to these costs include:

- An incorrect density assumption of the film. When the pilot was set up there was an assumption that a 50-gallon bag of film would weigh 35 lbs., when in fact the weight of a 50-gallon bag ranges from 4-5.5 lbs. or 5 lbs. on average (see Appendix C).
- The process of picking up loose bags and loading a front-end loader with the use of a corrato bin is labor-intensive and subsequently leads to higher costs.

If the density assumption had been correct, it would have reduced the up-front cost to $0.16 cents per lb. for the program and the number of tips per pickup (see Appendix F).

The system was designed to cover costs through the revenue earned from charging grocery stores a pickup fee and charging CWRR a baling fee. The processing/baling costs of $0.06 per lb. were billed to CWRR.

The transportation costs to the end recycler were $0.02 per lb. including transport, fuel, and border expenses. This cost component was absorbed by Merlin during the project.

Film Processing Overview

The most common method of processing film is shredding the bale immediately and running the material through the color stream. Automated sorting conveyor lines using optical sorters work well with the rigid materials. However, film tends to stick and wrap around the equipment while it's being conveyed. Although optical sorters will identify color, they use an air shot to redirect the material, which would be ineffective for film.

Manual sorting would work best; however, the cost and availability of labor is not cost effective for the return. In future systems, robotics coupled with Artificial Intelligence (AI) could help minimize labor costs. However, the volume of material would have to be significant to justify such an investment.

Management of Environmental Impacts

Return-It defined a third-party assurance process to confirm that material collected was recycled and to determine the percentage of material recycled vs. collected. This process also assessed the quality of material collected and provided an overview of significant contaminants that impeded the quality of collected material.

The material collected through the pilot was processed into types of resins/pellets, one that is clear and one that is grey/black. The clear resin has a higher value on the markets as it has a larger variety of end uses.

Conclusion and Recommendations

The steering committee should be retained to provide oversight to the program if it continues beyond the pilot phase. As a voluntary program, it will also be important to establish annual reporting standards or protocols within the program plan to ensure there is sufficient transparency regarding data collected and performance

measurement. The program plan should also consider implementing targets and program performance measures to demonstrate a commitment for this program to achieve results that are beyond compliance.

Additionally, the following changes to the program plan will aid in successful implementation:

- A centralized reporting system to hold data collected during the project.
- A local resource to interface with stakeholders and troubleshoot issues arising in real time.

Due to COVID-19 restrictions, Return-It was unable to visit store sites for the launch and initial program set-up which made it difficult to identify issues in a timely manner.

It was reported by the stores that 100% of the stores have baling capacity and 75% have some form of compaction. The primary use of this capacity is to bale or compact recyclables. Currently none of the end processors for the recyclables accept them in a comingled form. However, 75% of the stores were willing to work with the end processors to discuss receiving and processing film in a comingled form.

Therefore, Return-It recommends the following changes:

- Comingle plastic film with cardboard/paper recycling.
- Bale or compact at the grocery stores.

By comingling and baling or compacting, the density of the material shipped is increased, reducing the amounts of visits required to pick up the material.

An additional recommendation is that the back-of-store material can be separated to ensure ”A” quality material. This assumes that most of the film in the front of the store, delivered by customers, will be colored and/or mixed stream film and most of the film collected through store operations, such as overwrap and/or shrink wrap from pallets, will be clear.

It may not be reasonable to expect customers to sort their plastic film and it may not be cost effective to educate the public to sort the material. Additionally, customer sorting would require multiple bins, which would take up additional space and resources at the store front. However, sorting material collected through store operations can be included within employee duties.

A more efficient approach of comingling, compacting, and separating at the stores would significantly reduce the costs for this program [1] (see Appendix I). Additionally, all partners would have fewer process activities to complete if the proposed changes were implemented (see Appendix E). The proposed recommendations meet the test of reasonability to ensure they are relatively easy to implement at the store level, which will ensure a successful long-term film collection program.

[1] ***During this pilot (Jan - May 2022) the costs for collecting mixed film using a Corrato Bin were $0.43 per lb. per store. Using the more efficient recommend approach would have reduced the costs to $0.06 to $0.12 per lb. per store).***

Appendix A Consultation and Program Feedback

Retailers' Consultation Session

A consultation session was held with the participating retailers to gauge program feedback. Return-It compiled feedback on the following topics:

- Collection
- In-store materials
- Marketing materials and implementation
- Associated costs

Marketime Foods

Collection (Customer/Staff feedback and store pick ups)

- Customers wondering if additional materials would be accepted; Styrofoam was brought up frequently .
- More labor from the employees instead of the drivers as employees had to meet driver for pickup and load the material into the truck.

In-Store Materials (bins, posters, placement, functionality)

- A+ on everything. Quite easy to distinguish it was not a garbage can. Large enough to not need to constantly change. Durable.
- “You can be clear as you want to be [on the posters], and they will still have questions and not read the words.”
- What was sent worked perfectly.

Marketing Materials and Implementation

There was a toolkit sent out with informational marketing pieces that could be used for downloading. How useful was this?

- I did not use it; I did not have a specific use for it.
- I forwarded the stuff to the marketing people.
- We got a lot of good word of mouth and marketing support from the King County social media campaign.

Associated Costs

- I love the program, but the cost is an issue for me. It is more than the organics and garbage costs.

Town and County Market

Collection (Customer/Staff feedback and store picks ups)

- Employee feedback: “*Why are we out there in the pouring rain putting bales of plastic, when the driver could do it themselves?”*
- The driver pulls up and has a dump bin and the staff must put the bags into the bin. When the bin is emptied, the staff must refill the bin with bags.
- The drivers are able to pull up right to where the bags are, so it is not a matter of having to get the bags from a different location.
- It is an issue when a load is missed, as not all locations have the room to accumulate the plastic collected.
- Received positive feedback from local business, which it as an avenue to take their soft plastic.

- Received positive feedback in the broadening of what type of soft plastic is accepted.

In-Store Materials (bins, posters, placement, functionality)

- Kept using their existing bins.
- Location is key, placed at the front end but away from the garbage bins. Intentionally placed this way so customers must actively look for the soft plastic bin, and not confuse it with garbage.
- Easy for staff to change/replace bags.

Marketing Materials and Implementation

There was a tool kit sent out with informational marketing pieces that could be used for downloading. How useful was this?

- The recycling of plastic was already a program, so I did not use anything in there.

Associated Costs

- We stand for what the pilot stands on behalf of, but it is at a cost, and it is at our cost as a business. We have been recycling soft plastic and been using Return-It before this plastic pilot. But what has happened is our cost has gone up. We need to explore different options for our business, from a financial point.
- Suggestion: Have a maximum on how much they could tip. For example, if the maximum were 5, but they picked up 7, they would only get charged for 5.

