CalRecycle

California Department of Resources Recycling and Recovery

2021 Handling Fee Final Report

Crowe *Produced under contract by Crowe, LLP*

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Acknowledgments

The CalRecycle Cost Survey requires a high degree of communication and collaboration by all involved. Crowe LLP thanks CalRecycle management and staff for their support throughout the entire project. In addition, Crowe acknowledges and appreciates the cooperation and time commitment of the many recycling centers that were selected to participate in the processing fee cost survey.

Executive Summary

The processing fee and handling fee cost surveys were performed under contract by Crowe LLP (Crowe) for the California Department of Resources Recycling and Recovery (CalRecycle). This Handling Fee Final Report provides estimates of the statewide, weighted average cost per beverage container to recycle for recycling centers that do not receive handling fees (processing fee recyclers), and recycling centers that do receive handling fees (handling fee recyclers). This report also summarizes the tasks that Crowe and its subcontractors conducted in order to obtain the final, statewide, weighted average costs per container. Finally, this report provides analyses of the results of this handling fee cost survey.

This executive summary is organized as follows:

A. Handling Fee Cost Survey Background

B. Handling Fee Cost Survey Objectives

C. Handling Fee Cost Survey Results

D. Handling Fee Cost Survey Tasks

E. Handling Fee Cost Analyses

F. Overview of Handling Fee Cost Survey Results

A. Handling Fee Cost Survey Background

In 1986, the California State Legislature enacted the California Beverage Container Recycling and Litter Reduction Act (AB 2020, Margolin, Chapter 1290). This “bottle bill” program is the only one of its kind in the nation in terms of its unique program structure.

A major subprogram within AB 2020 is the convenience zone system. AB 2020 established specific goals for convenient recycling in order to allow consumers to redeem their containers and receive back their refund value. A traditional deposit system requires beverage retailers (dealers) to accept and sort returned empty containers. However, part of the compromise behind AB 2020 was to develop a mechanism to avoid, or minimize, dealer take-back requirements, which were viewed as costly and unwieldy. While California had about 500 pre-existing recycling centers, these were not deemed adequate to ensure convenient recycling opportunities, as many of these sites did not accept all materials, and/or were in non-convenient industrial locations.

Rather than requiring all dealers to accept empty containers, AB 2020 established redemption centers close to where people shopped. Thus the “convenience zone” was born, which was defined as the area within a one-half mile circular radius surrounding each supermarket in California with annual sales exceeding $2 million.[1] Each convenience zone (CZ) was to contain at least one recycling center that redeemed all types of beverage containers and was to be open at least 30 hours per week, including at least 5 off-business hours. If a recycling center was not established within a CZ, then all dealers within the CZ would be required to take back containers. Through this mechanism, the law created incentives for dealers to ensure that a recycling center was in their CZ.

The intent of AB 2020 was to balance equity, efficiency, and effectiveness in providing recycling opportunities. The convenience zone mandate was established to be equitable, i.e., providing consumers with an easy mechanism to return their redemption value. At the same time, this mechanism was intended to be more efficient and effective than a traditional deposit system.

The CZ system is significantly more efficient and cost effective than in-store dealer take-back. However, conventional wisdom is that recycling in convenience zones on average costs more than recycling at pre-existing recycling centers.

A major issue that has surrounded convenience zones over the program’s 33 years is based around the question: *How much should the State pay for convenience?* As a result, the issue of subsidizing recycling centers in convenience zones has led to frequent legislative adjustments over the history of the program, with the last significant handling fee adjustment, AB 3056 (Committee on Natural Resources, Chapter 907, Statutes of 2006), signed into law in September 2006.

AB 3056 implemented the most significant changes to the handling fee system since 1993. These changes started with the 2006 handling fee cost survey, and the new approach to handling fee calculations and payments, as of July 1, 2008. AB 3056 requires CalRecycle to conduct a handling fee cost survey every two years in conjunction with the processing fee cost survey. The handling fee is calculated by subtracting the statewide weighted average cost per container for recycling centers that do not receive handling fees (Processing Fee or PF Recyclers) from the statewide weighted average cost per container for recycling centers that receive handling fees (HF recyclers).

[1] This definition is still in place today.

The handling fee cost survey described in this report is the eighth of the every-two-year-surveys to determine costs per container. This handling fee cost survey was conducted in parallel with the processing fee cost survey, which was used to determine costs per ton for four of the ten beverage container material types. Results of the processing fee cost survey are described in separate reports.

Together, the processing fee and handling fee cost surveys performed in 2021 represented one of the largest cost survey efforts undertaken by CalRecycle. In total, the Crowe team completed 453 randomly selected recycler cost surveys, comprised of surveys of 238 processing fee recyclers, and surveys of 215 handling fee recyclers. The cost surveys are also similar in detail and complexity to prior cost surveys in terms of quantitative information obtained.

B. Handling Fee Cost Survey Objectives

The objective of the handling fee cost survey was to estimate the California statewide, weighted average, 2020 certified recycler cost per container to recycle for handling fee recyclers and processing fee recyclers. Recycler center costs were surveyed in 2021 using recycler center calendar year 2020 financial statements. Based on the current approach, beginning July 1, 2022, the per container handling fee payment for eligible supermarket sites, non-profit convenience zone recyclers, and rural recyclers, will be based on the calculated measured difference between the cost per container for these two populations (i.e., handling fee recycler cost per container minus processing fee recycler cost per container).

The recycler costs per container in this report present the culmination of 11 months (April 2021 through February 2022) of research, development, and implementation efforts for a primary data economic cost survey of California certified recycling centers. The actual handling fee cost survey field work was performed over a seven-month period from May 2021 through November 2021.

C. Handling Fee Cost Survey Results

The statewide, weighted average, recycler cost per container for handling fee recyclers and processing fee recyclers are presented in **Exhibit ES-1.** The statewide, weighted average, cost to recycle for handling fee recyclers in 2020 was 1.668 cents per container, 44 percent higher than the statewide, weighted average, cost to recycle for processing fee recyclers in 2020, at 1.157 cents per container.

Exhibit ES-1
Statewide Recycler Costs per Container (2020)

Recycler Type	2020 Statewide, Weighted Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90% Confidence Interval
1. Handling Fee Recycler	1.668 Cents	+44%	6.07%
2. Processing Fee Recycler	1.157 Cents	n/a	5.63%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.511 Cents	n/a	n/a

Exhibit ES-1 includes the new handling fee payment calculation, 0.511 cents per recycled container, equal to the difference between the handling fee recycler statewide, weighted average cost per container to recycle, and the processing fee recycler statewide, weighted average cost per container to recycle, as specified in the Beverage Container Recycling and Litter Reduction Act, California Public Resources Code, Division 12.1, Chapter 4, Section 14585 (f)(3). The Department is scheduled to implement this new handling fee payment starting July 1, 2022. CalRecycle adds a cost-of-living adjustment (COLA) to the handling fee.

The sample sizes used to determine the costs per container were estimated to achieve a 90 percent confidence interval. This standard was higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85 percent confidence interval. The cost per container results for both handling fee recyclers and processing fee recyclers presented in this report exceeded this target, with low error rates at the 90 percent confidence level of 6.07 percent, and 5.63 percent, respectively.

D. Handling Fee Cost Survey Tasks

The nine major tasks accomplished over a 13-month time period that the Crowe team conducted to complete this handling fee cost survey are summarized below. The processing fee cost survey and handling fee cost survey were conducted in parallel. Several of these tasks were the same for both surveys, for example, updating the cost model, training, and quality control. The cost survey procedures, field methodology, and quality control steps were identical for both processing fee recyclers and handling fee recyclers.

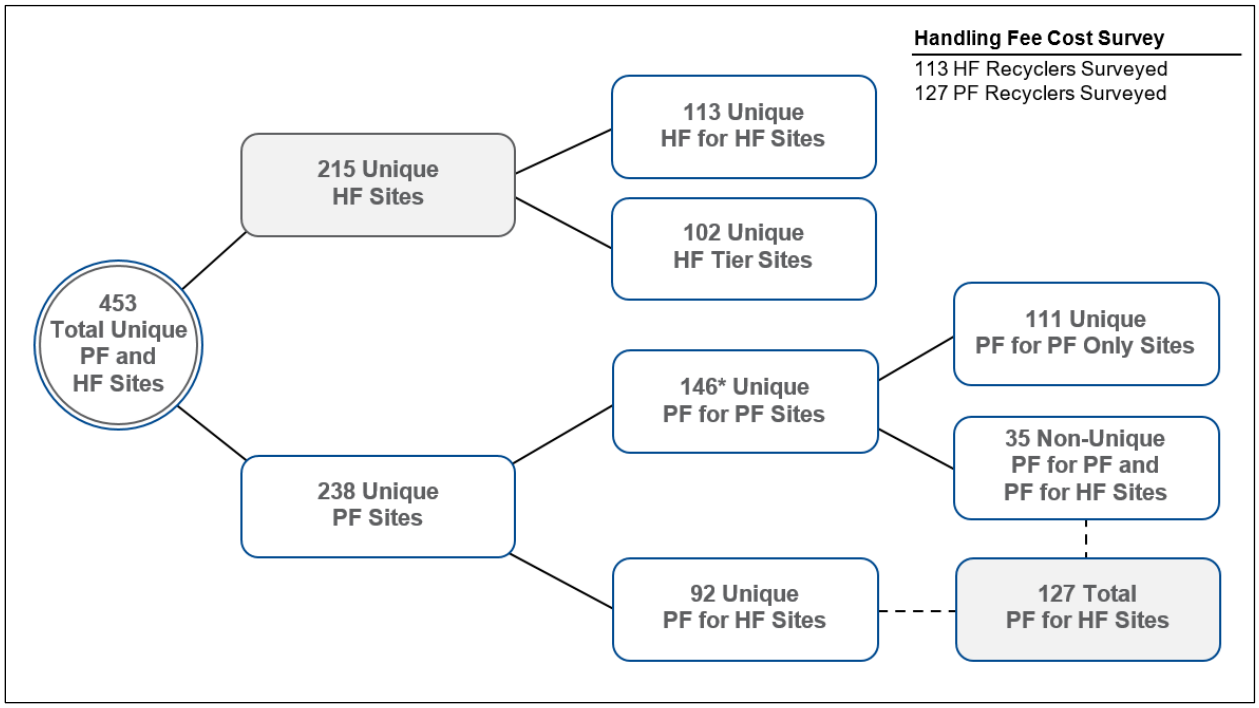
1. **Developed and documented a sample survey design framework and selected recycling centers for the cost survey.** Crowe determined the number of recycling centers to be selected for the stratified random sample used to measure costs per container for handling fee and processing fee sites. Following the sample design, they randomly identified certified recycling centers selected to participate in the cost survey.

2. **Monitored site completion characteristics to sample design for both handling fee recyclers and processing fee recyclers.** In total Crowe surveyed 238 processing fee recyclers and 215 handling fee recyclers to calculate recycler costs for specific components of the processing fee and handling fee cost surveys (including handling fee tiers). **Exhibit ES-2** illustrates the total number of processing fee and handling fee recyclers surveyed and the number of recyclers in the handling fee survey.

3. **Updated and calibrated the Labor Allocation Cost Survey Model.** The cost survey model is a 17-worksheet, Microsoft Excel-based computer model Crowe used to allocate recycling center costs to beverage container material types based on labor allocations. They updated the cost survey model to reflect 2020 container per pound and CRV payment information, as well as procedural changes to the cost survey. In addition, they calibrated the Indirect Cost Allocation Sub-Models for Aluminum/Bi-Metal and All-Plastics with 2020 survey information. These sub-models, now incorporated into the Labor Allocation Cost Survey Model, ensured proper allocation of costs and labor to plastic resins HDPE #2, PVC #3, LDPE #4, PP #5, PS #6, Other #7; and bi-metal (collectively referred to as the minority materials). These allocations were necessary in order to determine costs per container for all CRV material types.

4. **Revised and updated the Cost Survey Training Manual and training materials.** Crowe continued to update the evolving training manual, based on the heavily streamlined 2016 Cost Survey Training Manual. The Manual consists of ten chapters, each emphasizing actions for survey team members to take in the field and when completing site files. The training manual focuses on key areas of learning necessary to successfully conduct cost surveys. In addition, Crowe updated PowerPoint presentations covering topics in the Training Manual. The presentations include videos of a cost survey site visit, quizzes, and activities specific to each training module.

Exhibit ES-2
Processing Fee and Handling Fee Cost Survey Sample (2020)



Note: 35 PF sites within the 146 also were within the handling fee cost survey PF for HF sites, for a total 127 (92 + 35) PF sites used for the cost per container calculation.

5. **Revised and conducted cost survey training.** In response to COVID-19 restrictions that were in place when training occurred (April 2021), Crowe transitioned training to Zoom. They provided eight half-days of interactive virtual training for new surveyors. Experienced surveyors participated in the last four half-days of training. The virtual training included case studies and working on practice site files in break-out rooms. After day six of virtual training new surveyors participated in a training site visit with a highly experienced Crowe team member to provide “real-world” experience. The experienced survey team member guided the new team member, with increasing levels of responsibility for the on-site and post-site visit procedures over the course of the visits. Following the field visits, new survey members worked together to complete the site files. The entire survey team reconvened after the training site visits to present and discuss the site visits and review the remainder of the training materials. For this 2021 Cost Survey, they also conducted a one-hour training for Quality Control reviewers.

6. **Scheduled, conducted, and completed 342 recycling center on-site visits during seven months between late-April 2021 and mid-November 2021.** The site visits took place during varying levels of COVID-19 safety provisions. Survey teams followed applicable guidelines (masking, social distancing) throughout the course of the survey. Survey team members also discussed the impact of COVID-19 on recycler operations in 2020 during the site visits. Throughout the scheduling and site visits, the Crowe team built upon the field working relationships established with the program's recyclers in prior years. These on-site working relationships were important to the success of this cost survey and should carry over into future cost surveys. All the cost surveys were conducted by a team of one or two auditors, including accountants and/or recycling experts. It typically took between one to three hours to complete the on-site survey. In addition to the on-site time, usually over eight hours of additional time was required after each site visit to analyze data, and to follow-up with each recycler to obtain complete financial and labor information.
7. **Created a secure SharePoint site for electronic file reviews.** Crowe developed a secure on-line file review system for team members to upload and review survey files. The survey files maintain the functional components of former hard copy documentation (site procedure checklist, site memorandum, site equipment sheet, Excel cost model, signed affidavit, and supporting site labor and financial information), but eliminate the paper-intensive file development and review process of prior cost surveys.
8. **Developed and implemented an intensive quality control procedure.** The quality control procedure included eight hours, and five different levels of review (site team review, independent first level review, manager review, CPA partner review, and project director review), for each site file. This review took place before the site files were released for data processing and data analysis. These quality assurance steps ensured that each site file was complete and accurate, and ensured that all results from the labor allocation model and the indirect cost allocation sub-models were accurate. In total, over 26 hours generally were spent for each completed recycler site, including the site team and quality control hours.
9. **Determined the final cost per container for processing fee and handling fee recyclers.** Using an automated process, Crowe extracted results from each of the 342 completed labor hour allocation cost models. They developed an Excel workbook to calculate costs per container for handling fee sites and processing fee sites. Calculations used a weighted average by container strata and by tier. Using defined and documented statistical procedures, Crowe calculated error rates at a 90 percent confidence interval.

E. Handling Fee Cost Survey Analyses

During the handling fee cost survey, Crowe conducted a series of analyses for CalRecycle, summarized as follows:

- **Compared historical cost per container results.** Crowe compared the statewide, weighted average cost per container for processing fee recyclers and handling fee recyclers from the 2006 to 2020 handling fee cost surveys. Cost per container decreased for both types of recyclers in 2020, following the increase in 2018. **Exhibit ES-3** illustrates the calculated handling fee resulting from each cost survey. **Exhibit ES-4** provides handling fee and processing fee cost per container results since 2006.

Exhibit ES-3
Handling Fee Cost Survey Calculated Handling Fee Payments (2006 to 2020)

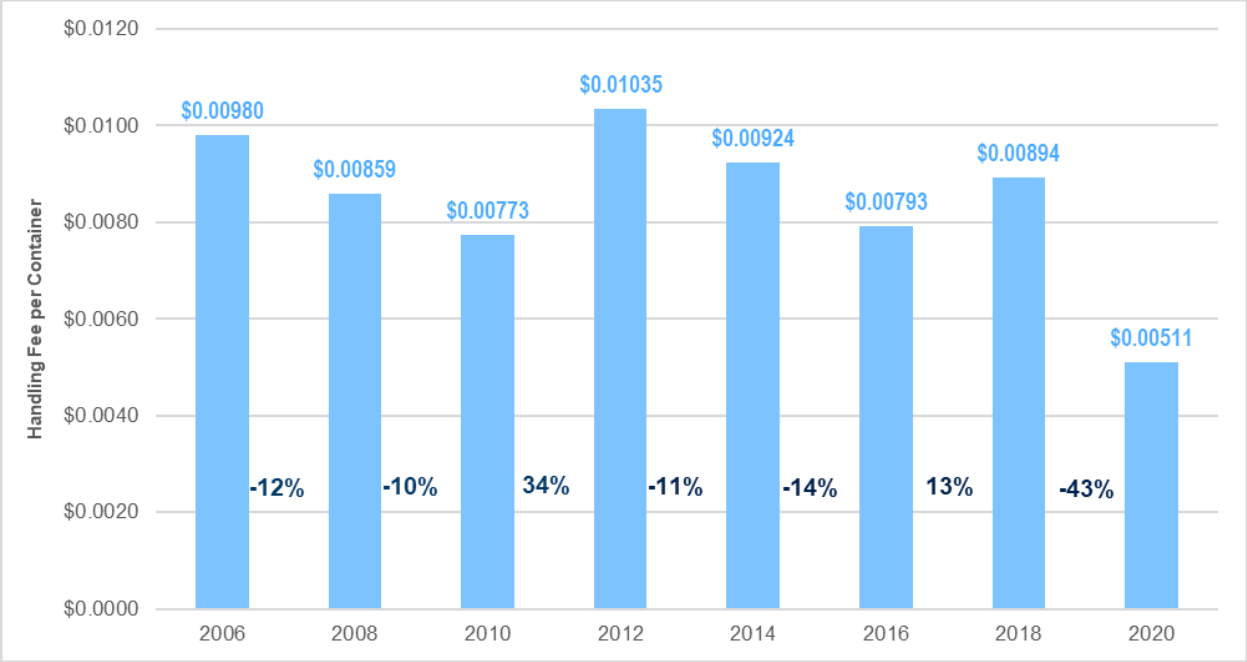
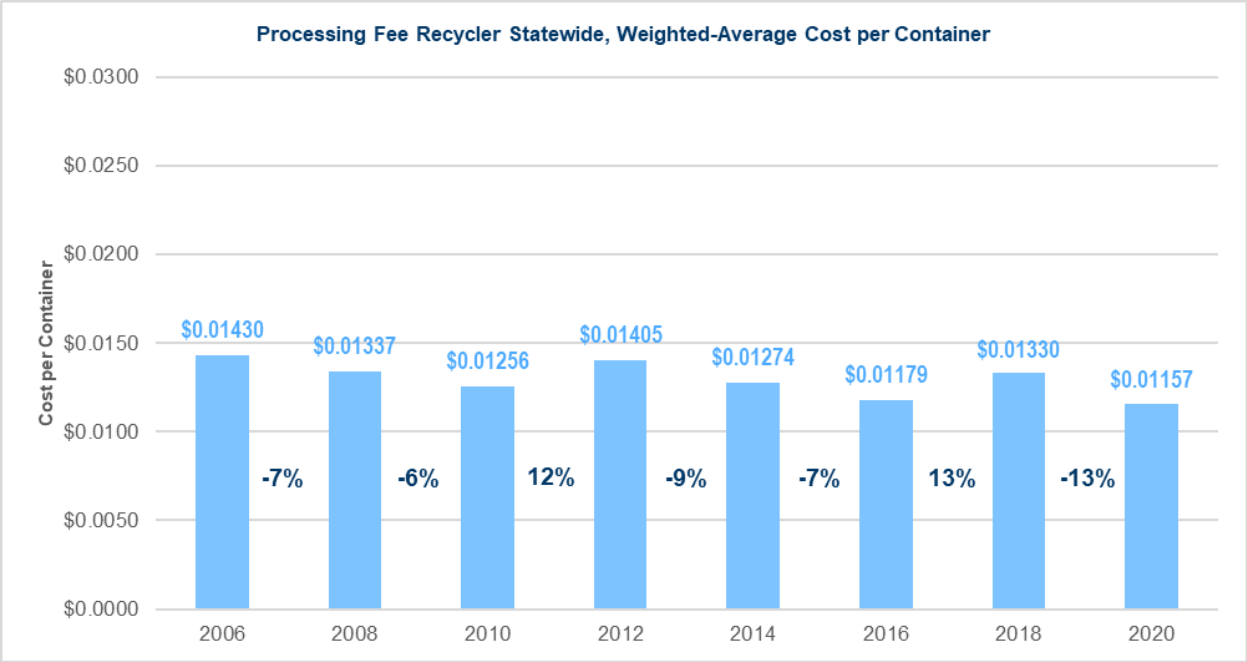
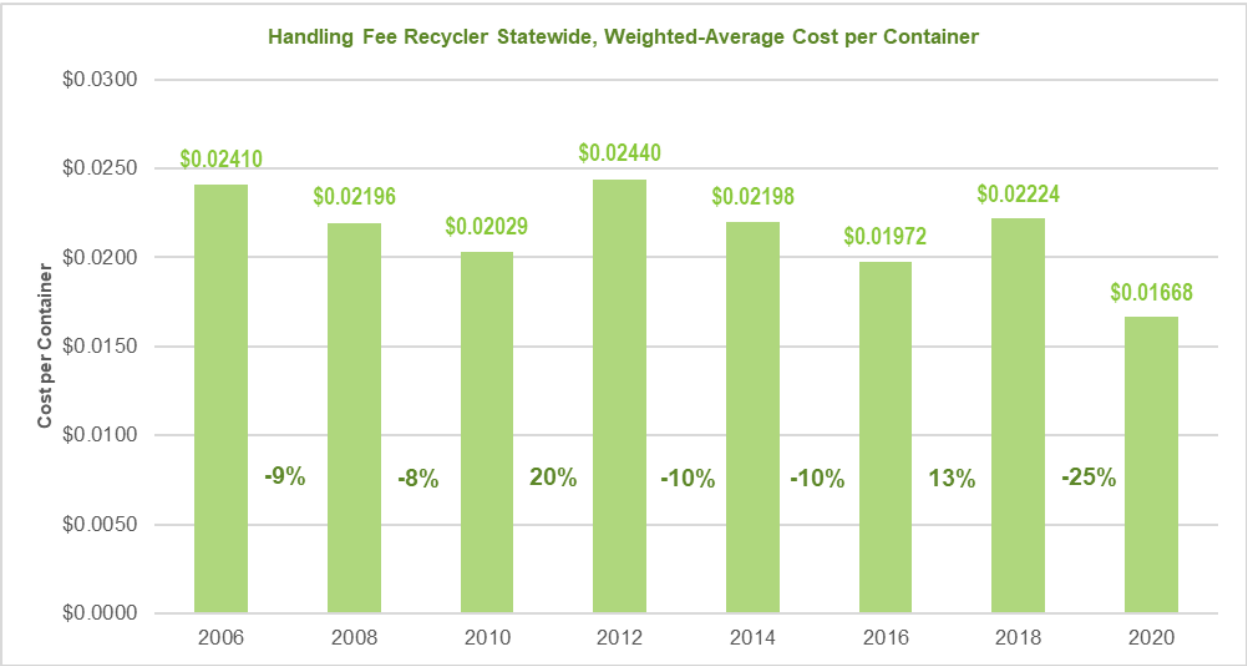