Collection and Processor Partner Consultation

Seadrunar

- Material coming through the program is not “A-grade” film.
- Plastic film markets are volatile, at times the product is worth money, at other times, it costs to get rid of the product.
- The current operational model implemented during the pilot did not cover the costs of processing the material but there is room to create efficiencies that can then cover the costs.

CWRR

- Stores need to have employees and material ready to tip material into truck.

Merlin Plastics

- High-grade[2] the material as much as possible.
- Increase volume to create efficiencies.

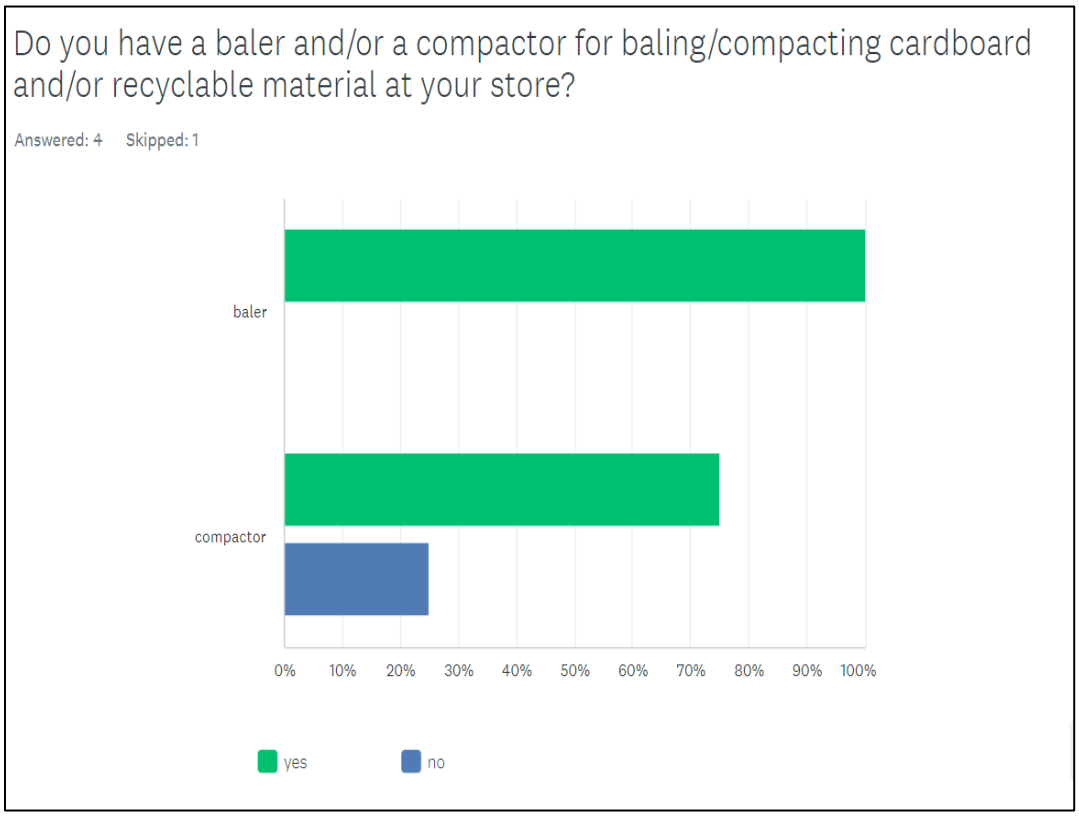
[2] High-grading refers to mixing the material with high quality film, such as clear shrink wrap, to increase the value of the material

Retailers Survey

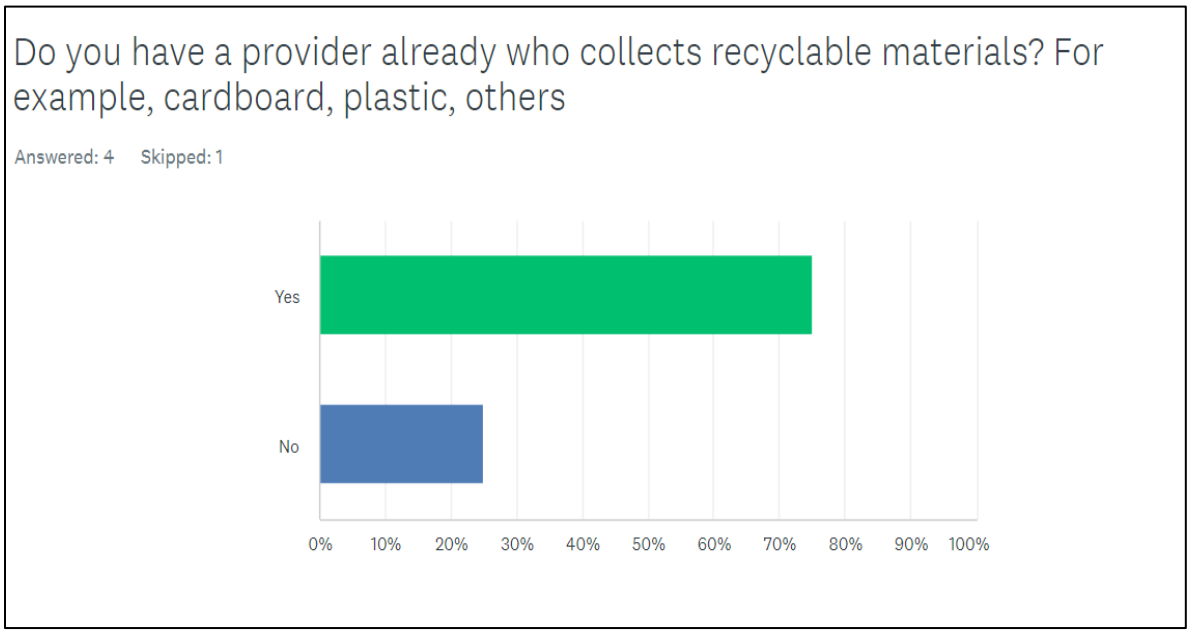
A survey was conducted to better understand each retailer's collection process to determine the possibility of adjusting the in-store collection and transportation process that would build in efficiencies and reduce cost to the collection program. The results would be used to define possible next steps in developing a continuation of the pilot or a permanent program.