Exhibit ES-4
Processing Fee and Handling Fee Recycler Cost per Container (2006–2020)





- **Compared recyclers, containers recycled, and cost per container by strata.** Crowe analyzed the distribution of recyclers, costs, and recycling by strata. They also compared the average cost per container by stratum and the statewide average cost per container for both handling fee and processing fee recyclers and analyzed the total number of recyclers and containers recycled by stratum.
- **Evaluated changes in number of recyclers, costs, and recycled containers.** Crowe evaluated historical trends in population number of recyclers and the relative population CRV costs and containers recycled by processing fee and handling fee recyclers.
- **Evaluated changes in recycling center productivity and costs.** Crowe evaluated changes in number of recyclers and containers recycled between 2018 and 2020. The average containers handled per recycling center increased significantly in 2020 due to the reduction in the number of recycling centers. More productive recycling centers that recycle more material generally have lower costs than less productive recycling centers that recycle less material. The increase in containers per recycler was one factor in the lower costs per container.
- **Compared population characteristics of handling fee and processing fee recyclers.** Crowe compared the total population CRV costs, total population containers, and total population size (number of sites) between handling fee and processing fee recyclers for 2006 to 2020 survey years. In all eight years, handling fee recyclers recycled about one-third of the containers but accounted for just over 40 percent of total costs. Handling fee recyclers accounted for between 40 to 62 percent of the total number of recyclers, with the percentage continuing to decline in recent years.
- **Analyzed changes in owner's income over the last three cost surveys.** Between 2018 and 2020, owner's profitability for recyclers for the small strata 3 and large strata 1 recyclers decreased while it remained roughly the same for the medium, strata 2 recyclers. Lower owner profitability would contribute to lower costs.
- **Analyzed annual handling fee payments.** Crowe compared the total handling fee payments over the last several years and estimated future handling fee payments overall and for selected large handling fee companies.

- **Analyzed likely reasons behind the handling fee recycler cost per container decrease.** Crowe evaluated several possible reasons for the 25 percent decrease in handling fee recycler cost per container. The increase in average containers per recycling center was a significant factor in the increased cost per container, as was the closure of one large recycler in 2019. Decreased transportation costs between 2018 and 2020 were also a contributing factor.
- **Analyzed the impacts of COVID-19 on handling fee and processing fee recyclers.** Crowe surveyed recyclers about the impacts of the pandemic on operations. Most sampled HF recyclers identified COVID-19 impacts including shutdowns, shortened hours, fewer employees, and the need for additional supplies.
- **Analyzed the extent to which scrap prices, processing payments, and handling fee revenue covered costs of handling fee recyclers.** Crowe compared the extent to which these three revenue sources provided coverage of small, medium, and large handling fee recycler costs in 2020, 2021, and projected for 2022. The analyses illustrate that processing payments, handling fee payments, and scrap income cover most HF recyclers' costs. However, there are a large number of recycling centers (mostly smaller sized recyclers) that do not generate enough revenue from estimated processing payments, handling payments and scrap income to cover their costs, increasing the risk of closure.

F. Overview of Handling Fee Cost Survey Results

Between 2018 and 2020 there was a reduction in the overall survey population of HF and PF recycling centers, and to a lesser extent, a decrease in the number of containers of CRV material recycled. This combination alone could suggest a possible decrease in cost per container between 2018 and 2020. The largest handling fee recycling operation closed in 2019, directly impacting the handling fee cost per container. Crowe's analysis of 2018 and 2020 cost survey data identifies four factors appear to have that contributed to decreases in costs container between 2018 and 2020. These factors are discussed further in the remainder of this report. The four factors are:

- The average number of containers per recycler increased significantly while average costs per recycler remained nearly flat. For HF recyclers, the average number of containers per recycler increased 39 percent while costs only increased 4 percent. For PF recyclers, the average number of containers per recycler increased 12 percent while costs decreased by 2 percent. The dramatic increase in the number of containers per recycler (due to the decrease in the number of RCs) contributed to significantly higher efficiency, which contributed to lower costs. The number of labor hours per 1,000 containers recycled decreased 25 percent for HF recyclers and decreased 16 percent for PF recyclers.
- Related to the first factor, the closure of one large recycling operation in 2019 contributed to the lower overall costs in 2020. This recycling center historically represented a large portion of total containers recycled (26 percent in 2018) and typically operated smaller recycling centers with a higher cost structure.
- The 13 percent decrease in diesel fuel prices between 2018 and 2020 contributed to lower transportation costs per container, which contributed to lower overall costs.
- A significant (1.5 to 2.4 multiplier) increase in the proportion of surveyed recycling centers with average hourly wages below minimum wage, likely due to a higher percentage of owners making low to no profit as sole proprietorships and partnerships. Lower wages (i.e., labor costs) contribute to lower recycling costs.

1. Handling Fee Cost Survey Methodologies

This section describes Crowe's cost survey methodologies, from establishing the survey sample frame, to the quality control procedures, and all the supporting tasks in between. Crowe followed processing fee and handling fee cost survey procedures consistent with prior cost surveys. There are nine key tasks described in this section:

A. *Survey Design*
B. *Survey Scheduling, Logistics, and Confidentiality*
C. *Training Manual Updates*
D. *Surveyor Training*
E. *Cost Model Updates*
F. *Calibration of the Indirect Cost Allocation Sub-Models*
G. *Site and Survey Tracking*
H. *Cost Survey Procedures*
I. *Quality Control and Confidentiality Procedures*
J. *Distribution of Sample*

A. Survey Design

This 2020 survey was the eighth time that CalRecycle conducted a handling fee survey to determine the cost per container of recycling beverage containers. Crowe also developed the survey design for the first seven handling fee cost surveys. They utilized the same handling fee cost survey design methodology developed for the previous handling fee cost surveys.

The purpose of the survey design was to identify the specific recycling centers surveyed to estimate California statewide, weighted average, 2020 certified recycler center cost per container to recycle for handling fee (HF) recyclers, and processing fee (PF) recyclers. Recycling center costs were surveyed in 2021 using recycler center calendar year 2020 financial statements. Recycling center costs measured by the cost survey will be used for the handling fee payment calculation, effective July 1, 2022.

The population of handling fee recycling centers eligible for the handling fee cost survey was defined as all recyclers: (1) receiving at least one handling fee payment for any of the months between January 2020 and December 2020, (2) certified operational on or before March 1, 2020, (3) reporting redemption value between January 2020 and December 2020, (4) not subsidized by the Department of Rehabilitation, and (5) not subject to major investigation by CalRecycle (17 sites were removed for this reason). There were 442 recycling centers in this total handling fee recycling center survey population.

The population of processing fee recycling centers eligible for the handling fee cost survey was defined as all recyclers: (1) certified operational on or before March 1, 2020, (2) reporting redemption value between January 2020 and December 2020, (3) not subsidized by the Department of Rehabilitation, and (4) not subject to major investigation by CalRecycle (30 sites were removed for this reason). There were 581 recycling centers in this total processing fee recycling center survey population. This is the same population of recyclers as was used for the processing fee cost survey.

This overall 2021 handling fee cost survey had a slightly larger sample size than previous handling fee cost surveys. The Crowe team completed 127 PF and 113 HF recycler cost surveys during seven months of field work (May 2021 through November 2021) to obtain these cost survey results. This handling fee cost survey was consistent with prior cost surveys in terms of quantitative information obtained for each recycling site.

To measure calendar year 2020 costs, the survey design consisted of two stratified random samples:

- A statistically defensible, stratified random sample of 113 sites, drawn from the 442 qualifying handling fee recycling centers. Three strata were defined by the total annual containers handled by a site. This stratified random sample was used to measure the costs of recycling CRV containers for handling fee recycling centers. Handling fee recycler strata definitions are provided in **Exhibit 1-1.**
- A statistically defensible, stratified random sample of 127 sites, drawn from the 581 qualifying processing fee recycling centers. Three strata were defined by the total annual containers handled by a site. This stratified random sample was used to measure the costs of recycling California Redemption Value (CRV) containers for processing fee recycling centers. Processing fee recycler strata definitions are provided in **Exhibit 1-2.**

Crowe treated the above two survey components equivalently, in terms of scheduling, site visits, and quality control. It was only in the final calculations that they made a distinction between the two groups. Because of these parallel strata definitions for handling fee and processing fee recyclers, Crowe was able to directly compare cost per container results for the two populations. Furthermore, as a result of this survey design, the cost survey conducted for 2020 costs per container treated the two recycler populations with equal statistical rigor.

Exhibit 1-1
Handling Fee Recycler Container Stratum Definitions (2020)

Strata	2020 Number of Containers Recycled
1	Greater than, or equal to, 17.1 million containers
2	Greater than, or equal to, 9.1 million containers, up to less than 17.1 million containers
3	Less than 9.1 million containers

Exhibit 1-2
Processing Fee Recycler Container Stratum Definitions (2020)

Strata	2020 Number of Containers Recycled
1	Greater than, or equal to, 33.6 million containers
2	Greater than, or equal to, 18.2 million containers, up to less than 33.6 million containers
3	Less than 18.2 million containers

CalRecycle regulations require that the cost per container be estimated at an 85 percent confidence interval, and CalRecycle policy further specifies a 10 percent error rate. Similar to the processing fee cost survey, the sampling plan (for the two stratified random samples) was based on a more accurate and statistically conventional and accepted, 90 percent confidence interval. These standards were higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85 percent confidence interval. Department policy specifies a 10 percent error rate. The cost per container results for both handling fee recyclers, and processing fee recyclers, presented in this report meet this target, with low error rates at the 90 percent confidence level of only 6.07 percent, and 5.63 percent, respectively.

This is the first ever handling fee cost survey that included a tiered survey of the handling fee recycler population. This tiered approach provides the average cost per container results for each tier, meeting a 90 percent confidence level (i.e., less than 10 percent margin of error).

Using the same strata thresholds as the handling fee cost survey strata, Crowe surveyed 215 HF recyclers, adding 102 HF recyclers to the survey from the base 113 HF recyclers selected for the HF for HF survey.

Exhibit 1-3 provides a comparison of the HF survey population and the sample selections for both the HF for HF survey and HF tiered survey. The HF tiered survey includes 49 percent of the recycler population and 55 percent of the total container volume.

Exhibit 1-3
Comparison of 2020 Handling Fee Survey Population and Sample Selection RCs by Strata using 2020 Strata Definitions

Strata Number and Definition	Survey Population	HF for HF Selection	HF Tiered Selection
Strata 1: >=17,100,000 Containers	55	25	37
Strata 2: 9,100,000 Containers to <17,100,000 Containers	117	37	75
Strata 3: <9,100,000 Containers	270	51	103
Total	442	113	215
Total Containers (in millions)	4,260	1,344	2,363

Sample Design Results

Exhibit 1-3 provides a summary of the completed handling fee recycler survey sites. Crowe scheduled, conducted, and completed 215 handling fee recycler site visits and cost analyses for the traditional and tiered components of the handling fee cost survey.

Exhibit 1-4 provides a summary of the completed processing fee recycler survey sites. Crowe scheduled, conducted, and completed 127 processing fee recycler site visits and cost analyses for the handling fee cost survey. They surveyed a total of 35 sites, shown in **Exhibit 1-4**, for both the handling fee and processing fee cost surveys.

Exhibit 1-4
Processing Fee (PF) Recycler Site Visits (2020)

Processing Fee Recycler Site Category	Total Number of PF Site Visits for HF Survey	Number Visited for HF Survey Only	Number Visited for Both PF and HF Surveys
PF Container Stratum 1	20	12	8
PF Container Stratum 2	41	30	11
PF Container Stratum 3	66	50	16
Total PF completed sites	**127**	**92**	**35**

Exhibit 1-5 provides a comparison of the error rates, population size, sample size, and sample method for the two recycler populations in the handling fee cost survey. With error rates of 4.94 percent (HF) and 6.70 percent (PF), this handling fee cost survey exceeded the conventional statistical accuracy of 10 percent at the 90 percent confidence level for both handling fee and processing fee recyclers.

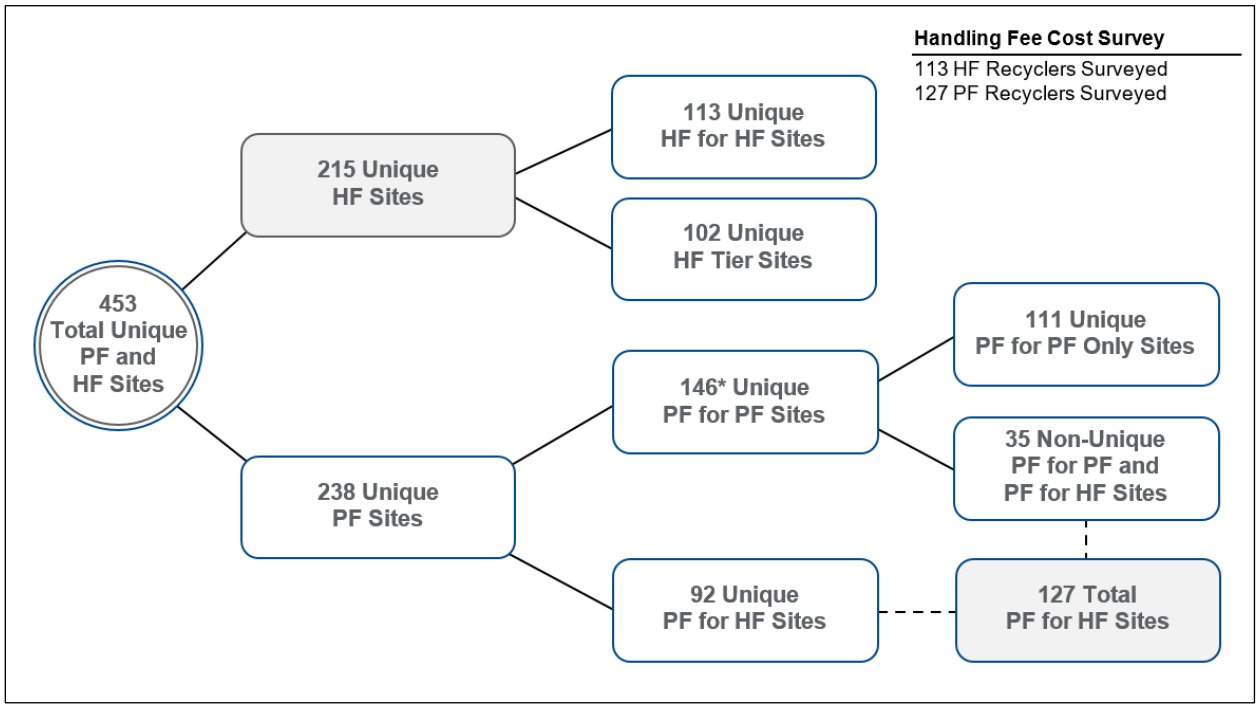
Exhibit 1-5
Error Rates, Population Sizes, Sample Sizes and Method by Recycler Type (2020)

Recycler Type	Error Rate (90% CI)	Population Size	Sample Size	Sample Method
1. Handling Fee Recyclers	6.07	442	113	Container Stratified Random Sample
2. Processing Fee Recyclers	5.63	581	127	Container Stratified Random Sample

Sample Reconciliation

The final 238 processing fee recyclers included 127 sites for the handling fee cost survey. Together, the processing fee and handling fee cost surveys performed in 2021 represented one of the largest cost survey efforts undertaken by CalRecycle. **Exhibit 1-6** illustrates the total number of processing fee and handling fee recyclers surveyed, and the number of recyclers in the processing fee cost survey.

Exhibit 1-6
Processing Fee and Handling Fee Cost Survey Sample (2020)



Note: 35 PF sites within the 146 also were within the handling fee cost survey PF for HF sites, for a total 127 (92 + 35) PF sites used for the cost per container calculation.

B. Survey Scheduling, Logistics, and Confidentiality

A significant component of the cost survey involved scheduling site visits and communicating with recyclers chosen from the sample frame. Two staff-people at Crowe were employed during the project start-up and survey months (April through November) to coordinate scheduling and communicate with recyclers.

Because conducting a cost survey fundamentally entails the collection of proprietary financial information, sensitivity to stakeholder relations is highly important. Without willing and active cooperation from the selected recycling center operators, determining the real costs of beverage container recycling would be exceptionally difficult and the results would be hard to support. The approach was to communicate with site operators and managers from the start of the process to help them understand what the cost survey entailed, what information Crowe was seeking to obtain and to correct misunderstandings about the purpose of the cost survey.

The first stage of recycler communication was a letter on CalRecycle letterhead informing the recycler that they were selected to participate in the processing fee and handling fee cost survey. The letter also identified the expectations of the recycler and introduced Crowe as CalRecycle's cost survey contractor. Introduction letters were sent to all selected recyclers starting in April 2021. In the second stage of communication, Crowe's scheduling coordinator established telephone contact with the recyclers to schedule site visits. In addition, the scheduler typically sent a confirmation email to recyclers.

The survey team directly contacted the recycler approximately one week before the site visit for final visit confirmation. Site visits were generally conducted by a team of two surveyors, including accountants and/or recycling experts. Each survey team typically included at least one member with experience on cost surveys. Survey teams made their own travel arrangements.

The scheduling coordinators conducted many behind-the-scenes tasks to ensure overall success of the project. For example, to reduce travel expenses, the coordinators utilized mapping software to efficiently schedule consecutive site visits first within regions, and then within nearby locations. Scheduling coordinators also sent additional letters and emails to many recyclers to confirm site visit logistics.

The coordinators also were tasked to optimize site visit efficiency, matching the varying schedules of over 17 site survey team personnel, diverse geographic locations, and availability of the recycling centers. During any given week, up to three different survey teams were simultaneously in the field. In most cases, one site visit, with some telephone follow-up, was sufficient to obtain all the information needed to complete the survey of each site. A few sites required repeated telephone follow-up or initial "drive-by" visits to confirm that the site was operating and make direct contact with the site owner/manager.

The coordinators also implemented and maintained a secure Microsoft SharePoint site for the transfer and storage of all cost survey recycling center site files. The site allowed the cost survey team members to securely access files in the field, facilitated the efficient review of sites via a check-out workflow, and tracked the status of each site. The secure SharePoint site was backed up automatically daily by Crowe's IT systems.

To ensure confidentiality of recyclers' proprietary information, every Crowe and subcontractor employee that worked on the processing fee cost survey contract signed individual Confidentiality Agreements warranting that they would not disclose any information made available by each certified recycler.

C. Training Manual Updates

The first *Processing Fee Cost Survey Training Participant Manual* was prepared by NewPoint Group in 1995 to support the cost survey training provided to (then) Division of Recycling (DOR) staff. This manual contained hundreds of example case studies, problem sets, quizzes, sample financial documents, handouts, reading assignments, and procedures to develop skills needed to conduct successful processing fee cost surveys. Because the training manual was originally prepared in 1995, it required extensive revisions and adjustments.

For the 2015 cost survey, Crowe evaluated the entire 700-page training manual used in prior years, removing outdated and duplicative information. They identified 17 training modules for revision, developing learning objectives and interactive exercises for each. Subsequently, performed many iterative updates, including streamlining the Manual to ten chapters, each emphasizing actions for survey team members to take in the field and when completing site files. The updated training modules also reflected the change to the file assembly and review process from a manual, paper-based process to a secure online, SharePoint-based process. They also developed and refined new PowerPoint presentations covering topics in the Training Manual.

For the current cost survey, Crowe continued to update and revise the training manual and materials. The 2021 training manual updates included new COVID protocols. They also performed a significant overhaul of the training materials, in response to shifting from classroom training to a 100 percent virtual training environment.

The virtual presentations include recycling center news videos, training videos, recycler case studies, quizzes, demonstrations, and activities specific to each presented topic. This shift to a virtual learning environment also included moving to half-day online training sessions from the previous full-day in-person sessions, and redefining training topics and goals for each session. Crowe created new work assignments and interactive exercises as part of the training update.