The survey was sent to all participant and responses were gathered from:

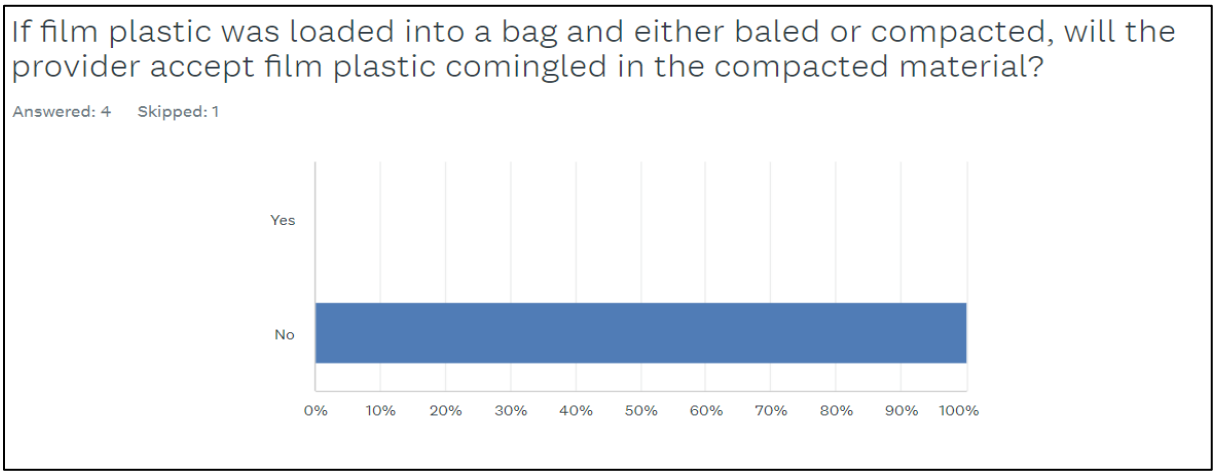
- Town and Country
- Marketime Foods
- Madrona Grocery Outlet
- PCC Community Markets



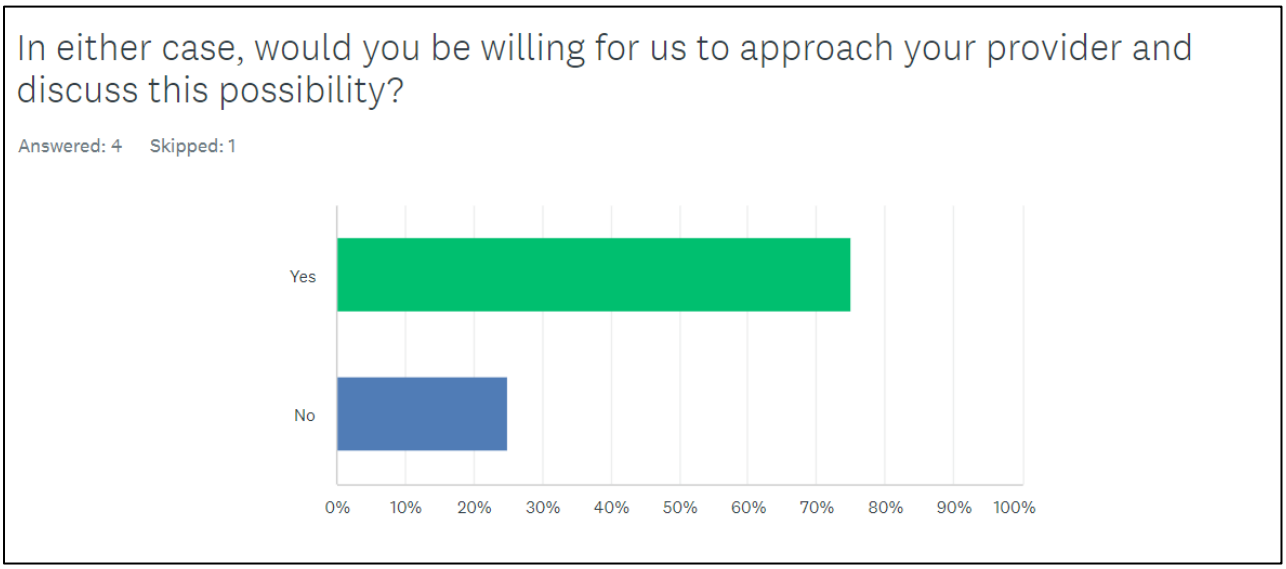
- 100% of the respondents currently count with a baler for cardboard and/or recyclable material.
- 75% of the respondents count with a compactor for cardboard and/or recyclable material.
    - Marketime Foods does not have a compactor on site.



- All the respondents except for Marketime Foods already have a provider who collects materials.



- All the respondents with a provider to collect materials reported that the provider does not accept plastic film comingled in the compacted material.

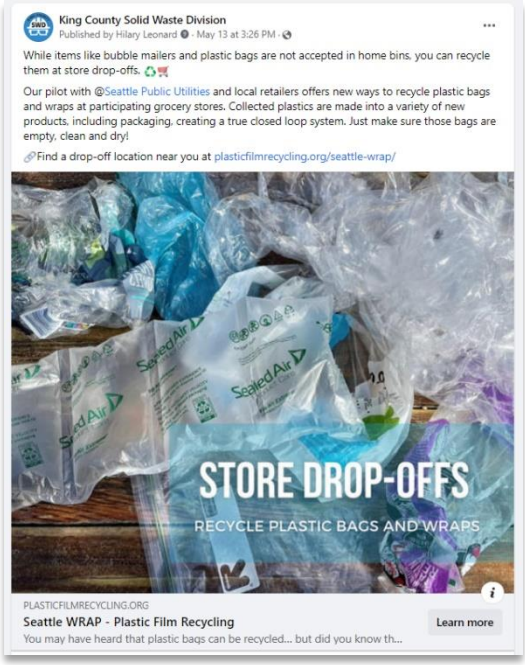


- All the respondents with a provider to collect materials were open to Return-It approaching the provider to discuss the possibility.
- The following questions were also asked within the survey, but no answers were received:
    - What happens to the recyclable material on site?
    - Possibility of installing a permanent compactor or baler.
    - Other comments/feedback.

Appendix B – Social Media Post Results

Facebook Paid Campaign

Budget: $800
Active Dates: May 13-31, 2022



Results

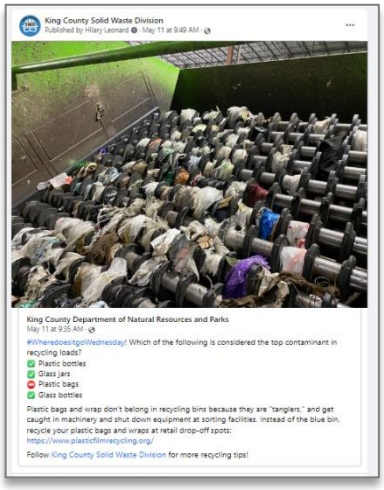
- 184,773 post impressions with a reach of 78,992 people living in King County, ages 18-65+
- Total post engagement of 21,520 with 6513 link clicks
- The post was shared 233 times with 154 post saves
- The overall sentiment of the comments was positive. Top insights include:
  - Many commenters expressed gratitude that there is a recycling option for these materials and hope for a successful pilot.
  - Ridewell[3] was suggested as an option 11 times
  - The non-CTA link provided in the post text did not work for many users. For each of these comments we responded with a clickable link.
  - Several commenters were interested to see Amazon take a more active role in recycling.
  - Several comments misunderstood the Covid pop-up on the *bagandfilmrecycling.org* page to mean no site collections are currently active.

[3] Ridewell is a start-up offering subscription-based recycling services to customers.

Organic Facebook Posts

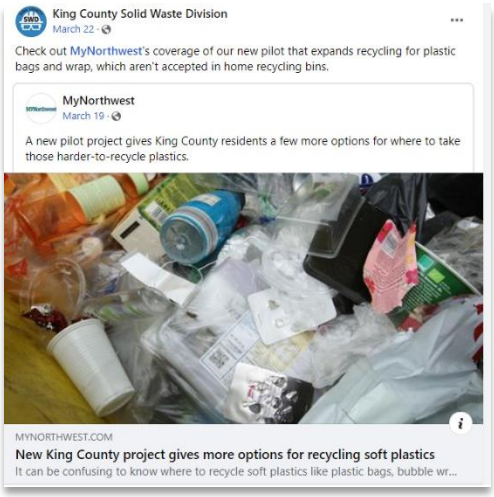
Date: May 20, 2022
Results: 303 impressions with a reach of 286 people

Date: May 11, 2022
Results: 246 impressions with a reach of 228 people



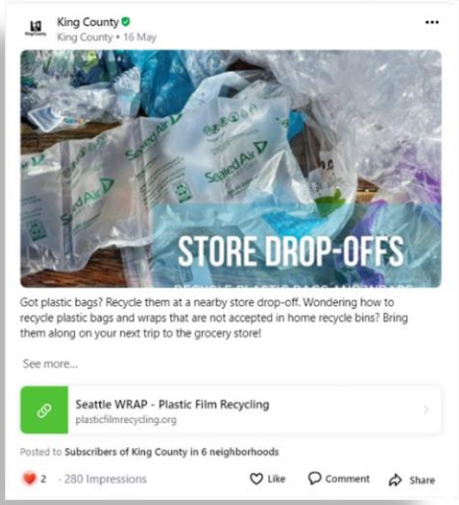
Date: March 24, 2022
Results: 623 impressions with a reach of 548 people

Date: March 19, 2022
Results: 169 impressions with a reach of 161 people



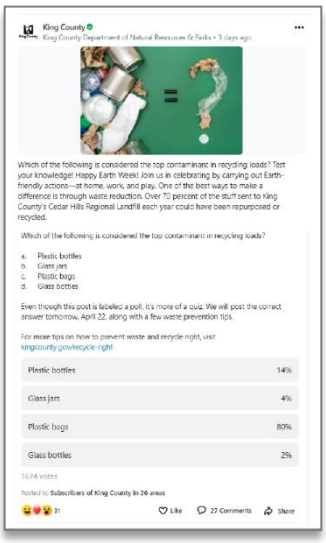
Date: March 18, 2022
Results: 1,644 impressions with a reach of 1,478 people

Nextdoor Posts



Date: May 16, 2022
Results: 653 impressions

Date: April 21-22, 2022
Results: 1647 votes with 29288 impressions



Twitter

Date: May11, 2022
Results: 193 impressions with three engagements

Date: April 20, 2022
Results: 355 impressions with eight engagements

Date: April 20, 2022
Results: 208 impressions with seven engagements

Date: March 24, 2022
Results: 985 impressions with 42 engagements

Date: March 23, 2022
Results: 209 impressions with eight engagements

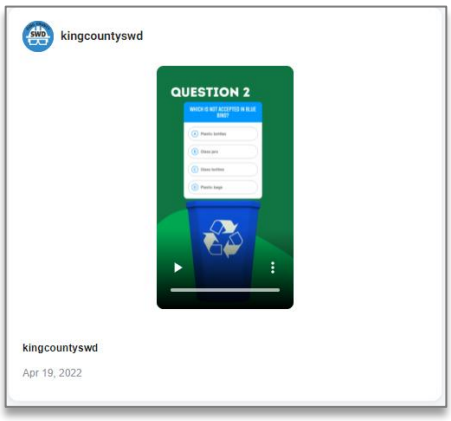
Date: March 21, 2022
Results: 1,663 impressions with 353 engagements

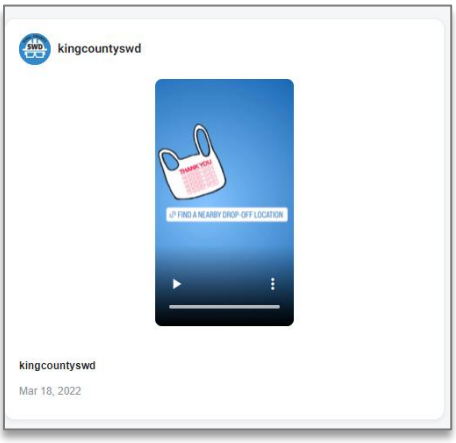
Date: March 18, 2022
Results: 2,054 impressions with 137 engagements

Instagram

Date: May 20, 2022
Results: 177 impressions with 161 accounts reached

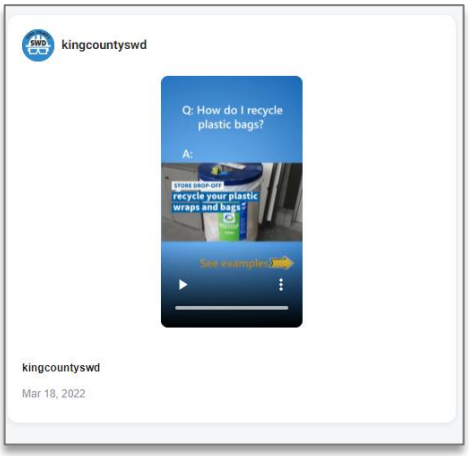
Date: April 19, 2022
Story views: 54





Date: March 18, 2022
Story views: 45

Date: March 18, 2022
Story views: 62



Date: March 18, 2022
Results: 206 impressions with 194 accounts reached

Appendix C – Summary of Data (Material Received)