The updated training manual still consisted of two volumes:

- *Participant Manual, Volume 1* (the primary training manual)
- *Field Manual, Volume 2* (a summary version of the site visit procedures)

D. Surveyor Training

Successfully completing the processing fee and handling fee cost survey site visits required knowledge of recycling, recycling practices, the beverage container recycling program, the specific procedures of site visits, auditing, and financial cost-accounting. The Crowe-trained surveyor team consisted primarily of accountants and recycling experts.

Roughly two-thirds of the individuals who conducted site visits for this survey had experience in the previous processing fee cost surveys (every other year beginning in 2002) and had completed one or more training sessions in prior years. These surveyors already had extensive experience in auditing and financial accounting procedures, as well as practical site-visit and recycling program experience. These returning team members still completed 16-hour virtual training course in 2021.The new survey team members completed the full 32-hour virtual training program and participated in field training.

Following the first six half-days of remote classroom training, each new survey team member conducted a cost survey site visits with a highly experienced team member in order to provide “real-world” experience. The experienced survey team member guided new team members, with increasing levels of responsibility for the on-site and post-site visit procedures over the course of the visit. Following the field visits, new survey members spent time working together to complete the site; with the experienced surveyor providing guidance and oversight. The entire survey team reconvened after the training site visits to present and discuss the site visits and review the remainder of the training materials.

For the remote classroom component of the training, Crowe prepared and presented multi-media presentations for each training module, including training videos and PowerPoint presentations. A significant segment of the training sessions was spent on hands-on activities and preparing three site files (simple, moderate, complex) using data from prior cost surveys. The training allowed team members to better understand the many variations of financial information, and other complicating issues, they would likely face in the field. The training session included role-playing interviews, and on-line quizzes. The remote classroom training was led by the Crowe team.

E. Cost Model Updates

The labor allocation cost model (cost model) is a Microsoft *Excel* workbook consisting of 17 worksheets. The model was first developed to improve the methodology of the 1995 cost surveys. Since that time, it has been updated and revised to accommodate legislative and regulatory changes, as well as upgrades of *Excel*. In 2000, the survey team and the DOR conducted a significant model revision to add plastic resins #2 to #7 to the model, and to upgrade to *Excel* 1997, which replaced old *Excel* macros with *Visual Basic* programming.

The current version of the cost model represents several legacy generations (and layers) of modifications and updates, including a significant number of improvements that were made immediately following each cost survey. Prior to conducting the current cost survey, Crowe reviewed and updated the cost model to reflect 2020 container per pound and CRV payment information, as well as procedural changes to the cost survey. They added fields in the model's Direct Cost Worksheet to streamline surveyor entered costs directed to a subset of material types for commonly occurring cost allocations. The model also included added quality control indicators.

F. Calibration of the Indirect Cost Allocation Sub-Models

As a result of the introduction of new containers to the Beverage Container Recycling Program in 2000, the 2002-2008 cost surveys included calculating cost per ton for ten different material types: six plastic resins, in addition to PET #1, glass, aluminum, and bi-metal. A key task of the 2002 cost survey project was to develop a costing methodology for plastics #2 to #7 and bi-metal. For this 2020 cost survey, Crowe applied this same indirect cost allocation sub-model procedure to determine costs per ton for the minority material types that was developed in 2002 and used again in every two years from 2004-2018. In addition, they calibrated the Indirect Cost Allocation Sub-Models for Aluminum/Bi-Metal and All-Plastics with 2020 survey information. These sub-models, now incorporated into the Labor Allocation Cost Survey Model, ensure rational allocation of costs and labor to bi-metal and plastic resins HDPE #2, PVC #3, LDPE #4, PP #5, PS #6, and Other #7. While the survey no longer directly measures the cost per ton for bi-metal and plastics #3 to #7, the sub-model is still utilized to help determine aluminum, PET #1, and HDPE #2 costs per ton.

The purpose of the two sub-models, the Indirect Cost Allocation Sub-Model for All Plastics, and the Indirect Cost Allocation Sub-Model for Aluminum/Bi-Metal, was to separate the individual majority and minority material costs from the larger indirect cost categories: all plastics and aluminum/bi-metal. Using operational and material handling factors, the sub-models provide a consistent, site-specific, and sub-material specific approach, for determining the costs per ton for both the high-volume majority materials and low-volume minority materials.

Four operational/material handling factors (weight of containers, number of containers, volume (size) of containers, and commingled rate), along with a weighting allocation across these factors, formed the basis of the indirect cost allocation sub-models for the two majority and seven minority materials (glass does not require a sub-model). The sub-models were integrated into the Labor Allocation Cost Model for each site.

G. Site and Survey Tracking

Consistent with the 2016 and 2018 cost surveys, Crowe completed and tracked site and survey process via a secure online SharePoint site instead of the former hard-copy system. All site files were electronically uploaded to the secure portal where reviewers could access them conveniently. The use of the SharePoint site increased security and efficiency. The SharePoint tracking list, augmented by an Excel database, incorporated all previous information associated with the prior reporting system, including a row of descriptive information on each processing fee and handling fee recycling sites.

At any point in time during the surveys, the Crowe business analyst could quickly identify how many sites were in each of nine status completion states, and where each individual site was in the site completion process. They also utilized the site status reporting systems to help prepare monthly progress reports for CalRecycle.

H. Cost Survey Procedures

There were three phases of an individual cost survey, illustrated in **Exhibit 1-7:**

- **Pre-site visit** – Model population, data review, and travel logistics
- **On-site visit** – Site tour, cost survey, and labor interviews
- **Post-site visit** – Data entry, analysis, and follow-up

Exhibit 1-7
Three Phases of the Cost Survey (2020)

Phases	1. Pre Site Visit	2. Site Visit	3. Post Site Visit
Activities	• Scheduling team sends notification letter • Survey team confirms site visit • Survey team reviews information on the site, including prior site files and current cost model • Scheduling team sends follow-up notification letter, as necessary	• Survey team conducts site visit	• Survey team completes site files and uploads files to SharePoint site • Reviewers begin reviewing site files • Survey team responds to comments • Review process ends in final approval
Participants	• Scheduling Team • Survey Team	• Survey Team	• Survey Team • Reviewers

Pre-Site Visit

Before conducting the on-site cost survey, the survey team obtained all available information about that site. Crowe entered recycling volumes for 2020 into the cost model *Excel* file for each site. The survey team evaluated the beverage container tons information to identify the approximate size and scope of the survey. Much of the pre-site visit time was spent on travel logistics and mapping.

On-Site Visit

Each site visit typically lasted from one to three hours, depending on the size and complexity of the site. The primary data-gathering effort took place during the site visit. Survey teams carefully followed procedures outlined in the Training Manual. The survey team first toured the site with site management to view and inquire about the site's operations, such as materials handled, equipment, recycling procedures, and material shipping. In response to the COVID-19 pandemic, the survey team followed State and local COVID guidance while traveling and during on-site visits.

Another key on-site task was reviewing the financial information with site management, or a financial officer, to identify and categorize allowable and non-allowable costs for calculating processing fees, direct and indirect costs, and beverage container indirect (BCI) and all materials indirect (AMI) costs. Team members classified costs into one of the following categories:

- Direct labor
- Other labor
- General business overhead
- Transportation
- Rent
- Depreciation
- Property taxes
- Utilities
- Supplies
- Fuel
- Insurance
- Interest
- Maintenance/repairs
- Not allowable

The next key task was conducting structured labor allocation interviews to determine the allocation of each employee's time first to recycler, processor, or other business, then to direct yard labor or all other labor, and finally by CRV material type or other non-CRV material type. The cost model used this labor allocation information to allocate indirect costs and wages.

Post-Site Visit

After the site visit, the survey team spent from four to ten or more hours further compiling the site data, entering information into the cost model, completing the Site Memorandum and site file, and reviewing the site file. In many cases, site managers did not have all the necessary information available at the site visit, and the survey team had to telephone the recycler to request additional information, or to ask specific questions about the data.

The survey team prepared the *Site Memorandum* using information gathered during the site tour. The *Site Memorandum* summarized important information about the site including: (1) a description of operations, (2) a description of CRV materials handled, (3) the source of financial information, (4) specific sources of payroll information, (5) direct costing, or other special cost considerations, (6) problems encountered and how these problems were solved, (7) final review and comments, and (8) a contact person's name, title, email address, and telephone/fax numbers.

Following the site visit, the team entered the labor information for each employee, as well as the cost summary and direct cost information, into the cost model. Once the data were entered into the cost model, the model calculated costs per ton for each of the CRV material categories recycled at the site. Finally, the survey team compiled and checked all workpapers, and conducted a reasonableness check of survey results before uploading the files to the secure SharePoint site for the manager to conduct the first of several independent office review steps.

I. Quality Control and Confidentiality Procedures

Data quality control (QC) was a primary focus of the cost survey project. Quality control procedures included five separate levels of review and totaled on average 11.5 hours per site. These data QC procedures were essential to ensure that the cost survey results were fair, equitable, accurate, reasonable, justifiable, and defensible.

The quality control process included reviews to:

- Determine what costs were: verified to a documented source; allowable and reasonable; and reconciled to appropriate documentation
- Determine that site procedures were followed and documented by the appropriate site team members
- Verify data entry to the cost survey *Excel* workbook model

- Verify that the labor cost reconciliation was accurate
- Verify consistency of the labor allocations with *Site Memorandum* and site recycling volumes
- Verify that cost per container results were reasonable, or that outliers could be explained by site data information
- Prepare completed and cross-referenced work papers to document the final financial and labor data
- Create a separate file for each site with work papers, notes, and final determination of costs for each CRV material and resin type

This extensive quality control process, with six different individuals or staff teams, determined that each site file was complete and accurate before it was released for data processing and data analysis. Site files that did not meet all the quality control criteria were returned to the original survey team for corrections, if appropriate. Crowe approved data for the final cost per container calculations described in Section 2 after this extensive series of quality control reviews was complete.

Confidentiality was important for the cost survey. The data from each recycling site were not to be disclosed, as release of the data could potentially be compromising to a recycling business. As a result, Crowe developed formal policies regarding confidentiality. Each project team member signed an Employee Confidentiality statement, and in addition, each project team firm signed a similar statement. Records from each site were maintained securely at the Crowe offices after they were completed, and financial printouts and worksheet drafts with site-specific information were shredded. The final site electronic site files will be delivered to CalRecycle for their secure record retention. Computers were protected against unauthorized access through use of security software that requires a password to use the laptops. All electronic files related to site visits were stored on the secure SharePoint site within Crowe's domain, accessible by password only, to survey team members.

J. Distribution of Sample

This subsection covers the distribution of the survey samples for PF and HF recyclers. These data confirm the validity of the survey results. Crowe evaluated the distribution of 2020 cost per container results. One would generally expect a “right skewed” normal distribution of cost per container results from the sample. That is, cost per container can never be less than $0.00 per container, and there is no fixed upper limit on the cost per container. A distribution of RCs by cost per container is expected to be bunched up toward the left, with a "tail" stretching toward the right.

Exhibits 1-8 and **1-9** provide frequency histograms of the cost per container results for sampled HF and PF recyclers. The vertical axis is the number of RCs, and the horizontal axis is the cost per container. The horizontal axis is in one-quarter cent increments. **Exhibit 1-8** provides the HF recycler histogram and **Exhibit 1-9** provides the PF for HF recycler histogram. Both histograms are “right skewed” normal distributions, as were the PF for PF histograms. The more interesting comparison is between 2018 (not shown in the graphic) and 2020, with the following observations:

- The HF distribution was more right-skewed than in 2018, with more sites falling into the left portion of the curve in 2020 (indicative of the significantly lower average cost per container in 2020). In 2020, 58 percent of sampled HF recyclers are below $1.75 cents compared to 32 percent in 2018.
- Similarly, the PF distribution shows a higher portion of recyclers at lower costs compared to the prior survey. In 2020, 70 percent of sampled PF recyclers are below $1.25 cents compared to 50 percent in 2018. This indicates that 50 percent more PF recyclers are at or below the statewide weighted average.

Exhibit 1-8
2020 Sampled Handling Fee Recyclers, Distribution of Cost per Container

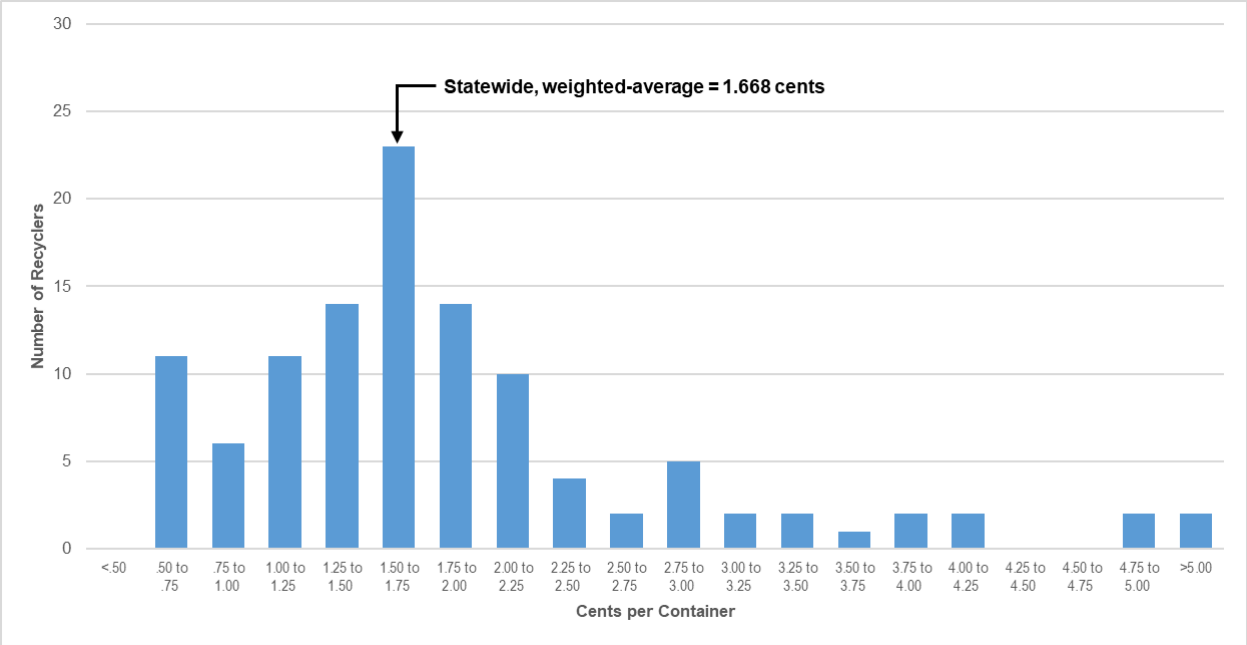
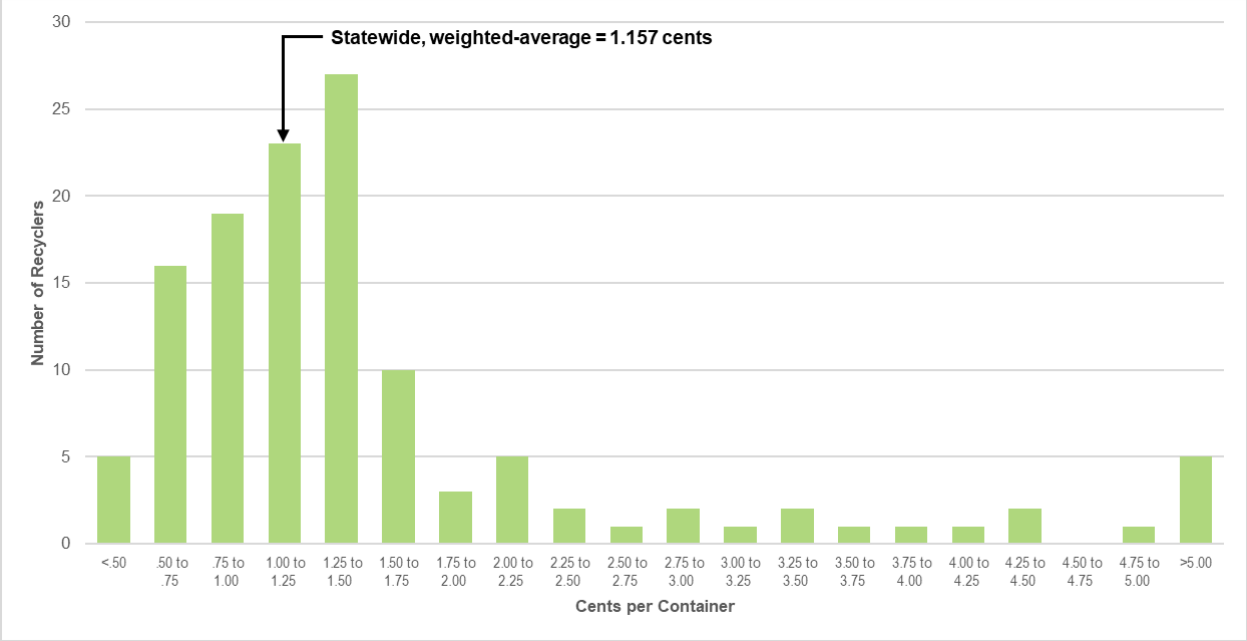


Exhibit 1-9
2020 Sampled Processing Fee Recyclers, Distribution of Cost per Container



2. Handling Fee Cost Calculations and Results

This section describes the calculations used and the final results for the statewide, weighted average cost per container to recycle for processing fee recyclers and handling fee recyclers. This section is organized as follows:

A. Cost Calculations

B. Cost Results

D. Comparison Cost per Container, 2006 to 2020

E. Handling Fee Recycler Cost per Container Decrease

A. Cost Calculations

This handling fee cost survey was the eighth time that CalRecycle calculated cost per container at the statewide level. This section discusses the calculation methodology.

The statewide statistical methodology (stratified weighted average cost, simple weighted average cost, or population weighted average cost) used for either cost per ton calculations or cost per container calculations, were pre-determined by sample design.[2] Crowe utilized two stratified random samples for the handling fee cost survey.

For the stratified random samples, Crowe used a weighted average by strata calculation to determine cost per container. This weighted average by strata calculation is similar to the approach for aluminum, glass, PET #1, and HDPE #2 cost per ton for the processing fee cost survey. **Exhibit 2-1** illustrates the weighted average by strata calculation approach for calculating cost per container.

[2] The Beverage Container Recycling Act specifies that cost per ton and cost per container calculations be based on a statewide weighted average. The Act eliminated the calculation of a simple average (taking the average of each site and dividing by the total number of sites).

Exhibit 2-1
Cost per Container Calculation (2020)

$$\frac{\text{Container Stratum 1 Sample Costs}}{\text{Container Stratum 1 Sample Containers}} \times \text{Container Stratum 1 Population Containers} = \text{Container Stratum 1 Total Population Costs}$$

$$+$$

$$\frac{\text{Container Stratum 2 Sample Costs}}{\text{Container Stratum 2 Sample Containers}} \times \text{Container Stratum 2 Population Containers} = \text{Container Stratum 2 Total Population Costs}$$

$$+$$

$$\frac{\text{Container Stratum 3 Sample Costs}}{\text{Container Stratum 3 Sample Containers}} \times \text{Container Stratum 3 Population Containers} = \text{Container Stratum 3 Total Population Costs}$$

$$\frac{}{\frac{\text{Total Population Costs}}{\text{Total Population Containers}}}$$

$$= \text{Statewide Stratified Weighted-Average Cost Per Container}$$

The handling fee cost survey consisted of two stratified random samples, one for handling fee recyclers, and one for processing fee recyclers. Within each population, recyclers were grouped into one of three strata based on the annual number of containers recycled. While the specific definitions for handling fee container strata and processing fee container strata were different, the overall structures of the two sets of strata were similar. That is, both the handling fee and processing fee container strata were constructed so that the recyclers within each stratum handled approximately one-third of the total number of population containers recycled. This was important because it allowed Crowe to directly compare results of the two cost per container calculations.

The first step in calculating cost per container was to aggregate the individual material cost results from the completed labor allocation cost model for each site. For each recycling site, Crowe calculated total California Redemption Value (CRV) costs by summing CRV costs for each of the ten material types, as determined by the labor allocation cost model and sub-models.

Next, Crowe converted tons of each CRV material to number of containers. The number of CRV containers for a given material type was equal to: tons redeemed in 2020 × 2,000 × CPP, where CPP was the 2020 statewide average containers per pound for each material type, as determined by CalRecycle. They determined the total CRV containers by calculating the number of CRV containers for each material type and summing across all ten material types. For example, for a recycler with 100 tons of aluminum redeemed, the number of aluminum containers was equal to:

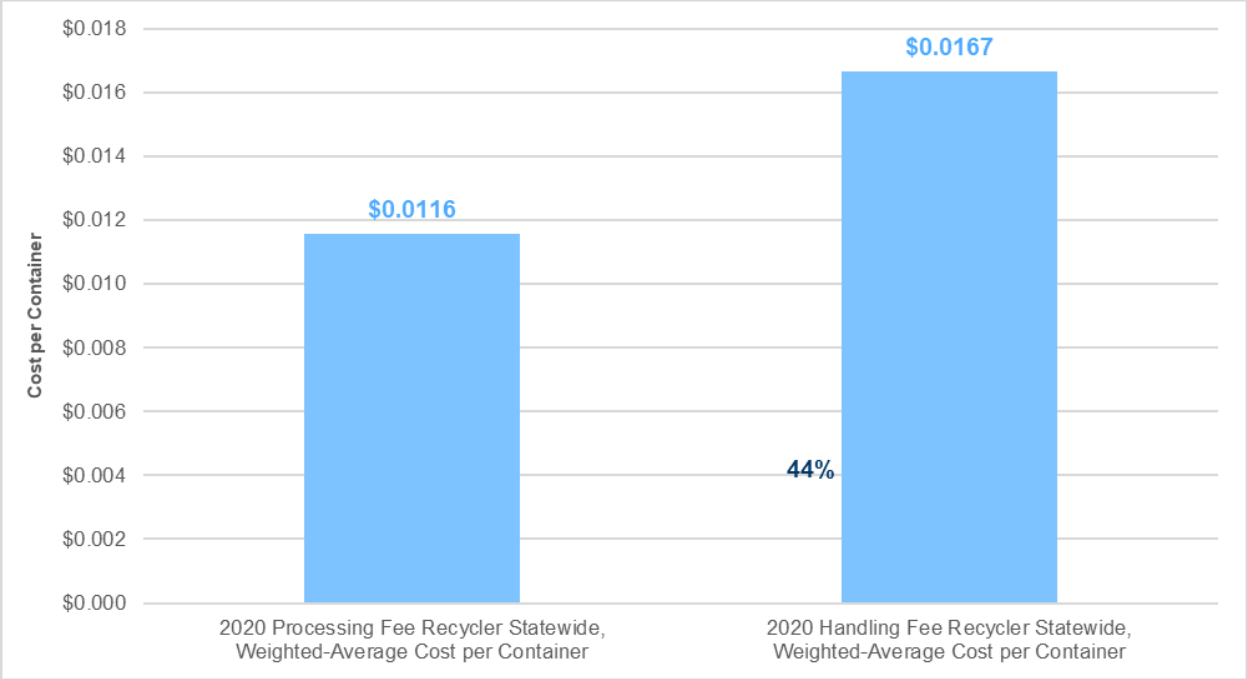
(100 tons) × (2,000 pounds/ton) × (29.45 containers/pound) = 5,890,000 containers.

Individual site CRV costs and CRV containers were combined to determine statewide weighted average costs per container. For the weighted average by stratum calculation for cost per container, Crowe first determined an average sample cost per container for each stratum by dividing total sample CRV costs for the stratum by total sample CRV containers in the stratum, then multiplied that stratum average cost per container by total containers in the stratum population. The final step was to total CRV costs for the three strata and divided by total containers in the population. This calculation is illustrated in **Exhibit 2-1**.

B. Cost Results

The statewide, weighted average, recycler cost per container for handling fee recyclers and processing fee recyclers are presented in **Exhibit 2-2.** The cost to recycle for handling fee recyclers in 2020 was 1.668 cents per container, 44 percent higher than the cost to recycle for processing fee recyclers in 2020, at 1.157 cents per container.

Exhibit 2-2
Handling Fee and Processing Fee Recycler Cost per Container (2020)



Note: Statewide, weighted average cost per container recycled.

Exhibit 2-3 includes the new handling fee payment calculation, 0.511 cents per recycled container, equal to the difference between the handling fee recycler cost per container to recycle, and the processing fee recycler statewide cost per container to recycle, as specified in Section 14585 (f)(3). Under existing law, the Department is scheduled to implement this new handling fee payment starting July 1, 2022.

Exhibit 2-3
Statewide Recycler Costs per Container (2020)

Recycler Type	2020 Statewide, Weighted Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90% Confidence Interval
1. Handling Fee Recycler	1.668 Cents	+44%	6.07%
2. Processing Fee Recycler	1.157 Cents	n/a	5.63%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.511 Cents	n/a	n/a

The sample sizes used to determine the costs per container were estimated to achieve a 90 percent confidence interval. This standard was higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85 percent confidence interval. The 2020 cost per container results for both handling fee recyclers and processing fee recyclers exceeded this target, with low error rates at the 90 percent confidence level of 6.07 percent, and 5.63 percent, respectively.

Exhibit 2-4 compares total number of containers recycled, sample population size, and sample size for handling fee and processing fee recyclers. **Exhibit 2-5** illustrates the cost per container calculations for the two populations of recyclers.

This 2020 handling fee cost survey resulted in the handling fee program's most significant downward shift in the handling fee payment. Between 2006 and 2018 cost years, the calculated handling fee payments fluctuated between 0.77 Cents and 1.04 Cents per container. The resulting 2020 cost year, at 0.511 is 42.8% less than the 2018 cost year. It is also significantly less than cost year 2010, another challenging year that resulted in a 0.77 Cent handling fee payment. The 2020 handling fee payment is 34% less than that of the 2010 cost year.

Exhibit 2-4
Handling Fee and Processing Fee Recyclers Number of Containers Recycled, Population Sizes, and Sample Sizes (2020)

Recycler Type	Total Number of Containers Recycled	Sample Population Size (sites)	Sample Size (sites)
1. Handling Fee Recyclers	4.25 billion	442	113
2. Processing Fee Recyclers	9.37 billion	581	127

Exhibit 2-5
Strata and Population Costs and Volumes (2020)

Handling Fee Recyclers

Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$8,242,865.69	621,492,910	$0.01326	$18,636,102.96	1,405,118,838
2	$6,992,500.52	456,007,612	$0.01533	$21,841,459.02	1,424,364,796
3	$5,693,255.37	266,344,158	$0.02138	$30,576,374.02	1,430,436,203
Total	n/a	n/a	n/a	**$71,053,936.00**	**4,259,919,837**

Handling Fee Recycler Statewide, Weighted Average Cost per Container: **$0.01668**

Processing Fee Recyclers

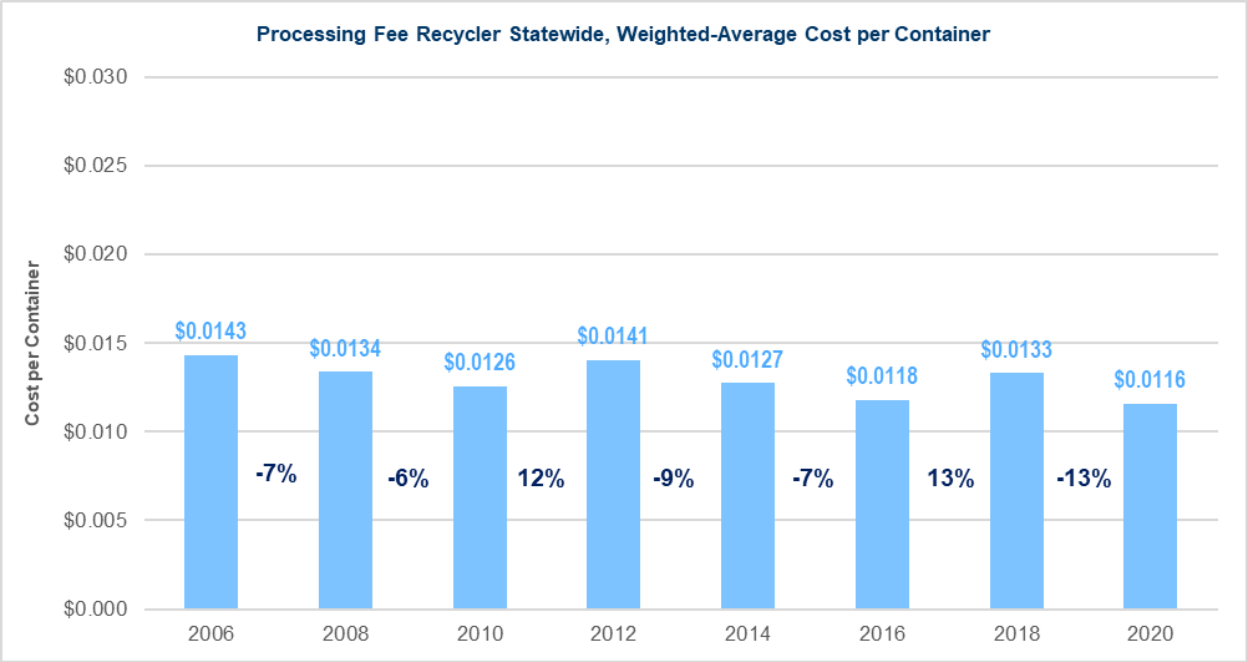
Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$9,564,988.90	1,055,271,269	$0.00906	$28,261,259.28	3,117,964,406
2	$10,328,524.64	975,810,583	$0.01058	$33,268,440.26	3,143,110,677
3	$7,789,170.49	516,403,030	$0.01508	$46,987,317.36	3,115,144,687
Total	n/a	n/a	n/a	**$108,517,016.90**	**9,376,219,770**

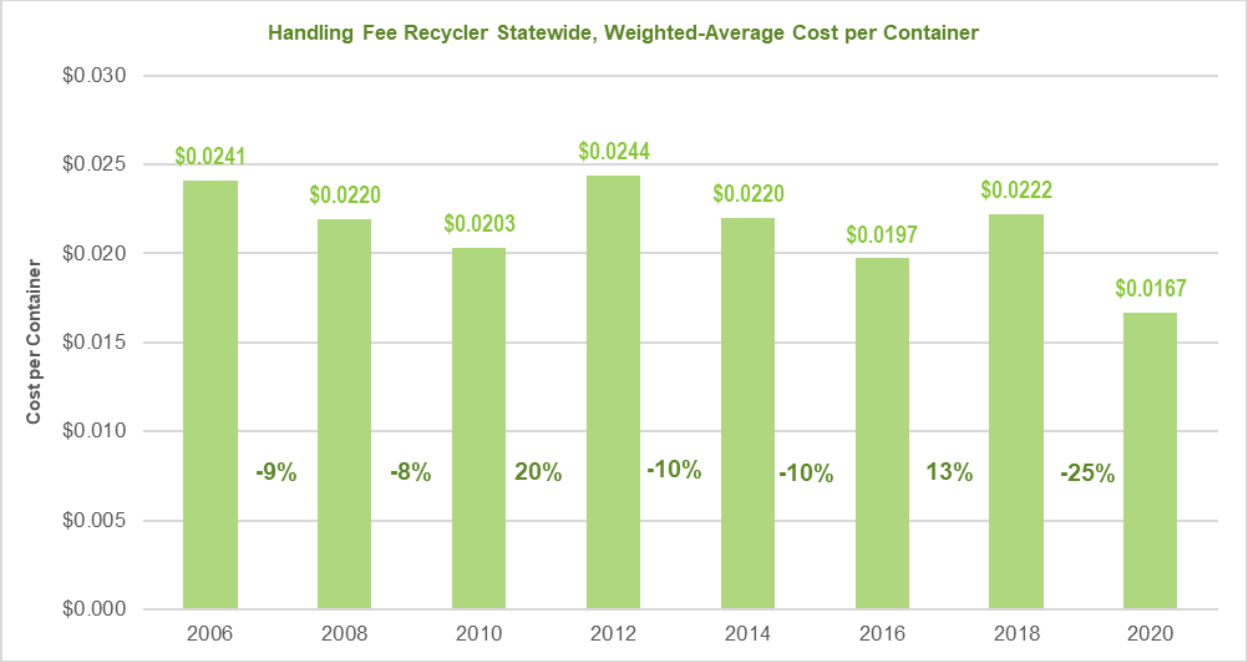
Processing Fee Recycler Statewide, Weighted Average Cost per Container: **$0.01157**

C. Comparison Cost per Container, 2006 to 2020

Exhibit 2-6 compares the statewide, weighted average cost per container for processing fee and handling fee recyclers from the seven handling fee cost surveys (even years, 2006 to 2020). Costs per container decreased by 13 percent in 2020 for processing fee recyclers and 25 percent for handling fee recyclers. The processing fee recycler decrease in cost per container between 2018 and 2020 is consistent with the processing fee cost survey result, in which the 2020 costs per ton for aluminum and PET #1 decreased.

Exhibit 2-6
Processing Fee and Handling Fee Recycler Cost per Container (2006–2020)





Note: Statewide, weighted average cost per container recycled.

Between 2006 and 2008, the processing fee recycler cost per container decreased 7 percent, while the handling fee recycler cost per container decreased 9 percent. Between 2008 and 2010, the processing fee recycler cost per container decreased 6 percent, while the handling fee recycler cost per container decreased 8 percent. For both surveys, these decreases were consistent with the processing fee cost survey cost per ton results.

Between 2010 and 2012, the processing fee recycler cost per container increased 12 percent, while the handling fee recycler cost per container increased 20 percent. This trend was reversed between 2012 and 2014, which saw a decrease of 9 percent in the processing fee recycler cost per container and a decrease of 10 percent in the handling fee recycler cost per container. This downward trend continued in 2016 with a decrease of 7 percent in the processing fee recycler cost per container and a decrease of 10 percent in the handling fee recycler cost per container. While the 2018 costs per container increased, they are still below the highest costs per container, seen in 2012.

The decrease in HF recycler cost per container between 2018 and 2020 is due to the interrelationship between several factors: recycler center productivity, labor hours, and costs. Crowe examined several selected factors that may have caused the decrease in cost per container for handling fee recyclers and processing fee recyclers in order to test the credibility of the full cost survey results. As a result of the analyses, Crowe is confident that the cost per container results are a valid reflection of handling fee recyclers and processing fee recyclers CRV recycling operations during 2020.

Several factors combine to influence recycling center costs, containers, and cost per container, both upward and downward. Consistent with the processing fee cost survey, recyclers incurred lower overall labor costs and general business overhead. Both factors were significant contributors to the lower cost per container. Crowe also examined the impact of costs provided by the largest handling fee recycler operator (now closed) on handling fee recycler cost per container.

Exhibit 2-7 and **Exhibit 2-8** provide comparisons of the results for the last eight handling fee cost surveys including 2020. The handling fee payment, as of July 1, 2022, will result in a decrease of 43 percent in the per container handling fee payments. The error rates for the 2022 handling fee cost survey were consistent with prior years. Both error rates, calculated at the 90 percent confidence level, were well below 10 percent.

Exhibit 2-7
Statewide Handling Fee and Processing Fee Recycler Costs per Container and Handling Fee (2006 to 2020)

Statewide, Weighted Average, Cost per Container

Recycler Type	2020	2018	2016	2014	2012	2010	2008	2006
1. Handling Fee Recycler	1.157 Cents	2.224 Cents	1.972 Cents	2.198 Cents	2.440 Cents	2.029 Cents	2.196 Cents	2.410 Cents
2. Processing Fee Recycler	1.668 Cents	1.330 Cents	1.179 Cents	1.274 Cents	1.405 Cents	1.256 Cents	1.337 Cents	1.430 Cents
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.511 Cents	0.894 Cents	0.793 Cents	0.924 Cents	1.035 Cents	0.773 Cents	0.859 Cents	0.980 Cents

Percentage Change

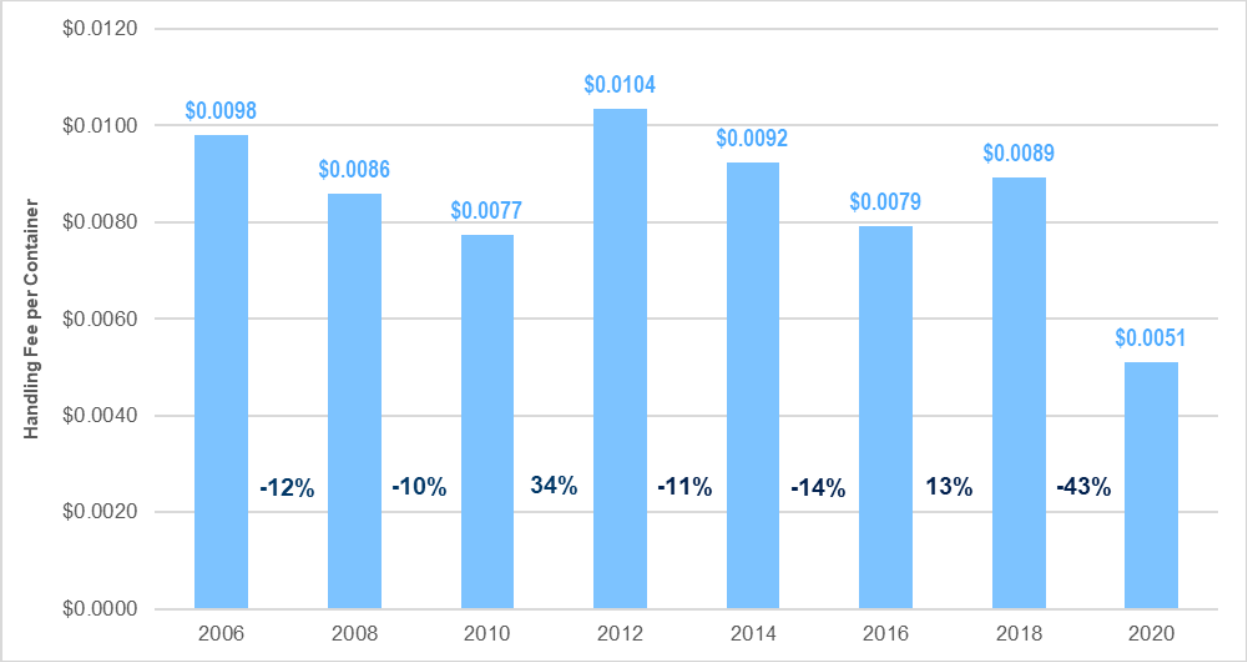
Recycler Type	2018 to 2020	2016 to 2018	2014 to 2016	2012 to 2014	2010 to 2012	2008 to 2010	2006 to 2008
1. Handling Fee Recycler	-13%	13%	-10%	-10%	20%	-8%	-9%
2. Processing Fee Recycler	-25%	13%	-7%	-9%	12%	-6%	-7%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	-43%	13%	-14%	-11%	34%	-10%	-12%

Exhibit 2-8
Statewide Handling Fee and Processing Fee Recycler Cost Survey Error Rates at 90% Confidence Interval (2006 to 2020)

Recycler Type	2020	2018	2016	2014	2012	2010	2008	2006
1. Handling Fee Recycler	6.07%	4.94%	5.07%	4.09%	4.37%	5.62%	5.17%	6.31%
2. Processing Fee Recycler	5.63%	6.70%	6.98%	7.03%	6.30%	5.79%	7.10%	6.16%

Exhibit 2-9 illustrates the eight per container handling fees, as measured by the eight cost surveys. The measured handling fee for a given year becomes effective on July 1, two years after the survey cost year. For example, the costs calculated for 2020 determine the handling fee effective on July 1, 2022. Between the 2018 survey year and the 2020 survey year, the handling fee will decrease 43 percent. The measured handling fee per container dropped by 12 percent between 2006 and 2008 survey years, from 0.980 to 0.859 cents per container. The measured handling fee dropped another 10 percent between 2008 and 2010 survey years, to 0.773 cents. CalRecycle made an administrative decision to maintain the prior $0.0089 cent per container handling fee (the calculated rate plus a cost-of-living increase) for July 2012. The measured handling fee increased 34 percent between 2010 and 2012 survey years and the handling fee decreased 11 percent between 2012 and 2014 survey years. The handling fee decreased 14 percent between 2014 and 2016 survey years. From 2016 to 2018, the handling fee increased by 13 percent. Note that CalRecycle applies a cost-of-living adjustment (COLA) to handling fees, so actual per container payments are slightly higher than the calculated results.

Exhibit 2-9
Handling Fee Cost Survey Calculated Handling Fee Payments (2006 to 2020)



D. Handling Fee Recycler Cost per Container Decrease

The handling fee cost per container decreased 25 percent between 2018 and 2020. This section discusses several factors that likely contributed to the lower HF cost per container and resulting lower handling fee payment. Crowe examined several selected factors that may have caused the decrease in cost per container for handling fee recyclers and processing fee recyclers, to test the credibility of the full cost survey results. The lower costs per container results from this handling fee cost survey are consistent with the lower costs per ton results of the processing fee cost survey.

Importance of Number of Containers Recycled

Cost per container is highly dependent on the number of containers recycled. **Exhibit 2-10** provides a comparison of the HF recycler cost per container and the number of containers recycled by the HF recycler population for the eight handling fee cost surveys. **Exhibit 2-10** shows that in most years, cost per container decreased between survey years when the number of containers recycled increased, and cost per container increased when containers recycled decreased. However, in 2020, cost per container decreased, even with a slight decrease in number of containers recycled. This indicates that non-volume factors contributed to the cost decrease (primarily the greater reduction in the number of handling fee recyclers).

Exhibit 2-10
Cost per Container Results and Containers Recycled by the Survey Population Handling Fee Recyclers (2006 to 2020)

Survey Year	Cost per Container (cents)	Percent Change in Cost per Container	Population Containers Recycled	Percent Change in Containers Recycled
2006	2.410		3,108,522,318	
2008	2.196	-9%	3,992,318,572	+28%
2010	2.029	-8%	4,562,408,591	+14%
2012	2.440	+20%	3,837,216,107*	-16%
2014	2.198	-10%	4,157,132,629	**+8%**
2016	1.972	-10%	4,520,190,932	+9%
2018	2.224	+13%	4,640,870,876	+3%
2020	1.668	**-25%**	4,259,919,837	**-8%**

Note: Containers recycled by the full population of 985 HF recyclers in 2012 and by the survey population of 920 HF recyclers in 2014, 706 recyclers in 2016, 669 recyclers in 2018, and 442 recyclers in 2020.