Summary of Material collected by CWRR is outlined in the below table:

	Number of stores	Number of pickups	Total Weight	Weight Per Pickup	Number of Bags Per Month	Number of Bags Per pickup	Tips Per Month
January	6	16	6,100	381.25	1,220.00	76.25	81.33
February	6	18	8,200	455.56	1,640.00	91.11	109.33
March	9	28	8,920	318.57	1,784.00	63.71	118.93
April	9	23	11,280	490.43	2,256.00	98.09	150.40
May	9	28	10,380	370.71	2,076.00	74.14	138.40
Total		**113**	**44,880**	**397.17**	**8,976.00**	**79.43**	**598.40**

Summary of Material received at Merlin is outlined below:

Comparison	Number of stores	Weight of Audit (lbs)
January	6[4]	
February	6	6,063
March	9	9,348
April	9	19,692
May	9	14,780.35
Total		**49,883.35**

There is more material received at Merlin than is being reported as collected. There is no material being lost in the process, however, this does illustrate the difficulty in data collection, resulting from the way the project was set up, as the reporting and business processes were not set up properly.

The probable reason for the variance is under reporting or a missed pickup from CWRR.

The experience of CWRR was that the average weight of film plastic in the past has been 35 lbs. in a 50-gallon container. Our experience is that this would be the weight of a 50-gallon bin of household garbage.

[4] There were no audits completed in January

Return-It sampled 50 gallon-full bags of film and the weight ranges from 4 to 5.5 lbs. or 5 lbs. per bag on average.

Assumptions of the Initial Setup	
Average weight of plastic bags (lbs.)	35.00
Number of plastic bags in a 4-yard bucket (bags)	15.00
Total weight in a 4-yard bucket (lbs.)	525.00
Average weight of plastic bags (lbs.)	5.00
Number of plastic bags in a 4-yard bucket (bags)	15.00
Total weight in a 4-yard bucket (lbs.)	75.00

	Assumed / Planned	Actual
Bag weight (lbs.)	35.00	5
Total weight picked up (Between January and May)	44,880.00	44,880.00
Total number of pickups (First Tips)	113.00	113.00
Number of additional tips	-	485.40
Number of bags per bin	15.00	15.00
Total weight per bin	525.00	75.00
Total number of tips	85.49	598.40
Rate for pickup	65.00	65.00
Rate for additional tips	25.00	25.00
Revenue collected for pickup	7,345.00	19,480.00
Rate per lb.	0.16	0.43
Average price per pickup	65.00	172.39
Pickup cost 75%	48.75	129.29
Total direct costs	5,508.75	14,610.00
Cost per lb.	0.12	0.33

Due to the bag weight discrepancy that occurred in this pilot, this table illustrates that while the stores were expecting to pay $65 per pickup, they actually paid $170, which is an average of three times more than expected for the pickup.

Pricing calculation for processing and transportation

Seadrunar Processing Rates	
Rate per U.S. ton (USD)	$ 120.00
Lbs. per U.S. ton	2,000.00
Rate er lb. (USD)	$ 0.06

Transport Rates (Merlin Plastics)	
Northbound legs (CAD)	$ 1,000.00
Converted to USD	$ 760.00
Average load (lbs.)	38,000
Rate per lb.	$ 0.020

Units of Measure	
Metric ton (lbs.)	2,204.62
U.S. ton	2,000.00

Appendix D – Audit Result

This section calculates the results of the four audits that were done at the Merlin Plastic Delta BC (British Columbia) facility.

Audit Date: February 22, 2022

	Weight (kgs)	Weight (lbs)	Percent
LDPE CLEAR	2102.38	4,634.94	76.45%
LDPE CLEAR WITH PRINT	143.83	317.08	5.23%
LDPE MIXED	60.50	133.38	2.20%
LDPE MIXED GROCERY	278.85	614.76	10.14%
Contaminants		-	
Laminates	30.53	67.30	1.11%
Mixed rigid plastics	0.00	-	0.00%
Paper	0.00	-	0.00%
OCC	0.00	-	0.00%
Garbage	73.15	161.27	2.66%
Organics	60.78	133.99	2.21%
UBC (Used Beverage Containers)	0.00	-	0.00%
Food grade aluminum	0.00	-	0.00%
Metal	0.00	-	0.00%
Total Weight	**2750.00**	**6062.71**	**100.00%**

Type	Percentage
Film	94.02 %
Contaminants	5.98 %

Audit Date: March 15, 2022

	Weight (kgs)	Weight (lbs)	Percent
LDPE CLEAR	3326.28	7,333.18	78.45%
LDPE CLEAR WITH PRINT	190.80	420.64	4.50%
LDPE MIXED	60.63	133.67	1.43%
LDPE MIXED GROCERY	413.40	911.39	9.75%
Contaminants			
Laminates	74.20	163.58	1.75%
Mixed rigid plastics	0.00	-	0.00%

Paper	0.00	-	0.00%
OCC	0.00	-	0.00%
Garbage	106.00	233.69	2.50%
Organics	68.69	151.43	1.62%
UBC (Used Beverage Containers)	0.00	-	0.00%
Food grade aluminum	0.00	-	0.00%
Metal	0.00	-	0.00%
Total Weight	**4240**	**9,347.59**	**100.00%**

Type	Percentage
Film	94.13 %
Contaminants	5.87 %

Audit Date: May 22, 2022

	Weight (kgs)	Weight (Lbs)	Percent
LDPE CLEAR	6,684.71	14,737.25	74.84%
LDPE CLEAR WITH PRINT	468.93	1,033.81	5.25%
LDPE MIXED	320.66	706.93	3.59%
LDPE MIXED GROCERY	781.55	1,723.02	8.75%
Contaminants		-	
Laminates	167.92	370.20	1.88%
Mixed rigid plastics	-	-	0.00%
Paper	-	-	0.00%
OCC	-	-	0.00%
Garbage	290.29	639.98	3.25%
Organics	217.94	480.47	2.44%
UBC	-	-	0.00%
Food grade aluminum	-	-	0.00%
Metal	-	-	0.00%
Total Weight	**8,932.00**	**19,691.67**	**100.00%**