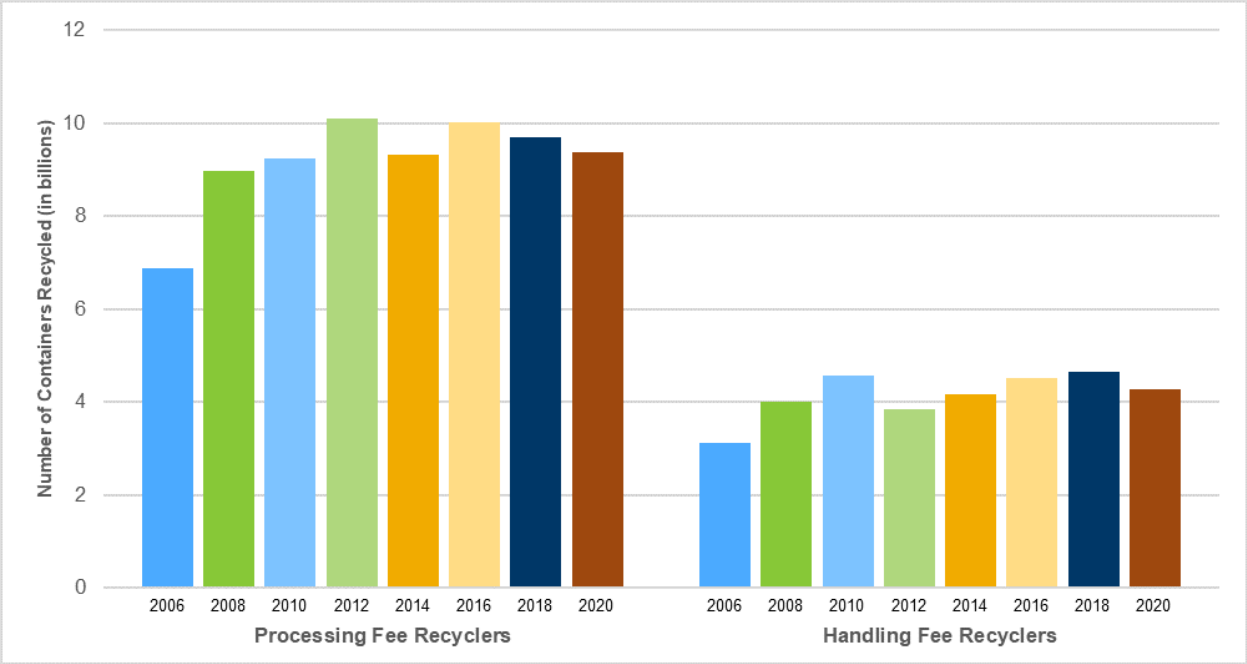
The importance of number of containers recycled applies to the overall results but starts at the individual recycling center level. In determining CRV costs at an individual recycling center, there is sometimes an opportunity to allocate costs between CRV and non-CRV (including other business) categories. However, most handling fee recyclers only handle CRV material. For example, of the 113 HF for HF recyclers surveyed for 2020, only 4 percent of total labor hours were associated with non-CRV recycling. Thus, the cost per HF container is primarily based on all the recycling center's (RC's) costs, divided by all the RC's containers. To the extent that many RC costs are essentially fixed, the number of containers has a great influence on cost per container. For PF recyclers, costs (and labor) are more often distributed across CRV and non-CRV categories, so cost per container is less dependent on number of containers recycled.

Once the survey team has identified CRV costs at the individual RC, the number of containers recycled is the only variable in the cost per container calculation: CRV costs ÷ CRV containers. By comparison, the material-specific cost per ton calculations of the processing fee cost survey have an additional variable: the percent of labor spent on aluminum/bi-metal, glass, and plastic recycling. For any given RC, and for employees at the RC, the percent of labor spent on each of the three categories varies. Thus, cost per ton values are dependent on both tons of material and labor allocations, reducing the dependency on quantity of material recycled.

The importance of the number of containers recycled at the individual level is multiplied at the sample level, and then extrapolated to the respective HF and PF recycler populations. HF recycler costs primarily consist of CRV-only costs. PF recycler costs consist of a mix of CRV and non-CRV costs. Changes in the number of containers recycled, upward or downward, are generally amplified among handling fee recyclers, as compared to processing fee recyclers.

Exhibit 2-11 provides a comparison of containers recycled by the PF and HF cost survey populations over the eight handling fee cost surveys. Comparing the equivalent full population data, PF containers recycled increased each year from 2006 to 2012, decreased in 2014, increased again in 2016, and then decreased each year through 2020. HF containers recycled increased between 2006 and 2010, decreased in 2012 to levels below that of 2008, increased 2014 to 2018, and then decreased in 2020. Thus, at the population level, the decrease in containers recycled occurred among both HF and PF recyclers in 2020.

Exhibit 2-11
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2006 to 2020 Populations)



Cost of One Company that Owns a Large Number of Handling Fee Recycling Centers

The closure of a large recycling operation is a primary driver of the reduced handling fee recycler cost per container in 2020. During 2018, this recycler operated as many as 328 HF recycling centers (dropping to approximately 280 by the end of 2018). As of August 2019, the recycler closed all their remaining recycling centers. In the 2018 Handling Fee Cost Survey, Crowe randomly selected 40 HF sites from this company representing 26 percent of the container volume for the sampled HF recyclers for that year.

The closure of this company influenced handling fee recycler costs for three key reasons: (1) its RCs represented a significant portion of the recycler population (e.g., half of the 2018 population), so Crowe surveyed a large number of their RCs in the HF survey sample, (2) the company typically operated smaller recycling centers, and (3) the reduction in the number of HF recyclers contributed to the higher average containers per HF recycler and thus lower costs per container.

Cost Differential between Handling Fee Recyclers and Processing Fee Recyclers

The increase in HF recycler cost per container clearly has implications on the handling fee payment, as does the increase in PF recycler cost per container. The handling fee payment is the difference between the cost to recycle for recyclers that receive handling fees (HF recyclers) and the cost to recycle for recyclers that do not receive handling fees (PF recyclers):

Handling Fee = HF Cost/Container – PF Cost/Container.

To determine the handling fee, Crowe compares costs between similar samples of HF and PF recyclers. Both populations are stratified, with approximately one-third of containers recycled within each of the three strata. Because they utilize parallel sample designs, they can be assured that they are making an appropriate comparison, to the extent possible.

PF recycler cost per container to recycle decreased 13 percent between 2018 and 2020, from 1.133 cents per container to 1.157 cents per container. The 13 percent decrease in PF recycler cost per container is reasonably consistent with the decreases seen in the PF recycler cost per ton results (where aluminum and PET cost per ton decreased). The calculated 0.511 cents per container handling fee payment from this cost survey represents a 42.8 decrease from the 0.894 cents per container calculated in the 2018 HF cost survey.

The impact of the differential can move in both directions. For example, in the 2012 cost survey, the HF recycler cost per container increased 20 percent as compared to 2010, and the PF recycler cost per container increased 12 percent as compared to 2010. The calculated 2012 handling fee payment increased 34 percent as compared to 2010. The 2020 survey is consistent with the prior six HF cost surveys (not including 2018) where handling fee recycler costs changed in the same direction, and more than, processing fee recycler costs. In these cases, there are greater changes in handling fee payment, as compared to the changes for either HF or PF recycler costs per container.

3. Handling Fee Cost Analyses

This section provides analyses of the cost per container results for the handling fee cost survey. The section is organized as follows:

A. *Changes in Number of Recyclers, Costs, and Recycled Containers*
B. *Changes in Recycling Center Productivity and Costs*
C. *Total Annual Handling Fee Payments*
D. *Comparison of Population Size, Containers Recycled, and Costs by Strata*
E. *Comparison of Population Characteristics of Processing Fee and Handling Fee Recyclers*
F. *Summary of Handling Fee Cost Survey Analyses*

A. Changes in Number of Recyclers, Costs, and Recycled Containers

Introduction

The statewide, weighted average cost per container for the HF for HF RCs, and for the PF for HF RCs, is the quotient determined by dividing the estimated statewide weighted cost of recycling the CRV material, calculated from the handling fee cost survey (numerator), by the number of containers recycled, determined from CalRecycle reporting systems (denominator). Changes in the HF for HF, and PF for HF, cost per container from survey-to-survey result from increases, or decreases, in CRV costs, and in CRV containers recycled. There is generally an inverse linear relationship between costs of recycling and containers recycled (costs decrease as the number of containers decrease). However, the relative increase, or decrease, in costs and containers between any two given cost surveys are not necessarily the same.

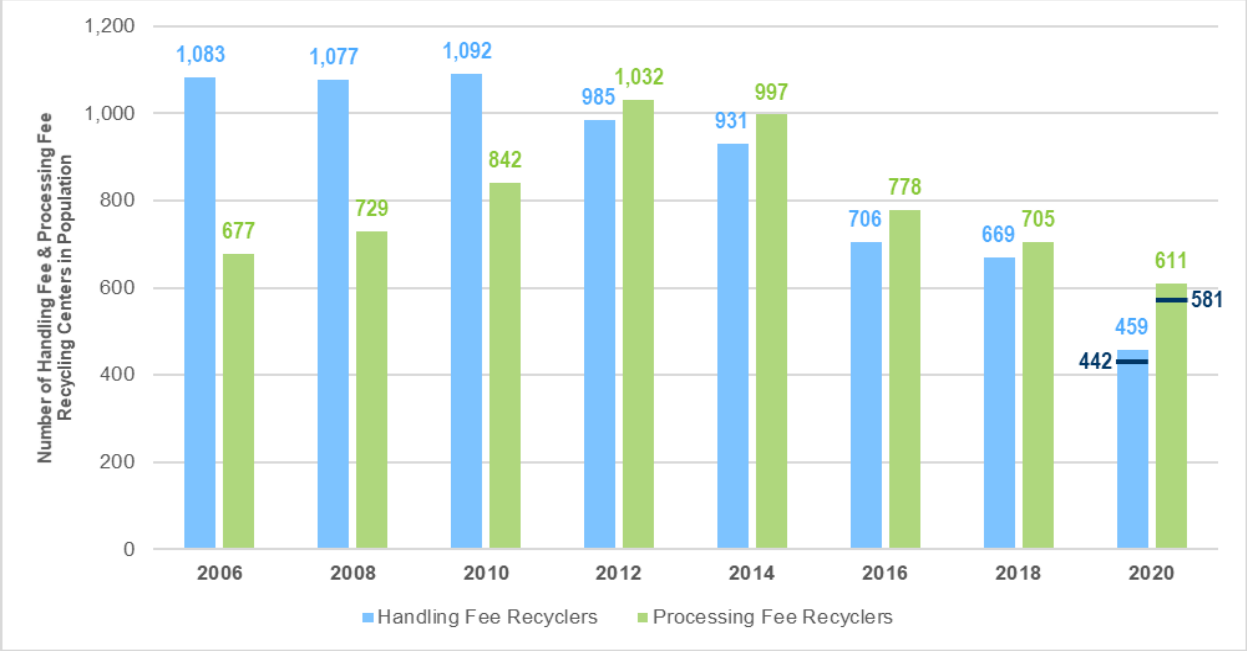
This subsection presents a series of graphs that explore the relationship between population CRV costs and containers recycled, over time, and how changes in these two variables impact changes in the cost per container, over time. The subsection that follows examines the impact of these changes on cost per container results.

Historical Trends in Population Number of Recyclers

The population costs and recycled containers are related, to some extent, to the number of recycling centers (RCs) in the population. In any given survey year, each recycler in the population may recycle more, or less, CRV materials. Generally, recyclers handling more containers have a lower cost per container than recyclers handling fewer containers.

Exhibit 3-1 provides the number of HF and PF recyclers during each of the seven prior and current, handling fee cost survey years. **Exhibit 3-1** displays the downward trend in HF RCs, since 2010. The number of HF RCs decreased 31 percent between 2018 and 2020. This 210 HF RC population reduction between 2018 and 2020 is the second largest drop in RCs (second only to the reduction between 2014 and 2016 HF populations), and the largest percentage decrease since 2006.

Exhibit 3-1
2006 through 2020 Populations, Number of Handling Fee Recycling Centers and Processing Fee Recycling Centers



Note: The 2020 bar includes 30 PF Recyclers and 17 HF Recyclers being investigated, these were removed from the survey population (442 HF recyclers and 581 PF recyclers).

The volume of containers recycled by HF RCs decreased by eight percent during the same period. When the number of HF RCs declines more than the number of containers recycled, the amount of recycled material available to each HF RC, on average, increases.

The number of PF RCs peaked in 2012 with 1,032. The PF RCs has been trending downward since 2012 and decreased 14 percent between 2018 and 2020. Similar to the trend with HF recyclers to a lesser extent, the total number of containers recycled decreased 3 percent.

Containers recycled by handling fee RCs increased between 2006 and 2010, declined between 2010 and 2012, and increased from 2012 to 2018 before decreasing in 2020. **Exhibits 3-2** and **3-3** provide historical trends in total population costs and total population containers, beginning with the 2006 handling fee cost survey and extending to the current 2020 handling fee cost survey. Population cost data are estimated from the handling fee cost survey. Population container data are based on CalRecycle reports.

Exhibit 3-2
Population CRV Costs and Containers of Handling Fee Recyclers
(2006 through 2020)

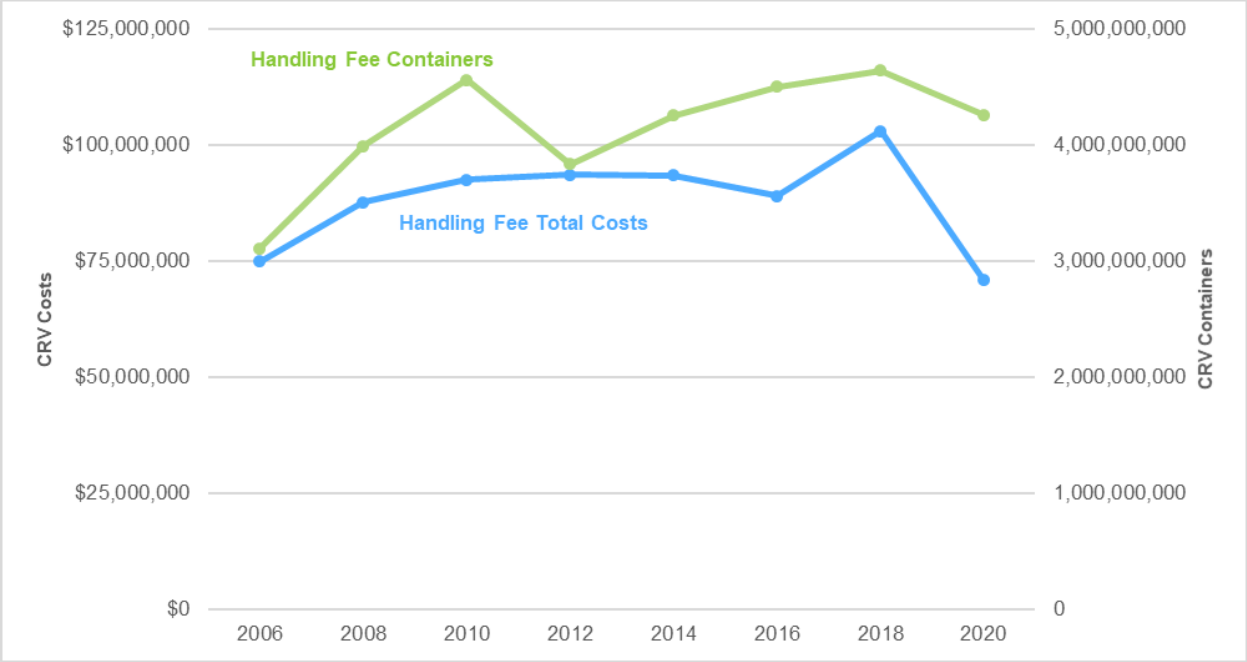
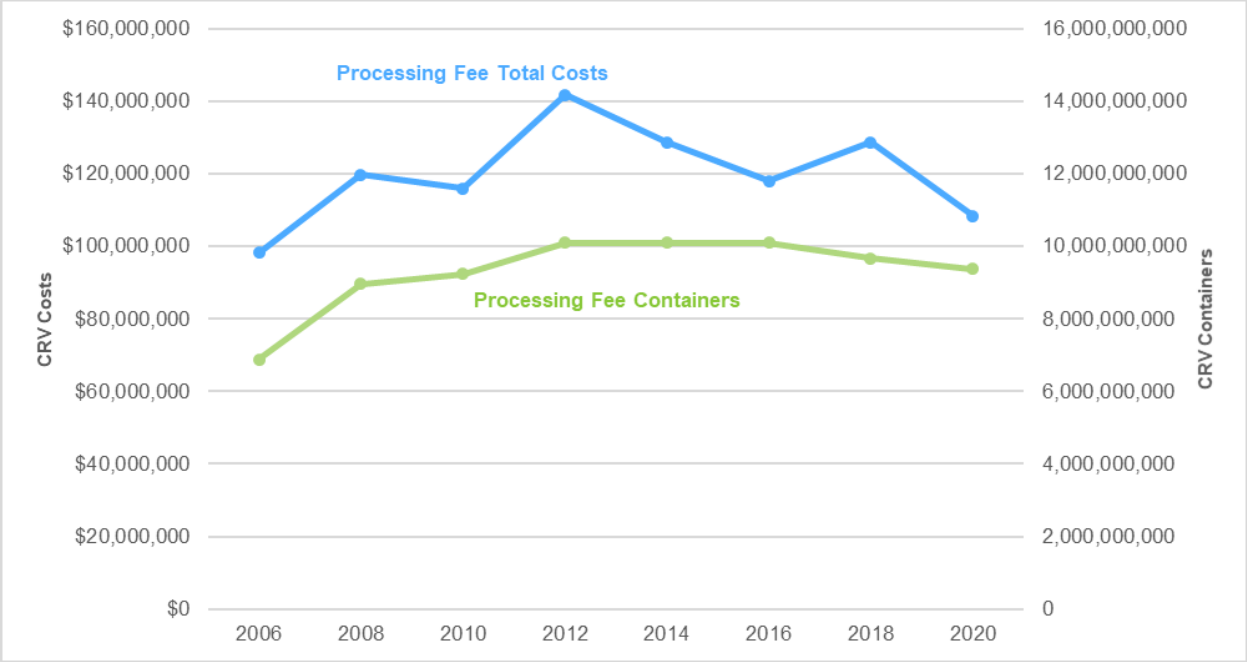


Exhibit 3-3
Population CRV Costs and Containers of Processing Fee Recyclers
(2006 through 2020)



The statewide weighted average cost per container result for each year for HF RCs and for PF for HF RCs are essentially equal to the cost data point in each chart (in blue) divided by the containers data point (in green). The change in the relative distance between the costs and containers lines over time provides an indication of change in cost per container from year to year. Examples include the following:

- When the containers line is below the costs line, an increasing distance between the two lines is reflected as an increase in cost per container. In this case, the denominator (containers) is inclining relative to the numerator (costs), resulting in a smaller quotient. For example, in **Exhibit 3-2**, the widening of the distance between 2010 and 2012 HF data points represents a 20 percent increase in HF cost per container. Similarly, the increase in total cost in 2018 relative to the smaller increase in total containers resulted in a 13 percent increase in cost per container. In 2020, the decrease in costs was larger than the decrease in containers, resulting in a decrease in cost per container.
- When the containers line is below the costs line, a decreasing distance between the two lines is reflected as a decrease in cost per container. In this case, the denominator (containers) is decreasing at a lower rate relative to the numerator (costs), resulting in a smaller quotient. For example, in **Exhibit 3-3**, the narrowing of the distance between 2012 and 2014 PF data points represents a 9 percent decrease in PF cost per container. Similarly, the closing of the distance between the 2014 and 2016 data points reflects the continued decrease in cost per container. The increase of containers relative to costs in 2020 reflects a decrease in cost per container.

B. Changes in Recycling Center Productivity and Costs

Introduction

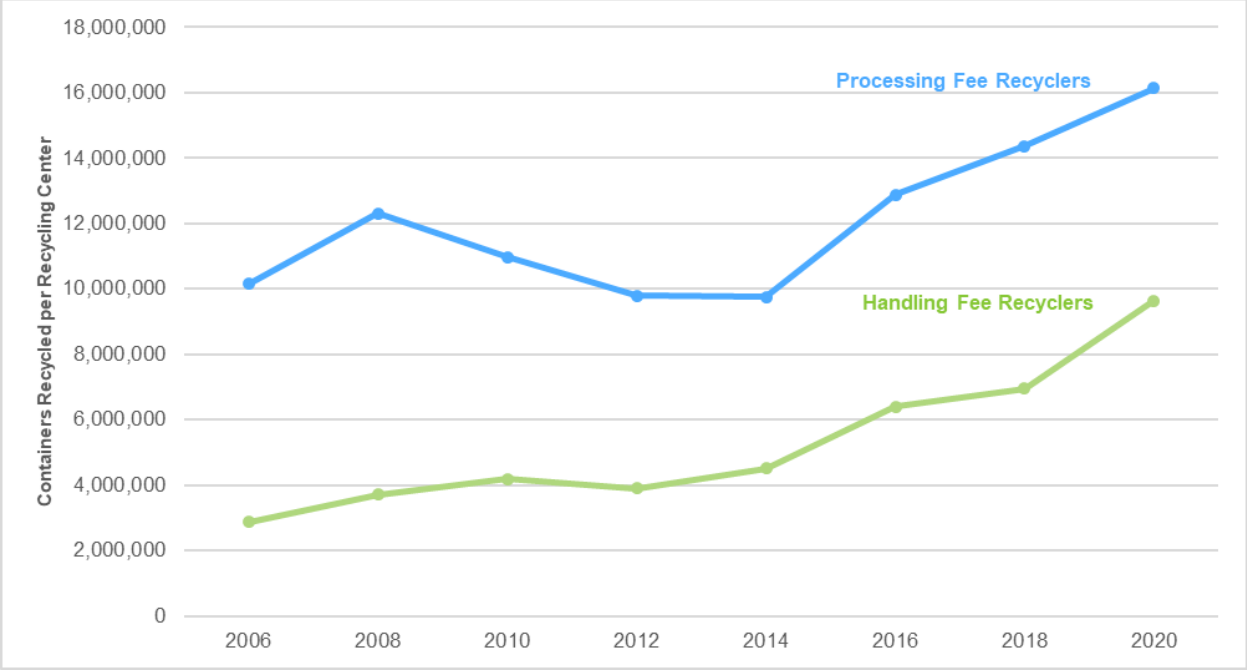
The decrease in cost per container for 2020 is due to the interrelationship between several factors: recycling center productivity, labor hours, and costs. From 2018 to 2020, productivity levels, measured as containers recycled per RC, significantly increased and labor hours per 1,000 containers recycled decreased for processing fee recyclers and significantly decreased for handling fee recyclers. For all sampled recyclers, less labor time was spent handling containers. By comparison, there was only a small increase in wages per hour. While average cost per RC was either flat or decreased in 2020, RC productivity (measured in containers per recycling center) increased significantly. The combination of these factors contributed to lower costs per container.

Average Containers Recycled per Recycling Center

The productivity of handling fee recycling centers (i.e., the average number of containers recycled per RC) has generally been increasing, with a dramatic increasing starting in 2014. There has been a similar steep increase in average containers per RC (productivity) for PF recyclers.

Exhibit 3-4 provides the average number of containers recycled per RC, for the cost survey years 2006 through 2020. Each cost survey year's data point is the quotient determined by dividing population containers recycled by the number of RCs in the population. The 2020 productivity significantly increased from 2018. Productivity increased to a much greater extent for handling fee recyclers with a 39 percent increase compared to a 12 percent increase for processing fee recyclers. This difference of 27 percentage points between handling fee and processing fee recyclers is the largest difference observed in the past seven surveys (average difference is 10 percentage points). The larger the positive difference, the smaller difference between handling fee and processing fee cost per container.

Exhibit 3-4
Average Containers Recycled per Handling Fee Recycler and Processing Fee Recycler (2006 through 2020)



More productive RCs that recycle more containers generally have lower costs per container than less productive RCs (i.e., those recycling less material). As a result, large increases in recycler productivity contributed to the lower cost per container results in 2020, compared to 2018.

Exhibit 3-5 shows a comparison of the average number of containers recycled per handling fee recycler, while **Exhibit 3-6** shows the same comparison for processing fee recyclers. Generally, as the number of recyclers decrease, the number of containers per recycler increases. The significant 39 percent increase in the number of containers per handling fee recycler is driven by two factors (1) a 31 percent decrease in the number of recyclers, (2) an 8 percent decrease in the total number of containers recycled. The moderate 12 percent increase in the number of containers per processing fee recycler is driven by two factors: (1) a 13 percent decrease in the number of recyclers, (2) a 3 percent decrease in the total number of containers recycled. The large decrease in the number of recyclers for handling fee recyclers is largely due to the closure of one large recycler while the decrease in the number of processing fee recyclers is likely due to the combination of the negative effects of the 2020 COVID-19 pandemic to the recycling industry.

Exhibit 3-5
Average Containers Recycled per Handling Fee Recycler with Number of Handling Fee Recyclers (2006 through 2020)

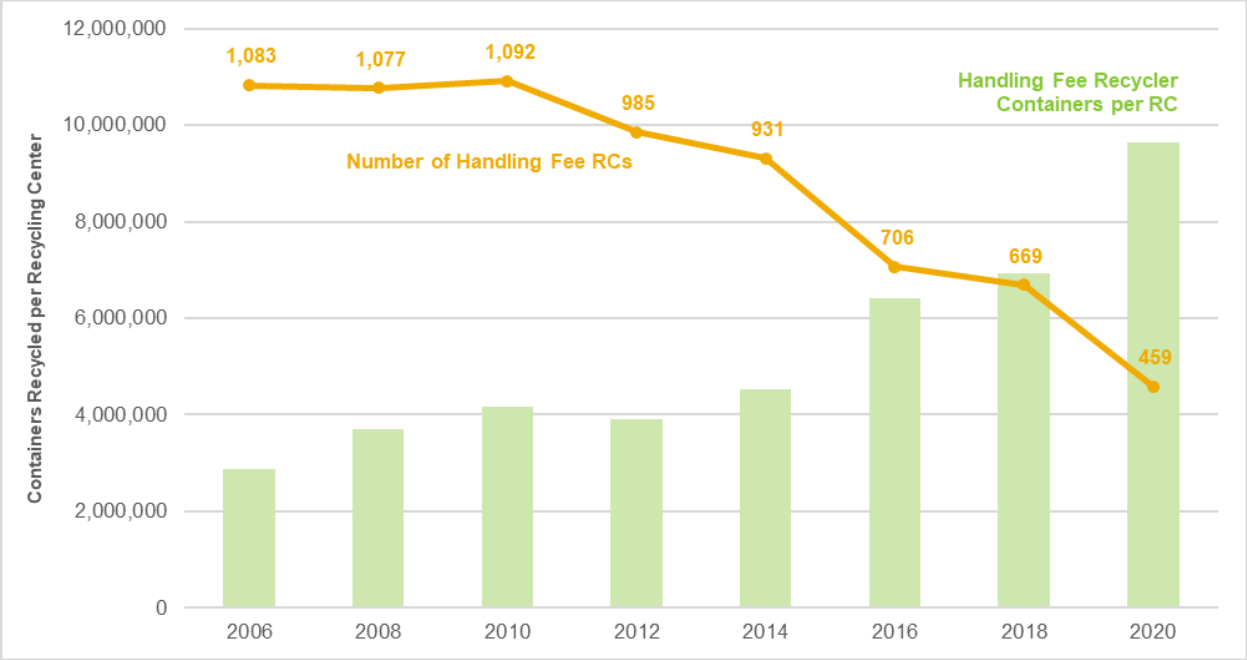
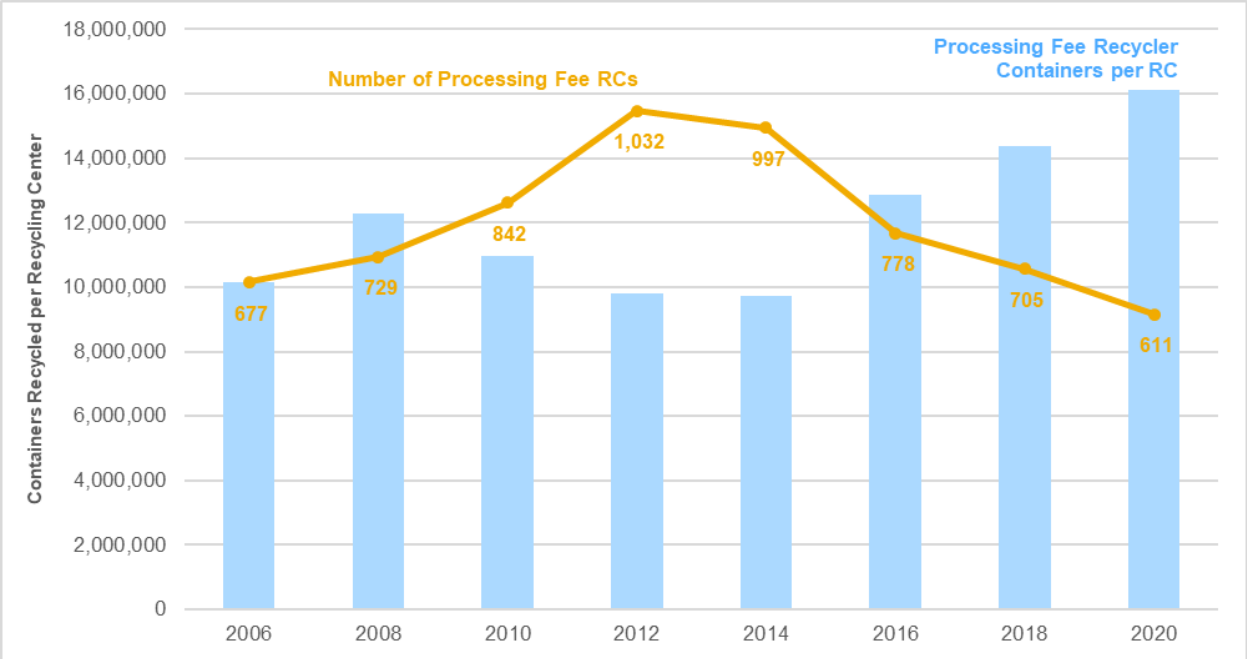


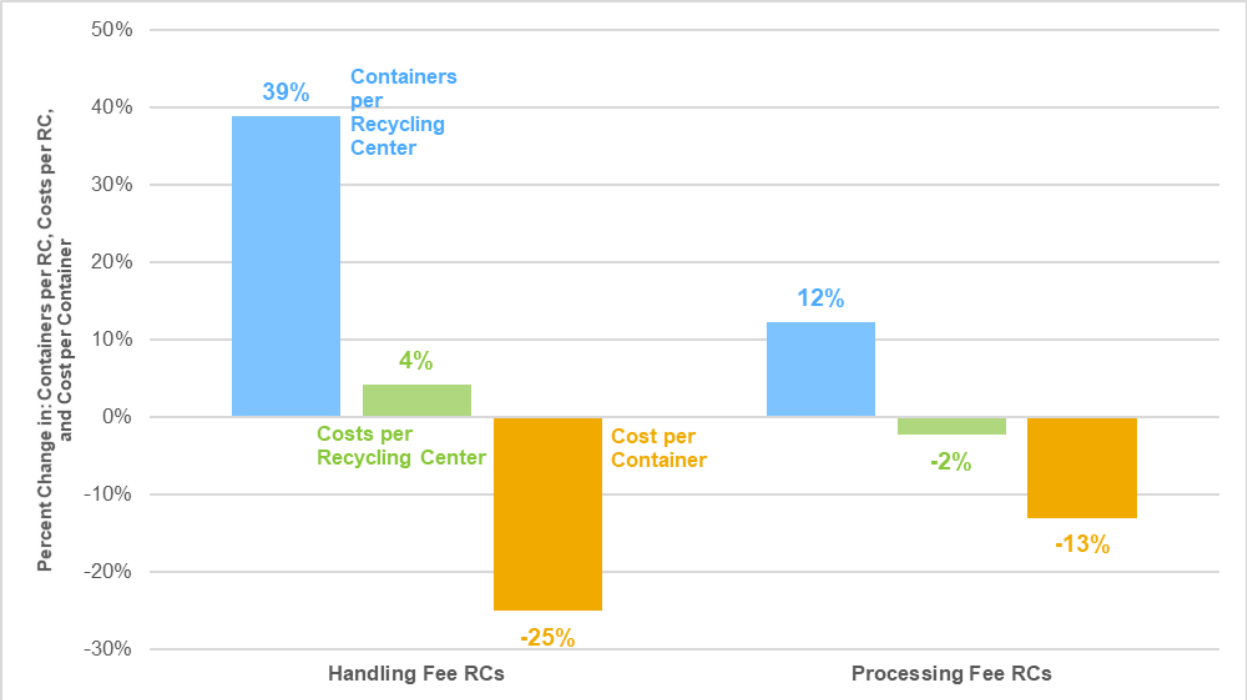
Exhibit 3-6
Average Containers Recycled per Processing Fee Recycler with Number of Processing Fee Recyclers (2006 through 2020)



Change in Containers per RC, Costs per RC, and Cost per Container

Exhibit 3-7 summarizes the relationship between RC productivity, costs, and cost per container. The figure shows the percent change between 2018 and 2020 in containers per RC, costs per RC, and statewide, weighted average cost per container. For handling fee recyclers, productivity, measured as containers recycled per RC, increased at a significantly higher rate than costs per RC, resulting in a significant decrease in cost per container. Processing fee recyclers experienced a similar trend to a lesser extent. The difference in percentage points between the change in containers and costs per RC for handling fee recyclers is 35 percent (+39 and +4 percent), while it was 10 percent (+12 and -2 percent) for processing fee recyclers. The smaller changes for processing fee recyclers contributed to a smaller decrease in cost per container.

Exhibit 3-7
2018 and 2020 Sampled Handling Fee and Processing Fee Recyclers Percent Change in Containers per Recycler, Percent Change in Costs per Recycler, and Percent Change in Statewide, Weighted Average Handling Fee Recycler and Processing Fee Recycler Cost per Container

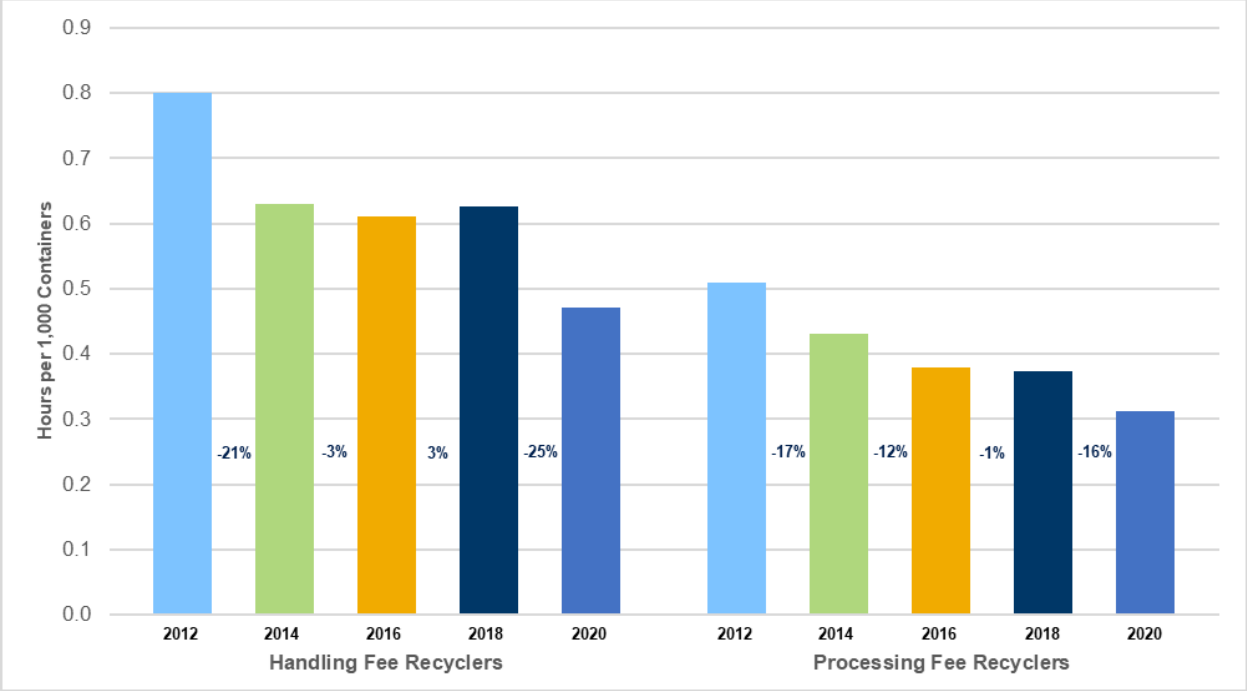


Labor Hours per 1,000 Containers Recycled

The labor hours required to handle 1,000 CRV beverage containers is another measure of RC productivity and is a factor that has a direct impact on cost per container. Crowe calculated, and compared, the average handling fee and processing fee recycler labor hours allocated per 1,000 containers recycled, for the 2012, 2014, 2016, 2018, and 2020 surveys. **Exhibit 3-8** shows the labor hours allocated per 1,000 CRV containers recycled. Across the years, the labor input required per 1,000 containers has been in a decreasing trend. The largest decrease occurred between 2018 and 2020 with handling fee recyclers decreasing by 25 percent and processing fee recyclers decreasing 16 percent. These record decreases in labor hours per 1,000 containers indicates a significant increase in productivity between years.

The increases in productivity were a key contributor to lower overall costs especially as labor represents over half of a recycler's costs. It's important to note that productivity for handling fee recyclers increased to a greater extent than processing fee recyclers, which contributes to a smaller difference between overall cost.

Exhibit 3-8
2012 to 2020 Sampled Handling Fee Recyclers and Processing Fee Recyclers Average Labor Hours per 1,000 Containers Recycled



Cost Category Comparison

In conducting the cost surveys, Crowe assigns each recycler cost line item to one of thirteen categories. To help evaluate potential reasons for the cost per container decreases between 2020 and 2018, they compared the average CRV category costs among HF for HF and PF for HF recyclers for the two survey years. This data reflects the total costs in a particular category divided by the number of sampled RCs. They do not consider costs by strata or recycled containers per site, they simply reflect an average category cost per RC for the 113 HF for HF and 127 PF for HF RCs surveyed as part of the 2020 cost survey.

Exhibit 3-9 provides a comparison of the 2020 average category costs per sampled HF RC, the percent of CRV costs by category for 2020, the 2018 average category costs per HF RC, the percent of CRV costs by category for 2018, and CPI adjusted 2018 category costs per HF RC, and the percent change between the 2020 and CPI adjusted 2018 category costs. The CPI adjustment between 2018 and 2020 was 4.5 percent.[3]

[3] U.S. Department of Labor, Bureau of Labor Statistics, West Urban Consumer Price Index (as of Oct 2021): https://data.bls.gov/timeseries/CUUR0400SA0?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true

Exhibit 3-9
Comparison of Average Handling Fee Recycler Category Costs (2018 and 2020)

Cost Category	2020 (n=113)	% of CRV Costs	2018 (n=110)	% of CRV Costs	CPI Adjusted 2018	% Change 2018 (adj.) to 2020
Direct Labor	$101,303	53.3%	$96,368	52.2%	$100,705	1%
Indirect Labor	$9,672	5.1%	$14,998	8.1%	$15,673	-38%
General Business Overhead	$12,488	6.6%	$13,303	7.2%	$13,902	-10%
Transportation	$18,103	9.5%	$15,840	8.6%	$16,552	9%
Rent	$21,194	11.1%	$16,555	9.0%	$17,300	23%
Depreciation	$5,194	2.7%	$5,855	3.2%	$6,118	-15%
Property Tax	$261	0.1%	$246	0.1%	$257	2%
Utilities	$4,790	2.5%	$3,583	1.9%	$3,745	28%
Supplies	$8,865	4.7%	$7,157	3.9%	$7,479	19%
Fuel	$461	0.2%	$280	0.2%	$292	58%
Insurance	$3,475	1.8%	$3,839	2.1%	$4,012	-13%
Interest	$286	0.2%	$1,390	0.8%	$1,452	-80%
Maintenance	$4,096	2.2%	$5,070	2.7%	$5,299	-23%
Total CRV Costs per Site	**$190,189**	**100.0%**	**$184,484**	**100.0%**	**$192,785**	**-1%**

This comparison illustrates several key points:

- Average CRV costs per RC were nearly flat between years with a 1 percent decrease.
- The percent of CRV costs, by category, were very similar between the two years. For example, direct labor represented 53 percent of CRV costs in 2020 and 52 percent in 2018.
- Consistent with prior cost surveys, the cost categories that make up the largest share of RC costs besides labor are:
  - Rent (~11 percent)
  - Transportation (~9 percent)
- The cost categories that increased between 2018 and 2020 were rent, transportation, supplies, utilities, and fuel.

- The cost categories with the greatest dollar decrease between 2020 and 2018, accounting for 87 percent of the decrease, were (ordered from greatest to least):
  - Indirect Labor
  - GBO
  - Maintenance
  - Interest
- The decrease in indirect labor was the largest single factor besides, accounting for 53 percent of the decrease.
- GBO and Maintenance had the next greatest dollar decrease, accounting for 13 percent and 11 percent of the decrease, respectively.

Exhibit 3-10 provides a similar comparison for a sampled PF RCs, which illustrates several key points:

- Average CRV costs per RC decreased by 14 percent, which directly contributes to a decrease in cost per container if volumes were held equal.
- The percent of CRV costs, by category, were very similar between the two years. For example, direct labor represented 51 percent of CRV costs in 2020 and 53 percent in 2018.
- Consistent with prior cost surveys, the cost categories that make up the largest share of RC costs besides labor are:
  - Rent (~12 percent)
  - Transportation (~8 percent)
- All cost categories decreased besides rent, supplies, and interest.
- The cost categories with the greatest dollar decrease between 2020 and 2018, accounting for 88 percent of the decrease, were (ordered from greatest to least):
  - GBO
  - Utilities
  - Depreciation
- The decrease in labor was the largest single factor, accounting for 55 percent of the decrease.
- Maintenance and GBO had the next greatest dollar decrease, each accounting for 8 percent of the decrease.

The most notable difference between the changes in cost categories between years for handling fee and processing fee recyclers is direct labor. For handling fee recyclers, direct labor was nearly flat while it dropped 17 percent for processing fee recyclers.