Type	Percentage
Film	92.43 %
Contaminants	7.57 %

Audit Date: July 22, 2022

	Weight (kgs)	Weight (lbs.)	Percent
LDPE CLEAR	4,188.01	8,711.07	58.94%
LDPE CLEAR WITH PRINT	1,155.13	2,402.66	16.26%
LDPE MIXED	766.43	1,594.18	10.79%
LDPE MIXED GROCERY	684.32	1,423.38	9.63%
Contaminants			
Laminates	125.91	261.90	1.77%
Mixed rigid plastics	21.90	45.55	0.31%
Paper	-	-	0.00%
OCC	10.95	22.77	0.15%
Garbage	153.29	318.84	2.16%
Organics	-	-	0.00%
UBC	-	-	0.00%
Food grade aluminum	-	-	0.00%
Metal	-	-	0.00%
Total Wt	**6,694.00**	**14,780.35**	**100.00%**

Type	Percentage
Film	95.62 %
Contaminants	4.38 %

Over the four shipments the cumulative results were:

	Weight (kgs)	Weight (lbs.)	Percent
LDPE CLEAR	16,301.38	35,416.44	71.00%
LDPE CLEAR WITH PRINT	1,958.68	4,174.19	8.37%
LDPE MIXED	1,208.23	2,568.17	5.15%
LDPE MIXED GROCERY	2,158.12	4,672.55	9.37%
Contaminants	-	-	0.00%
Laminates	398.56	862.98	1.73%
Mixed rigid plastics	21.90	45.55	0.09%
Paper	-	-	0.00%
OCC	10.95	22.77	0.05%
Garbage	622.73	1,353.77	2.71%
Organics	347.40	765.89	1.54%
UBC	-	-	0.00%
Food grade aluminum	-	-	0.00%
Metal	-	-	0.00%
	-	-	0.00%
Total Wt	**23,027.94**	**49,882.31**	**100.00%**

Appendix E – Process Activities

The activities completed by each partner within the operations process are outlined in this section. In total there are 31 separate main activities that take place to facilitate a shipment of film. Within each activity there may be repeating activities or cycles, such as emptying the store front containers when they are full.

- Within the store at the front of the shop there are three distinct activities that a store attendant will be responsible for.
- Once the material is in its designated shipping area between the store staff and the hauler, there are seven activities.
- Once the material is delivered to Seadrunar there are 10 activities.
- At Merlin there are 11 activities to finalize and finish the process.

If the recommendation can cut down the number of steps, cycles, or clearly streamline a process then it would be deemed to provide a benefit.

- Applying a reasonableness test.
    - This applies common sense to the recommendation in the respect that effort may be applied but is there a true expectation, or supporting evidence, that the change will make the desired outcome.

Storefront

1. Customer/store employees place a bag for collecting consumer household PE film in a designated receptacle.
2. When the receptacle is full the staff will remove a full bag and replace receptacles with an empty bag.
3. The staff member will take the full bag to the designated area.

Designated storage area

1. Full bags are accumulated for pickup.
2. Pickup is scheduled either on a schedule at set intervals or by email/ phone communications.
3. CWRR will drive to initial pickup and arrive at designated pickup location.
4. Driver will go out of the truck and will load the corrato bin (4 yards) with approximately 15 bags *(removed when compactor utilized).*
5. Load the container into the “compactor and storage area” for the truck (680 bags per store over three months) *(removed when compactor utilized).*
6. Continually reload and empty the area until the plastic has been loaded into the truck *(removed when compactor utilized).*
7. Fill out and leave the required paperwork with the store referencing the pickup.
8. Drive to either the next store location or to Seadrunar.

Seadrunar

1. Proceed to tipping floor and empty the truck at Seadrunar.
2. Empty truck will proceed to the scale and an empty weight is taken to provide the weight of the material delivered.
3. Empty container will be taken back to store *(added when compactor is utilized).*
4. Seadrunar will accumulate the material.

5. Seadrunar load it into a hopper or conveyor system to bale the material.
6. Once enough material has been added to complete bale.
7. Wire is inserted around the bale in the baler to secure the bale.
8. Transport the bale to an area for storage.
9. Store the bales for pickup and transport north.
10. Notify Merlin that a volume of material has been collected.

Merlin Plastics

1. Merlin will coordinate the pickup which includes required customs clearance.
2. Seadrunar will load the northbound truck for delivery.
3. At Merlin the load is unloaded.
4. Merlin will scale each bale to identify total load weight accurately.
5. Randomly one to two bales are selected during the unloading and scaling process for audit.
6. Selected bales are transported to the audit area.
7. 2 to 3 people spend time pulling categorizing the material (4–5-hour process).
8. Balance of the bales are transported to the line.
9. At the line, the bales are broken apart and processed.
10. Audited bales are broken apart and the plastic is graded and sorted.
11. After the audit is complete the material is transported back to the line for automatic baling and sorting.

Appendix F – Cost Calculations

NOTE: The costs in this section are reflective of the pilot period in (January- May 2022) and are for reference only.

Logistics Method	Single Stream (Color + Clear Plastic)	Mixed	High Grading
Initial method – corrato bin	$ (0.43)	$	(0.38)
Use a dedicated compactor 40-yard bin film by itself	$ (0.38)	$	(0.32)
Comingle film in bags with cardboard and have a MRF separate it out	$ (0.12)	$	(0.06)

Calculation of the current methodology (baseline calculation) with no logistics changes

Summary Table - Expected Costing Based on Actual (USD)				
Based on lift amount of		75		
	Actual	High Grading	Ratio	Rates per lb.
Revenue rate per lb. (collecting from the stores)	$ 0.434	$ 0.434		
Commodity value of material (Provided by Merlin)	$ 0.01			
Clear Plastic		$ 0.071	71%	$ 0.10
Colored Plastic		$ 0.002	23%	$ 0.01
Contaminants				$ -
Total Revenue	$ 0.44	$ 0.507		
Assumed pickup revenue to CWRR	$ 0.43	$ 0.43		
Processing cost (120 per ton) - Current should come out of CWRR Revenue	$ 0.06	$ 0.06		
Transportation costs to Merlin	$ 0.02	$ 0.02		
Merlin's processing costs (Delivered to the door				
Total Expenses	$ 0.454	$ 0.454		
Contribution (Revenue-Expenses)	$ (0.010)	$ 0.053		

Total Payout to Support Program (Per lb. basis)	.	
Program Cost (Total paid out by grocery store)	$ 0.434	$ 0.434
Program Cost (Factoring in commodity return)	$ 0.444	$ 0.381

Revenue Flow for the Project

- Retail Store – paying CWRR for the pickup services
- CWRR - invoice retail store directly
- Seadrunar - invoice CWRR
- Merlin covered the incremental expense for this project