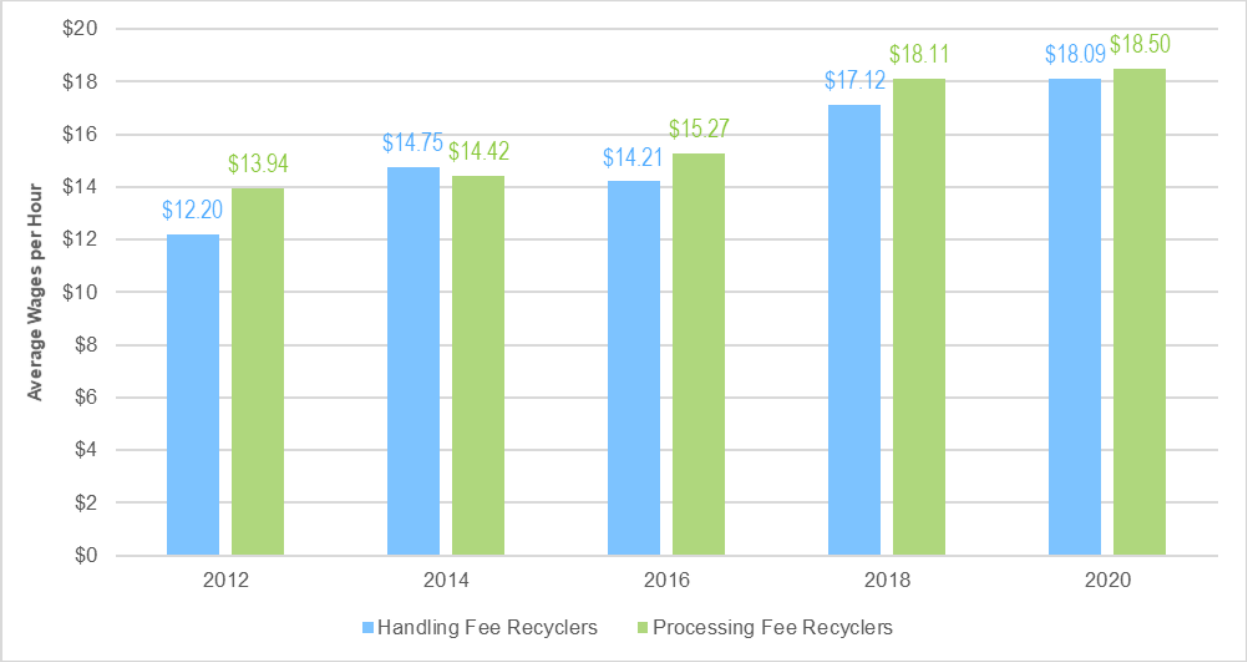
Exhibit 3-10
Comparison of Average Processing Fee Recycler Category Costs (2018 and 2020)

Cost Category	2020 (n=127)	% of CRV Costs	2018 (n=118)	% of CRV Costs	CPI Adjusted 2018	% Change 2018 (adj.) to 2020
Direct Labor	$115,806	51.2%	$132,801	52.8%	$138,777	-17%
Indirect Labor	$15,893	7.0%	$20,739	8.2%	$21,672	-27%
General Business Overhead	$13,065	5.8%	$15,873	6.3%	$16,588	-21%
Transportation	$18,115	8.0%	$13,871	5.5%	$14,495	25%
Rent	$28,328	12.5%	$27,582	11.0%	$28,824	-2%
Depreciation	$3,926	1.7%	$5,862	2.3%	$6,126	-36%
Property Tax	$1,076	0.5%	$1,296	0.5%	$1,355	-21%
Utilities	$6,684	3.0%	$8,539	3.4%	$8,923	-25%
Supplies	$8,408	3.7%	$7,253	2.9%	$7,580	11%
Fuel	$1,252	0.6%	$2,365	0.9%	$2,471	-49%
Insurance	$5,756	2.5%	$6,766	2.7%	$7,070	-19%
Interest	$1,363	0.6%	$860	0.3%	$898	52%
Maintenance	$6,698	3.0%	$7,934	3.2%	$8,291	-19%
Total CRV Costs per Site	**$226,370**	**100.0%**	**$251,741**	**100.0%**	**$263,070**	**-14%**

Labor and Non-Labor Costs

The average HF and PF recyclers wages per hour increased from 2018 to 2020. **Exhibit 3-11** illustrates average wages per hour for the last five handling fee surveys. For HF sites, the average wages per hour increased by $0.97 (6 percent), to a level higher than prior years. For PF sites, the average wage per hour increased by $0.39 (2 percent). Additionally, while RCs may be able to reduce labor hours to some extent, RCs still must employ one, or more, employee on site during all hours of operation. The cost survey does not capture time spent waiting for CRV customers. All time is allocated to CRV materials, non-CRV materials, or other business. These 2 to 6 percent increases in wages contribute to slightly higher costs. These increases in wages are consistent with the Processing Fee Cost Survey results.

Exhibit 3-11
2012 to 2020 Sampled Handling Fee and Processing Fee Recyclers Average Wages per Hour



Crowe also determined the labor and non-labor portions of cost per container for the 2012, 2014, 2016, 2018, and 2020 cost surveys, and compared how the two cost components changed between the two surveys. Changes to productivity and wages are significant as labor makes up over half of all recycler costs.

Exhibit 3-12 for sampled handling fee recyclers shows the following:

- Labor accounts for approximately 55 percent of the handling fee recycler cost per container in 2020.
- The share of labor cost per container has been rising since 2012. Labor rose from 43 percent in the 2012 cost survey to 47 percent in the 2014 and 2016 cost surveys, 53 percent in 2018, and 55 percent in 2020.

Exhibit 3-12
2012 to 2020 Sampled Handling Fee Recyclers Labor and Non-Labor Costs per Container

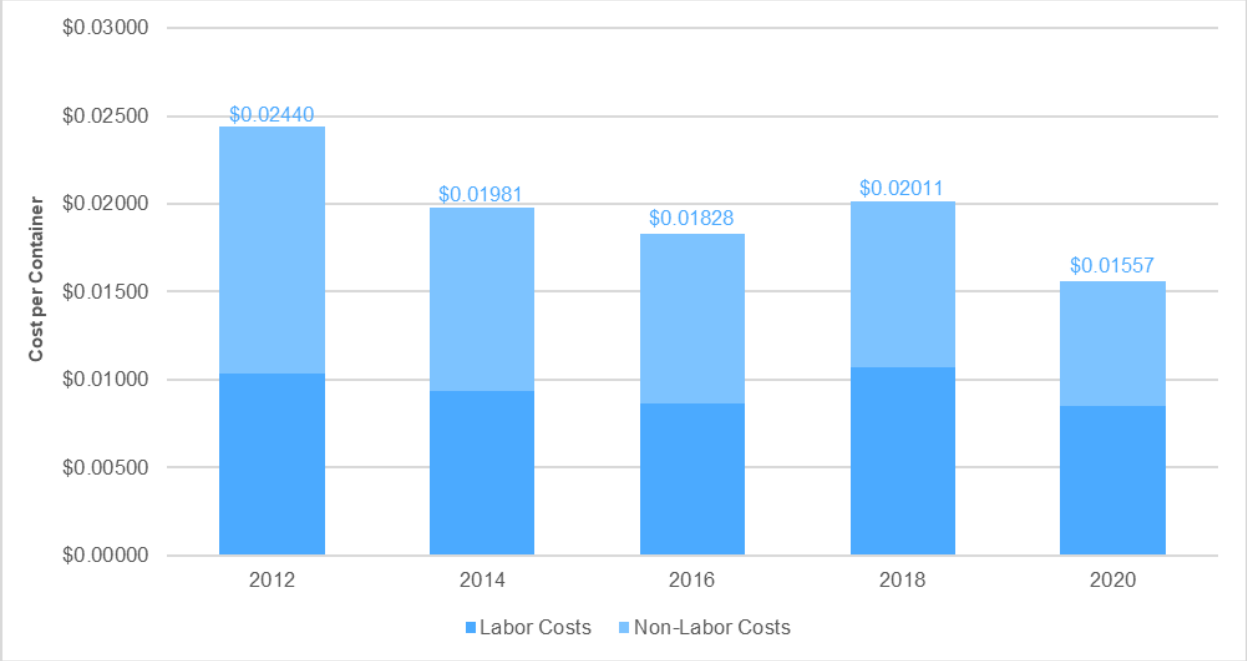
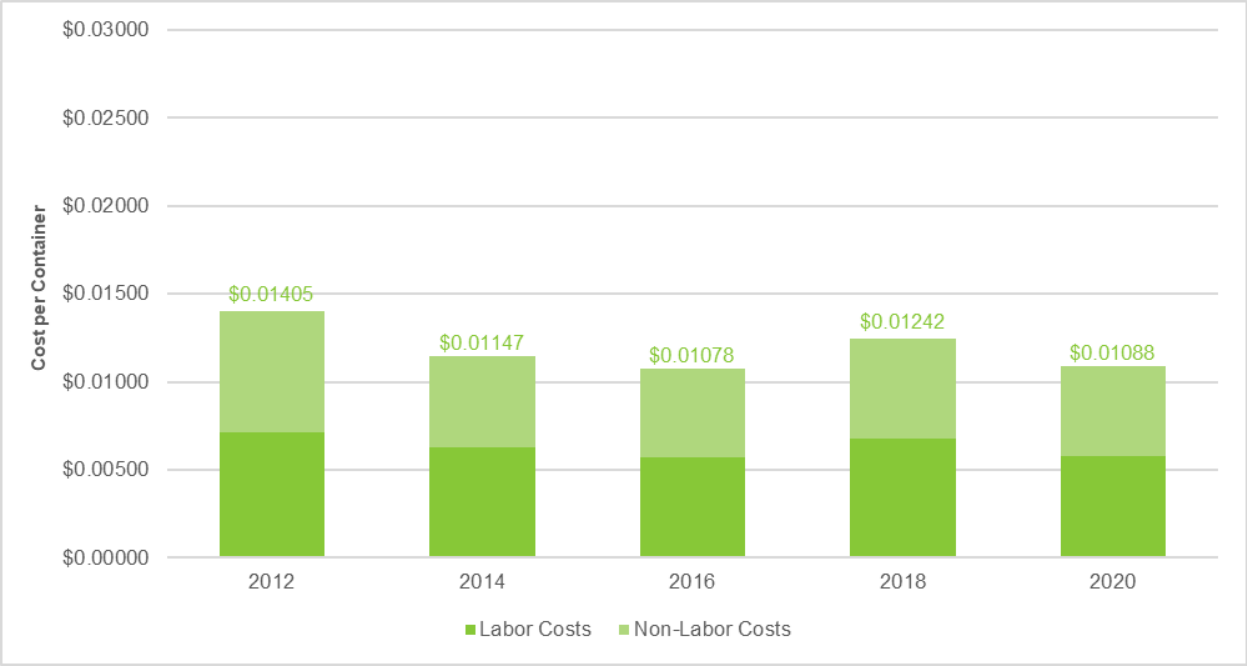


Exhibit 3-13 for sampled processing fee recyclers shows the following:

- Labor accounts for approximately 53 percent of the processing fee recycler cost per container in 2020.
- The shares of PF for HF labor and non-labor cost per container are generally consistent between the five survey years.

Exhibit 3-13
2012 to 2020 Sampled Processing Fee Recyclers Labor and Non-Labor Costs per Container



Changes in Labor Costs

Crowe analyzed CRV labor costs and labor hours to better understand how labor influenced the increase in cost per container between 2018 and 2020. In the analyses below, 2018 labor costs are not adjusted by CPI, rather they are a straight dollar comparison across the two survey years. A CPI adjustment would increase 2018 costs by 4.5 percent.

To evaluate the potential influence and impact of labor costs on costs per container, as well as the potential influence of high-wage sites or labor allocations, Crowe conducted evaluations of several potential factors related to labor hours, labor allocations, hourly yard wages, hourly administrative wages, and minimum wage. The cost survey labor allocation methodology assigns labor hours for each employee or owner at the site based on whether the time was associated with: 1) the recycler or other business, 2) CRV or non-CRV, 3) Direct yard labor (DYL) or all other labor (AOL), and 4) by aluminum/bi-metal, glass, and plastic. DYL labor includes yard employees that sort, weigh, handle, bale, or cashier. AOL labor includes administration, management, and driver time, all of which are typically higher-wage activities.

- Factors that <u>did</u> lead to lower labor costs:
    - Low wage sites – The proportion of surveyed low wage sites (sites below the minimum wage) increased from 11 percent to 17 percent for handling fee recyclers. For processing fee recyclers, the proportion of surveyed low wage sites (sites below the minimum wage) increased from 7 percent to 17 percent. These changes contribute to lower labor costs and overall costs.
    - Labor hours per 1,000 CRV containers decreased significantly, -25 percent for handling fee recyclers and -16 percent for processing fee recyclers. These decreases in hours (increases in productivity) largely due to higher containers per recycler contribute to lower the labor costs and overall costs.
- Factors that <u>did not</u> lead to lower labor costs:
    - Higher CRV hourly wages – Weighted average CRV hourly wages increased overall and by strata between 2018 and 2020, likely driven by the 13 percent (LA County) to 18 percent (Statewide) increases in minimum wage between 2018 and 2020.
    - Average hourly wages for stratum 2 and stratum 3 sites increased by 26 percent and 4 percent, respectively. Overall, hourly wages between 2018 and 2020 increased by 4 percent across all handling fee recyclers, which was less than the CPI.
    - Labor allocations – There were not significant changes in the allocation of CRV hours between material types or hours per 1,000 containers. In fact, overall hour allocations between CRV and non-CRV remained the same between 2018 and 2020.

- High wage sites – There were a small number of sites with relatively high owner wages (profits); though the number of higher wage sites increased between 2018 and 2020, the range of high wages diminished, likely contributing to a minor share of total costs.

CRV Hourly Wages

Crowe calculated CRV hourly wages by summing CRV labor costs across all RCs in each survey sample and dividing by the sum of CRV labor hours. **Exhibit 3-14** and **Exhibit 3-15** provide a summary of sampled HF and sampled PF CRV hourly wages, respectively. Thus, this calculation reflects a weighted average hourly wage across the survey samples. It does not consider number of CRV containers. As seen above, labor reflects approximately 50 percent of the cost of CRV recycling.

CRV hourly wages for sampled HFs increased 8 percent while CRV hourly wages increased by 10 percent for sampled PFs between 2018 and 2020. Considering the increase in California minimum wage of 18 percent between 2018 and 2020, and CPI could account for a 4.5 percent increase, these increases seem reasonable. Across strata for sampled HFs, the greatest increase was in stratum 2, with a 26 percent increase, which was similar with PF stratum 2 recyclers which increased 12 percent.

To provide context, at 2,080 hours annually, $17.81 per hour is equivalent to $37,044 gross annual income. In 2020, the median household income in California was $78,695.81. The 2020 per capita income was $38,654.93. (Source: U.S. Census, American Community Survey: American Community Survey). The California Poverty Measure for a family of four, slightly higher than the federal poverty level, was about $35,600 in 2020 (Source: Public Policy Institute of California (PPI California Poverty Measure).

Exhibit 3-14
Comparison of HF CRV Hourly Wages Overall and by Strata (2018 and 2020)

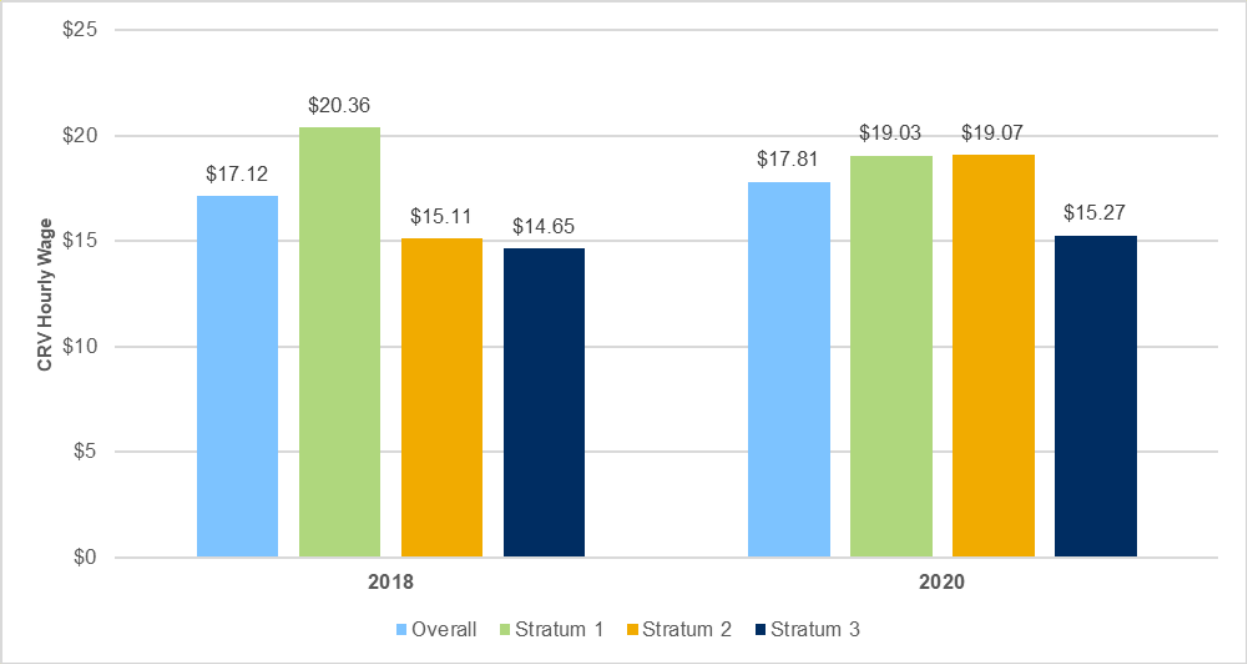
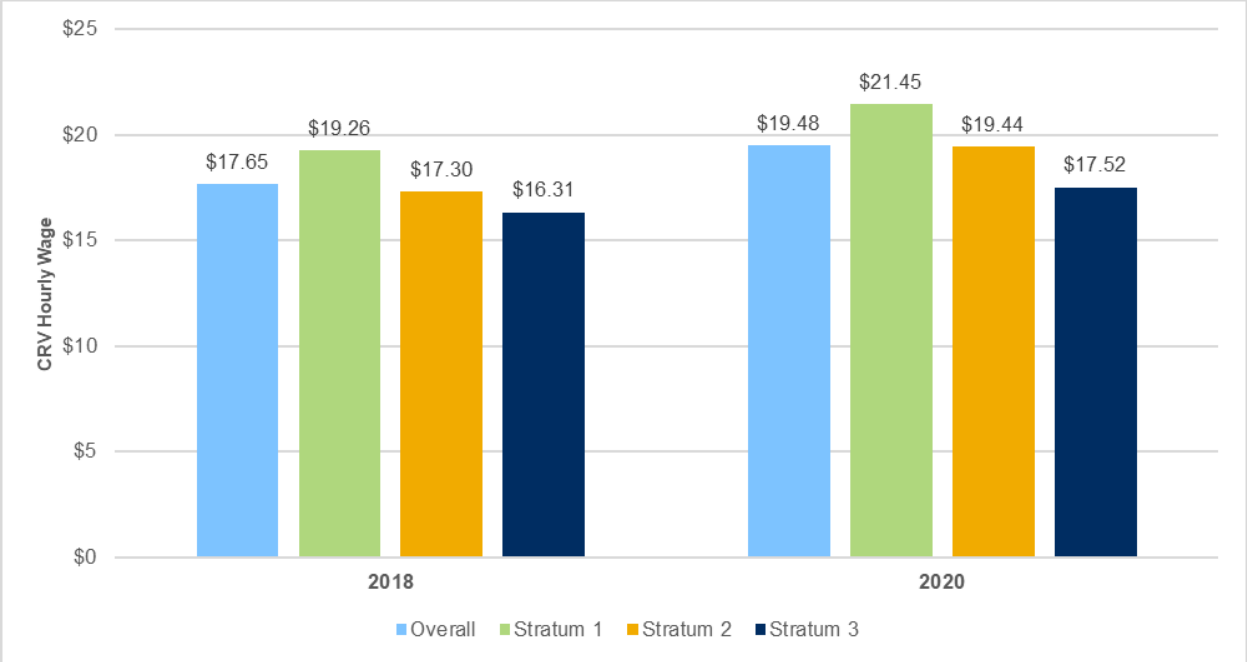


Exhibit 3-15
Comparison of PF CRV Hourly Wages Overall and by Strata (2018 and 2020)



Increases in DYL, AOL, and Overall Wage per Hour

Consistent with the weighted average increase in CRV hourly wage, the simple average DYL, AOL, and overall hourly wages increased across all surveyed sites and by strata with the exception of stratum 1. These wages include all labor: other business, RC, non-CRV, and CRV. They reflect a simple average of the average hourly wage for each site in the survey sample. They do not reflect the number of hours per site, or volumes of material handled. **Exhibit 3-16** and **3-17** provides a comparison of average hourly wages by strata and overall for sampled HF and PF recyclers, respectively.

Exhibit 3-16
Comparison of HF DYL, AOL, and Overall Wage per Hour (2018 and 2020)

Average DYL per hour

Strata	2018	2020	% Change
1	$14.55	$16.37	12%
2	$12.73	$15.06	18%
3	$12.65	$14.85	17%
Average	**$13.31**	**$15.42**	**16%**

Average AOL per hour

Strata	2018	2020	% Change
1	$66.53	$100.80	52%
2	$30.27	$48.91	62%
3	$17.79	$23.41	32%
Average	**$38.20**	**$57.71**	**51%**

Average Overall Wage per Hour

Strata	2018	2020	% Change
1	$21.64	$20.06	-7%
2	$15.08	$19.05	26%
3	$14.27	$15.90	11%
Average	**$17.00**	**$18.34**	**8%**

Exhibit 3-17
Comparison of PF DYL, AOL, and Overall Wage per Hour (2018 and 2020)

Average DYL per hour

Strata	2018	2020	% Change
1	$15.63	$17.05	9%
2	16.43	16.72	2%
3	14.67	16.41	12%
Average	**$15.30**	**$16.72**	**9%**

Average AOL per hour

Strata	2018	2020	% Change
1	$54.18	$45.77	-16%
2	32.83	39.67	21%
3	29.98	28.42	-5%
Average	**$35.06**	**$37.96**	**8%**

Average Overall Wage per Hour

Strata	2018	2020	% Change
1	$21.44	$23.69	10%
2	19.05	20.13	6%
3	17.56	18.38	5%
Average	**$18.66**	**$20.73**	**11%**

On average, CRV and non-CRV AOL hours make up about 20 percent of HF and PF recyclers' total hours. Therefore, changes, even rather significant, in AOL wages per hour have a relatively minor impact to overall wage per hour. Further analysis is provided within a subsection below to discuss high AOL wage per hour sites that may have influenced these changes.

The increase in overall HF DYL between 2018 and 2020 is consistent with the increase in statewide minimum wage. This is likely a coincidence but may also reflect anecdotal feedback provided during this and prior cost surveys. Anecdotally, Crowe's surveyors heard that low wage businesses such as recycling centers must respond to increases in minimum wage, even if they provide wages that are slightly above. To compete for workers in a tight labor market, employers must provide competitive wages. Furthermore, to attract workers to physically demanding work at recycling centers, employers said they needed to provide a premium above minimum wage.

The increase in average AOL per hour was significantly more than the increase in DYL per hour, and the overall wage per hour. While higher AOL wages contributed to the increased labor costs, they are not a driving factor in overall costs per container as AOL hours represent only 10 or 20 percent of CRV hours. The average HF recycler AOL wage changes from 2018 to 2020 in **Exhibit 3-16** are larger than the average AOL wage changes seen in the processing fee cost survey results. However, there are significant differences in 2018 to 2020 AOL hourly rates by strata between the processing fee cost survey results and the PF recyclers surveyed for the cost per container. This is due to the impact of a few high-wage or low-wage recyclers in the samples that heavily impact strata-specific results but are smoothed out in overall results.