Calculation for average volume per weight per store

Total Weight Collected (3 Months) (March, April, May)	30,580.00
Number of Stores	9.00
Number of Months	3.00
Collection Weight per store per month	1,132.59

Data for dedicated film compactor

Compactor Expenses (Monthly)	300.00
Capacity of Compactor (film) (lbs.)	2,000.00
Rate to empty	100.00

Calculation for dedicated film compactor

Calculation for Baler Expense		
Number of Months to empty the baler		2
Number of Hauls (1.5 hauls over the 3 months at 9 stores)		13.50
Total weight projected over 3-month period		30,580.00
Total Baler expense all stores (Per Month)	$	2,700.00
Total Baler Expense over 3 Months	$	8,100.00
Transport of Compacted containers	$	1,350.00
Total Expense dedicated baler	$	9,450.00
Expense per lb.	$	0.31

	Quantity	Actual Revenue / Expenses	High Grading Revenue / Expenses
Commodity Value of material (Provided by Merlin) (Weight)	30,580.00		
Rate Mixed	$0.01	305.80	
Clear Plastic (Rate)	$0.10		2,171.18
Colored Plastic (Rate)	$0.01		69.98
Contaminants			
Total Revenue		$305.80	$2,241.16
Revenue per lb.		$0.01	$0.073
Baler Rental and pickups		$0.31	$0.31
Processing Costs Seadrunar		$0.06	$0.06
Transportation Costs to Merlin		$0.02	$0.02
Merlin's Processing Costs (Delivered to the door			

Total Expenses / Costs		$0.39	$0.39
Theoretical Contribution per lb.			
Merlin is assuming the transportation expenses			
System Net after Transportation and Commodity		$(0.38)	$(0.32)

This above table shows the costs to the system during the pilot if dedicated compactors for film were used. If the material was completely high-grade, the cost would have been $0.38 per lb. per store; for partially high-grade material, the cost would have been $0.06 to $0.12 per lb per store.

Calculation for a comingle baler with cardboard

Comingle load with Carboard		
Compactor Expenses (monthly)	$	300.00
Capacity of Compactor Cardboard (lbs.)		3,500.00
Rate to empty	$	100.00

Monthly volume of Film at each store	
Total weight Collected (3 months)	30,580.00
Number of Stores	9.00
Number of Months	3.00
Collection Weight per store per month (lb.)	1,132.59

Baler Expense with Cardboard		
Total Expense bailer	$	8,100.00
Number of pickups: Assumption is one pickup per week per container (One compactor container per store)		108.00
Pickup Expense (3 Months)	$	10,800.00
Total Expense for Baler Rental & Transport 3 Months	$	18,900.00
Expense Prorated for the Commodity Per Pickup		
Cardboard (lb.)	$	3,200.00
Film		283.15
Total	$	3,483.15

Over 3 Month period amount of cost allocated to baler expense for Film		
Total Expense By the Weight allocation	$	1,536.40
Expense on a per lb. basis	$	0.05

Baler Expenses Over the 3 Month Period					
	Lbs.	Actual	High Grading		Rate per Lb. Collected
Mixed Volume		Revenue / Expenses	Revenue / Expenses		
Clear Volume	21,711.80		$ 0.10	$ 2,171.18	$ 0.071
Color Volume	6,997.83	0.01	$ 0.01	$ 69.98	$ 0.002
Contaminant	1,870.37				
Total Volume / (Mixed)	30,580.00	$ 287.10	$ 2,241.16	$ 2,241.16	$ 0.073
Revenue Per Lb.		$ 0.009	$ 0.07		
Baler Rental and pickups		$ 0.05	$ 0.05	$ 1,536.40	
Processing Costs Seadrunar		$ 0.06	$ 0.06		$ 0.06
Transportation Costs to Merlin		$ 0.02	$ 0.02		$ 0.02
Total Expenses / Costs		$ 0.13	$ 0.13		$ 0.08
System Net after Transportation and Commodity		(0.12)	(0.06)		

This table shows what the costs to the system would have been for this pilot using a comingled compactor for film and cardboard; if the material was completely high-grade, the cost would have been $0.12 per lb.; if the material was partially high-grade, the costs would have been $0.06 per lb.

Appendix G – Balers/Compactors

Examples of balers and compactors that are available at various price points and size specifications that would be suitable for use based on the recommendations outlined within this report.

From our findings, compactors are recommended over balers as compactors generally require less maintenance and labor, and the material that is compacted rather than baled is easier to sort at the processing facility.

Balers

Compactors

Appendix H – Retail Collection Operational Plan

Acceptable Items – The program will focus on polyethylene (PE) film products and packaging including plastic bags, overwrap and other film products or packaging.

Consumer Accessible Collection Bins – Transparent collection bins for customer drop-off will be provided to retail participants and should be placed in a prominent location near the front entrance area of the store. The bins will include customer information and instruction to encourage collection of a clean stream of material.

Store staff will be required to check the collection bins on a regular basis and remove the film collected to ensure customers always have room to deposit the acceptable film they are returning for recycling. It is advised to line the collection bin with a transparent plastic collection bag. This will provide staff with an easy way to tie the bag, remove it from the bin and move the collected material to the storage area ready for pick-up.

Pick-Up Scheduling – The program collection agent or hauler--Commercial Waste Reduction and Recycling (CWRR)--will initially contact each retail participant to develop and review a suitable pick-up schedule, instructions, and staffing requirements.

Once a pick-up schedule has been agreed upon, general procedures will include:

1. CWRR will call each store when they arrive at the location (contact information required).
2. Staff will load all acceptable film collected into the larger bin (4-yard container) provided to their store by CWRR. Any unacceptable products or garbage will not be picked up.
3. CWRR will ensure they collect all film from the location, provide clean 4-yard collection bins (as described above) and leave a copy of the Movement Authorization form (MA) with the store staff indicating the number of bins collected on each visit.

Associated Costs – Participating retailers in this pilot were responsible for the collection costs of the acceptable material. CWRR invoiced each store directly based on the agreed upon pick-up schedule developed.

- For each pick-up the initial cost for the first bin was: $65.15
- The cost for each additional bin within the pick-up was: $32.00

Retailers were informed that the costs could vary slightly as they were dependent on the location. Any additional costs were the result of local city taxes, ferry fares, or other fees.

Appendix I – Detailed Analysis of Recommendations

Based on this study, recommendations were developed for improved operational oversight, program furtherance, and ways to lower the variable costs (operational adjustments) for the stakeholders in these specific areas. The recommendations include the following:

Project Oversight

A consistent centralized system for data collection and financial control (additional costing).

This was the more difficult component of the project because data was communicated through email and Excel spreadsheet. This left extremely limited ability to validate, cross check and even retrieve data. To a certain degree, the secondary asset to a program is the data collected.

Due to Covid-19 restrictions, Return-It was unable to visit stores and other pilot partners in person, which made it difficult to identify issues, drive improvements and implement costs control. It is recommended that there be a dedicated individual directly managing the project, who would spend time gathering information and interfacing with the various stakeholders and solving problems.

More central to this report were operational adjustments that should be considered:

- High grading the material
- Logistic process improvement

The compactor analysis assumes that the stores are using a full sized 40-yard compactor and comparing:

- High grading the material with the same current process.

Then the report looks at:

- A dedicated baler with single (mixed) stream and high graded (separated) stream; and
- If the grocery store comingles it with the existing programs such as cardboard, or another high value recycling stream.

This table is a summary of the data analysis from Appendix D

Logistics Method	Single Stream (Color Mixed + Clear Plastic)	High Grading
Initial Method - Corrato Bin	$ (0.434)	$ (0.38)
Use a dedicated compactor 40 Yard bin film by itself	$ (0.38)	$ (0.32)
Comingle film in bags with cardboard and have a MRF[5] separate it out	$ (0.12)	$ (0.06)

[5] MRF is a processing facility that sorts and bales material for eventual end-market processing.

Initial Method

Based on product mix and the overall results, 71% of the plastic film collected during the pilot was clear and 23% was colored film.

The opportunity would be to separate a colored stream from the clear stream based on the significant variance in the commodity value.

The idea would be to set up a bin system that would accept the film in clear and colored/printed formats with separate bags for each. NOTE: If there is any coloration or printing on the bags, the plastic will turn grey or black during the process of converting it into resin. The resultant resin would be the recyclable format/end-product to be recycled.

Conclusion

When this option was considered separately, the data showed:

a. The retailers would have spent $0.06 to $0.08 per lb. less high grading film during the pilot period. However, they needed to have spent significantly less than $0.06 cents per lb. in the effort to realize the benefit.
    i. The costs would need to contribute to educating the public and providing space and supervision in the front of the stores for an additional receptacle.
    ii. During the pilot, the average store collected 1,100 lbs. of plastic per month; if there was an allowance of $0.05 per lb. per month, the store would reasonably have a maximum of $55 per store per month to cover advertising, additional real estate for the bins and any staff supervision.
b. It also would have been necessary to increase the required activities as resources and space would be needed to manage the program.
c. Therefore, it would be unreasonable to collect separate streams of film at the front end of the store.
    i. The one opportunity that presented itself, if you accept the assumption that most of the film in the back of the store is clear, is to create a separate clear bag and bin collection system in the back of the house. Then the front of the store collection bins could be reserved for post-consumer colored bags and film only.

After collection at the public receptacle, the process is for the material to remain bagged and accumulated in a designated location and stage it until the scheduled pickup. The issues consist of the real estate being consumed for storage and the temporary use of labor to store and manage the accumulating inventory.

Figure 3: Picture showing a pickup at a store, bags of plastic film, and a corrato bin.

There are a couple of readily available options: either compacting or baling. Our recommendation is to compact the film rather than bale it unless the store is already operating a baler.

However, for both pieces of equipment, it is unnecessary to debag the material as it will remain intact during compaction. Once the bale or the compacted material is decompressed, the bags are easily pulled out.

Balers require labor, a space to store the material while enough material accumulates to build the bale, and wire to hold the bale together.

Regarding maintenance, balers are high pressure and a highly maintained item. If it's not serviceable and needs repair, the baler just occupies space.

In conclusion:

A. The reality is that the average number of lbs. per month of film each store generated through the pilot program was about 1,000 to 1,500 lbs. and this would make one bale of plastic per month. From a data perspective, depending on the baler type, the store would need to accumulate a large number of bags to build bales. If the baler is dedicated to film only, then the film can cumulatively be filled in the baler until a bale can be produced.
B. There will be an increase in responsibilities over the current situation, and any baling is very hands-on and requires a specific skill set to properly operate this equipment.
C. Therefore, this option would be unreasonable, unless a baler was already in operation.

Key Recommendation

An in-store compactor is standalone and presents the best scenario from a costing perspective. Compactors don't require supervision (with exception of any OSHA requirements), and it can accumulate inventory internally.

Compactors come in many shapes and sizes (see Appendix E) and can fit into various situations from a loading dock style to a smaller unit fitting in a smaller space. For this analysis, we used a dock-loading compactor loading a 40-yard sealed container.

These units are compacting three to four times because the compression is only designed to push volume and empty air pockets. When the container is emptied, the material is loose and easy to separate. Typically, a 40-yard container can hold 8-9,000 lbs. of garbage. However, a full load of cardboard will be 3,500 lbs. and a full load of film will compact to an average weight of 2,000 lbs.

There are two options for compacting material:

- A dedicated compactor for film.
- A common compactor that will comingle film with other recyclable commodities, i.e. cardboard.

A dedicated compactor for film requires individual analysis based on the location. On average during the pilot every store accumulated 1,100 lbs. of material, and a film-only baler would hold 2,000-3,000 lbs. of film. On average a store would have to accumulate two to three months of inventory before shipping. In this case it would be advisable to look for a smaller unit which could hold 2- 500 lbs. of film to allow weekly/biweekly pickup of film. This would change the business case calculation for the film. However, based on an analysis from the pilot period, the retailer would have spent $0.32 to $0.38 per lb. and no additional labor would be required at the front of the store. *NOTE: Future costs would need to be reviewed and assessed to be applicable to current conditions in the marketplace*. There would be a reduction of real estate and associated labor used because bags are stored in a sealed designated storage container. There would also be a reduction in activities and work cycles. However, the process requires the redelivery of an empty 40-yard container back to the store.

Conclusion

Employing a common compactor is a realistic solution for collecting post-consumer film from small format stores. It's feasible to implement based on the combination of contributing factors, it relies on existing technology, and it's used quite commonly with other commodities and similar operations.

A common compactor that will comingle film with other recyclable commodities is a preferable option because most stores already have a built-in compactor for cardboard. They generally have an established relationship with a current hauler and taking bagged film with the cardboard and separating the bags is a normal practice. If the hauler has difficulty with that process, there are others that will accommodate.

That said, the retailers would have spent an estimated $0.06 to $0.12 per lb. during the pilot period because, in this example, the compactor expense and processing expenses are shared equally between all commodities within 40-yard bin. Return-It would recommend a smaller compactor unit with the capacity to hold up to 500 lbs. of plastic film, if the store does not already have an existing one.