Minimum Wage Increases

Changes in DYL are most likely to be impacted by changes in minimum wage. Because DYL accounts for 80 to 90 percent of CRV labor, increases in DYL have a greater impact on CRV recycling costs than increases in AOL. California minimum wage increased 18 percent, from $11 per hour in 2018 to $13 per hour in 2020. Los Angeles County's minimum wage increased 13 percent between 2018 and 2020. Approximately one-third of surveyed processing fee recyclers in 2018 and 2020 were in LA County. As a result, increases in hourly wages in LA County sites has a significant impact on overall labor costs. However, because the increase in LA county was less than non-LA counties in 2020, it's likely that this did not contribute greatly to higher labor costs.

As **Exhibit 3-18** illustrates, LA County DYL increased 25 percent between 2018 and 2020, while non-LA County DYL increased 12 percent. Average DYL in non-LA County sites was over $1.64 per hour higher than LA County sites in 2018, and over $0.28 cents higher than LA County in 2020. AOL hourly wages also increased more significantly in LA County than the remainder of the state. In 2018, overall wages in LA county were slightly lower than non-LA county recyclers, but in 2020, LA County had higher AOL on average. One reason for this could be that LA county wages are already higher than non-LA county wages, making it more difficult for recyclers in this area to increase wages. As noted above, these data reflect a simple average wage per hour and include non-CRV and other business wages.

Exhibit 3-18
Comparison of HF Los Angeles County and non-Los Angeles County DYL, AOL, and Overall Wage per Hour (2018 and 2020)

Wage Category	LA County 2018 (n=36)	LA County 2020 (n=35)	LA County % Change	Non-LA County 2018 (n=74)	Non-LA County 2020 (n=78)	Non-LA County % Change
Minimum Wage	$13.25	$15.00	13%	$11.00	$13.00	18%
Direct Yard Labor (DYL)	$12.09	$15.06	25%	$13.73	$15.34	12%
All Other Labor (AOL)	$40.87	$63.03	54%	$31.38	$43.83	40%
Overall Wage per Hour	**$14.93**	**$18.10**	**21%**	**$17.27**	**$17.74**	**3%**

Owner's Profitability

As part of this report, Crowe analyzed the owner's profitability from survey years 2016, 2018, and 2020. In 2016, 46 sites of 106 (43%) surveyed handling fee recyclers had available owner's income. In 2018, 124 sites of 242 (51%) surveyed handling fee recyclers had available owner's income. In 2020, 169 sites of 215 (78%) surveyed handling fee recyclers had available owner's income. The owner's profitability analysis provides insight into a recycler's profitability, which has implications to both overall costs and recycler survivability. Below lists a summary of the key findings from the owner's profitability analysis:

- Factors that directly impact costs:
    - Owner's wages as a percent of total CRV costs have slightly decreased from 22 percent in 2018 to 20 percent in 2020. This slight decrease would slightly impact costs.
    - Average cost per container for sites with owners earning under the poverty level across 2016 to 2020 were lower than the overall average costs. As labor costs generally make up half of a recycler's overall CRV costs, profitability could significantly impact costs, especially for recyclers for which the owner contributes a large portion of the recycler's overall hours. Sites with owners earning under the poverty level are not profitable and likely have low costs, but likely also low volumes. There are many dynamics that influence costs, however, should these low profit recyclers close, volumes may be shifted to other, more, or less, efficient recyclers.
- Factors that provide insight to the state of recycling centers:
    - The percentage of containers associated with recyclers with owners who earn below the poverty level slightly increased from 33 to 34 percent between 2016 and 2018 and slightly decreased to 32 percent in 2020. The percent of owners earning below the poverty level decreased from 54 to 48 percent between 2016 and 2018 and further decreased to 46 percent in 2020. These decreases indicate that low-profit recyclers continue to close, and volumes are shifted to generally larger, more profitable recyclers. In both comparisons, the proportion of low profit recyclers for strata 2 and 3 recyclers decreased while stratum 1 increased.
    - Stratum 3 recyclers had the highest share of recyclers with owner's earning both under the minimum wage and under the poverty level, which further validates larger sites are generally more profitable.
    - For sites with owner's income below the California poverty level, the hourly rates for owners were far below the hourly rates of employees and overall hourly rates. Thus, owners of these sites were making less than their employees.

- The non-owner average hourly rate for 2020 increased by 15 to 17 percent compared to 2018, depending on strata. This made the non-owner average hourly rate 9 to 19 percent above the 2020 minimum wage, or $14.11 to $15.42 per hour. This is consistent with the narrative that during the pandemic, recyclers had difficulty competing with unemployment benefits and many times, were forced to raise their rates to retain or attract employees.

Exhibit 3-19 displays the percent of handling fee recycler owners under the minimum wage by strata from 2016 to 2020. For greater accuracy, Crowe stratified the data by jurisdiction (e.g., statewide minimum wage, Los Angeles County). There are a large portion of recyclers located in Los Angeles County, which has a 5 to 15 percent difference from the statewide minimum wage, depending on the year. Stratum 3 recyclers had the highest proportion of HF RCs with owners earning under the minimum wage across all three years and decreased from 61 percent to 49 percent between 2016 and 2020. The proportion of strata 2 recyclers under minimum wage declined to a slightly greater extent than strata 3 recyclers, which went from 23 percent to 17 percent between 2016 and 2020. Conversely, the proportion of strata 1 recyclers with owners earning under minimum wage increased from 0 percent to 6 percent between 2016 and 2020. The generally declining proportion of recyclers with owner's income below minimum indicates that more profitable recyclers remain operational.

Exhibit 3-19
Proportion of Handling Fee RCs with Owner Income Under Minimum Wage by Strata (2016-2020)

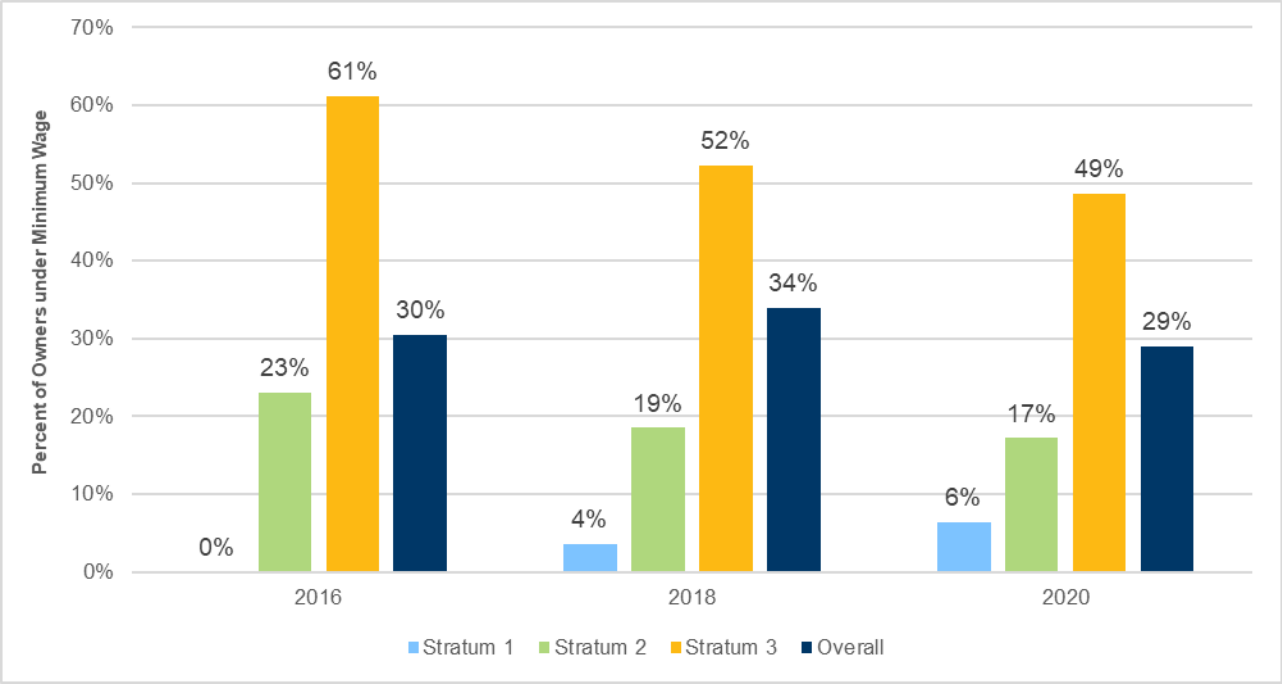
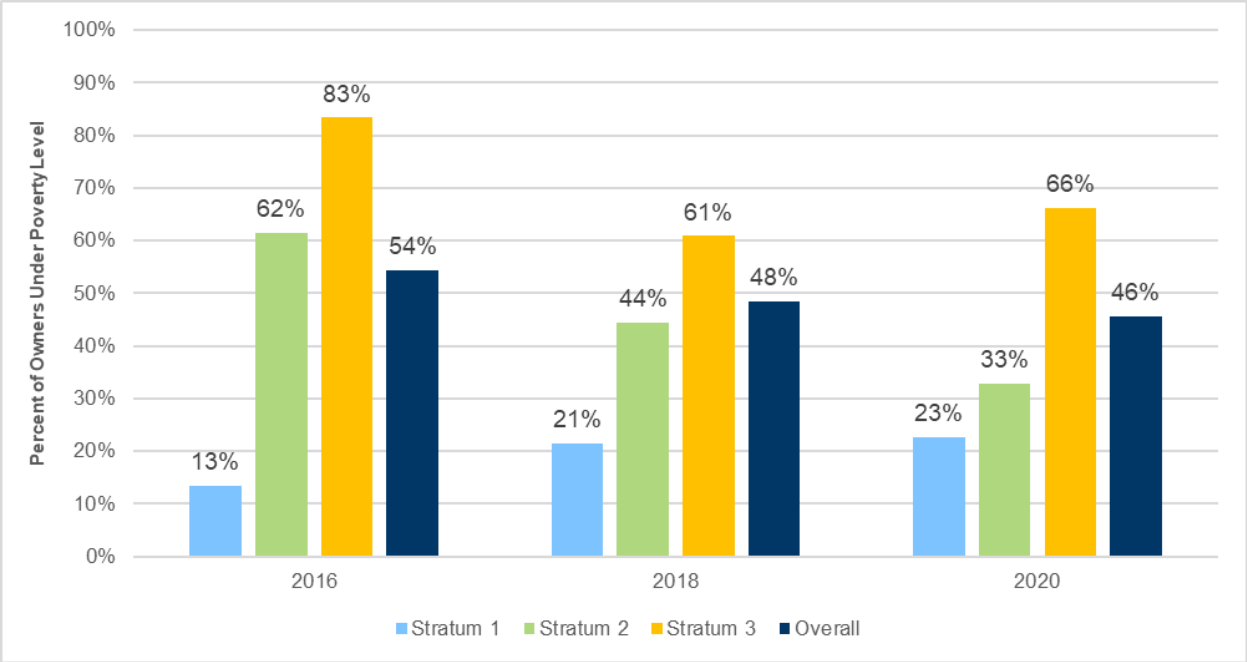


Exhibit 3-20 shows the percent of Handling Fee RC owners earning under the poverty level[4] by strata. The poverty level is for a family of four living in California. Stratum 3 recyclers had the highest proportion of RCs with owners earning under the poverty level across all three years and decreased from 83 percent to 66 percent between 2016 and 2020. The proportion of stratum 2 recyclers under the poverty level declined to a greater extent than stratum 3 recyclers, which nearly halved between 2016 and 2020, or a decrease from 62 percent to 33 percent. Conversely, the proportion of stratum 1 recyclers with owners under the poverty level nearly doubled, or an increase from 13 percent to 23 percent between 2016 and 2020. The declining proportion of recyclers with owners earning below the poverty level indicates that more profitable recyclers remain operational.

Exhibit 3-20
Percent of HF Recycler Owners Earning Under the Poverty Level by Strata (2016-2020)



[4] Poverty in California. Public Policy Institute of California. July 2021. PPI Poverty in California

Transportation Costs

Crowe analyzed CRV transportation costs to gain a better understanding of how transportation impacted the changes in cost per container between 2018 to 2020. Transportation decreased in 2020 but was still one of the larger contributors to overall CRV costs. To evaluate the impact of transportation on recycler costs, they evaluated transportation and fuel costs for each material type by hauling method. The transportation and fuel line items include non-labor costs that should generally reflect the cost to recyclers of hauling material to processors. These line items also include general transportation costs and fuel for forklifts, so they are not exclusive to transporting specific materials, however, these non-hauling costs are minimal compared to hauling. To analyze how transportation influenced cost per container between the two years, Crowe analyzed the changes in transportation costs, which impact overall cost per container, with the objective of providing an explanation for the changes. Transportation (and fuel) costs represent roughly ten (10) percent of total CRV costs for HF recyclers.

Exhibit 3-21 shows a comparison between 2018 and 2020 for transportation and fuel costs per container for sampled HF and PF recyclers as well as the price of retail diesel per gallon.[5] Transportation and fuel costs per container for sampled HF recyclers decreased 13 percent and PF recyclers increased 17 percent. In 2018, California averaged $3.87 per gallon of diesel, whereas, in 2020, the average price was $3.38 per gallon, or a decrease of 13 percent. The decrease in costs for HF recyclers and the increase for PF recyclers indicates that although the decrease in diesel price per gallon directly contributes to a decrease in transportation and fuel costs, there is more than the price of diesel at play.

[5] Source: U.S. Energy Information Administration, Annual Retail Gasoline and Diesel Prices: Annual Retail Gas and Diesel Prices

Exhibit 3-21
Transportation and Fuel Costs Per Container (2018 and 2020)

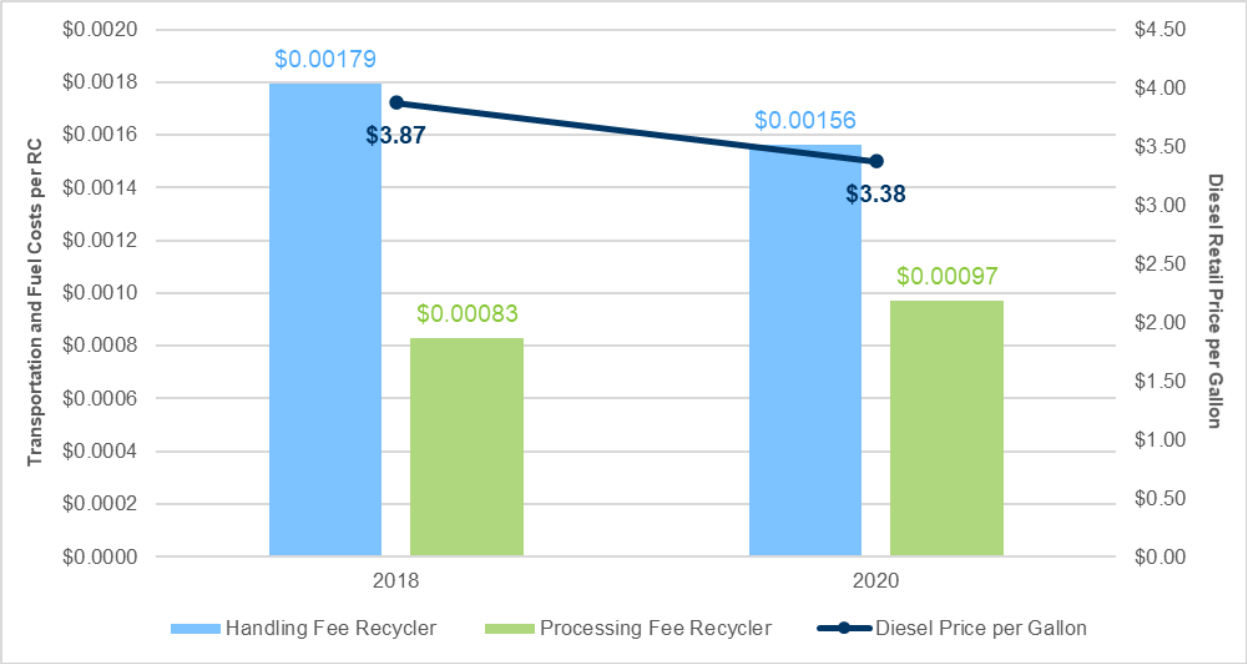
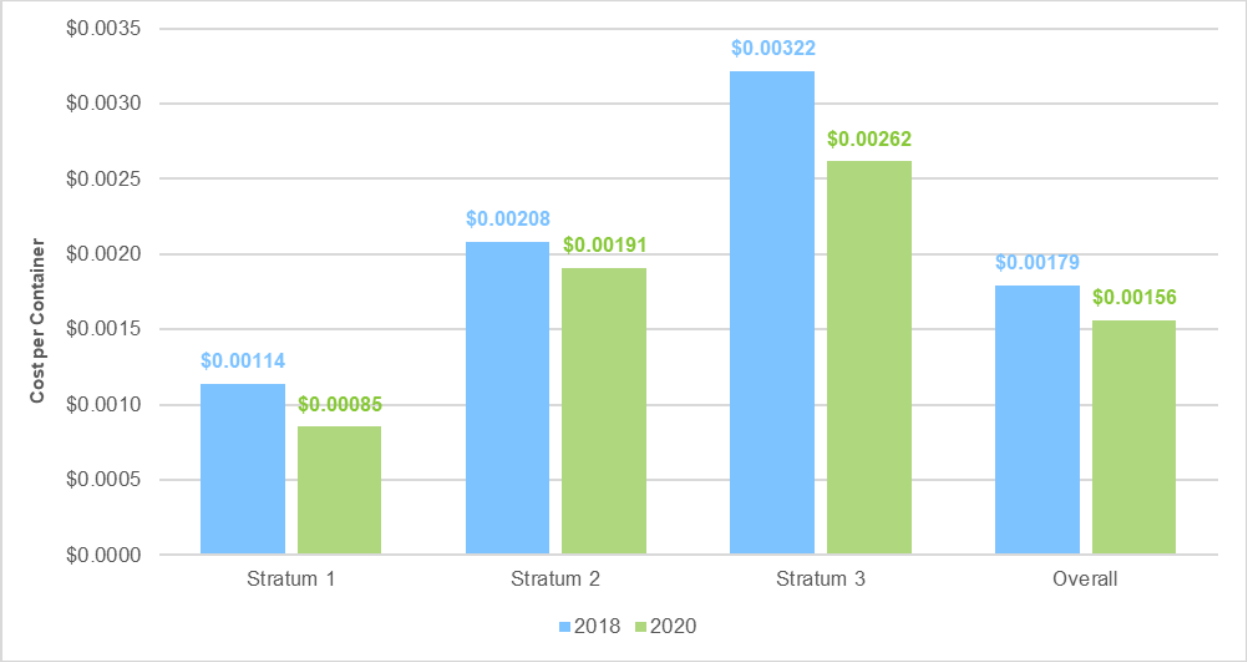
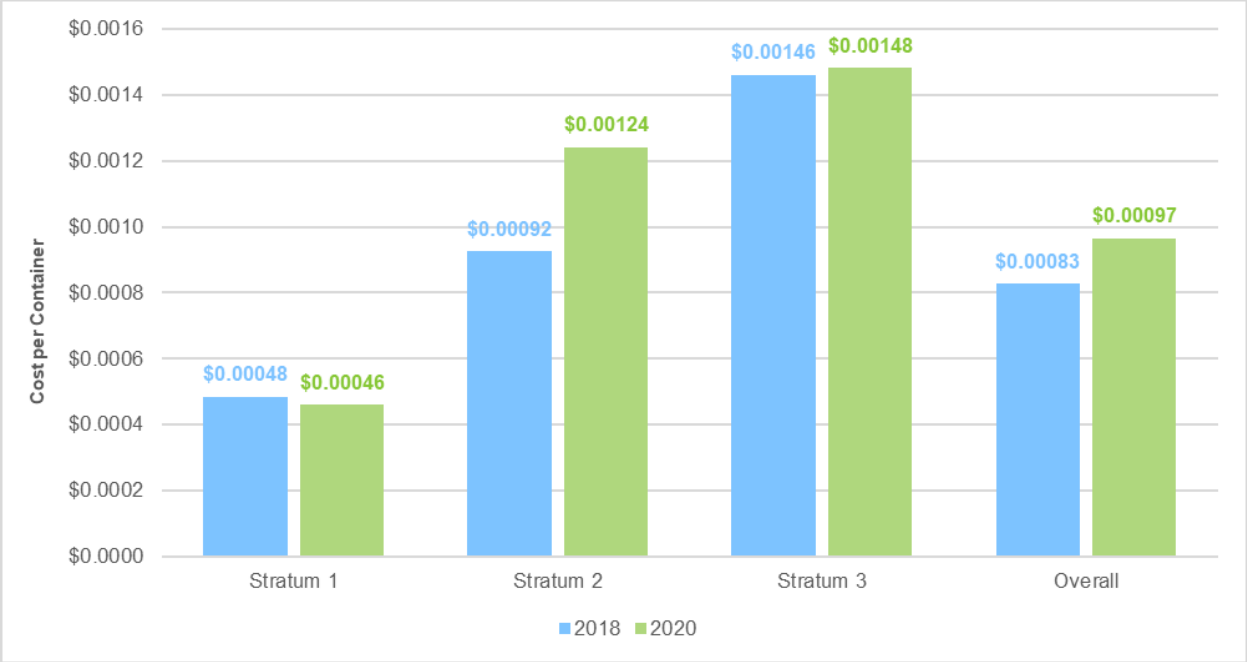


Exhibit 3-22 show a comparison between 2018 and 2020 for transportation cost per container for sampled HF and PF recyclers. Transportation cost per container was calculated by taking the sum of transportation and fuel costs divided by the total number of containers for the 2018 and 2020 survey samples. The results show that transportation cost per container decreased for handling fee recyclers and increased for processing fee recyclers.

Exhibit 3-22
Transportation Cost Per Container (2018 vs. 2020)
Handling Fee Recycler



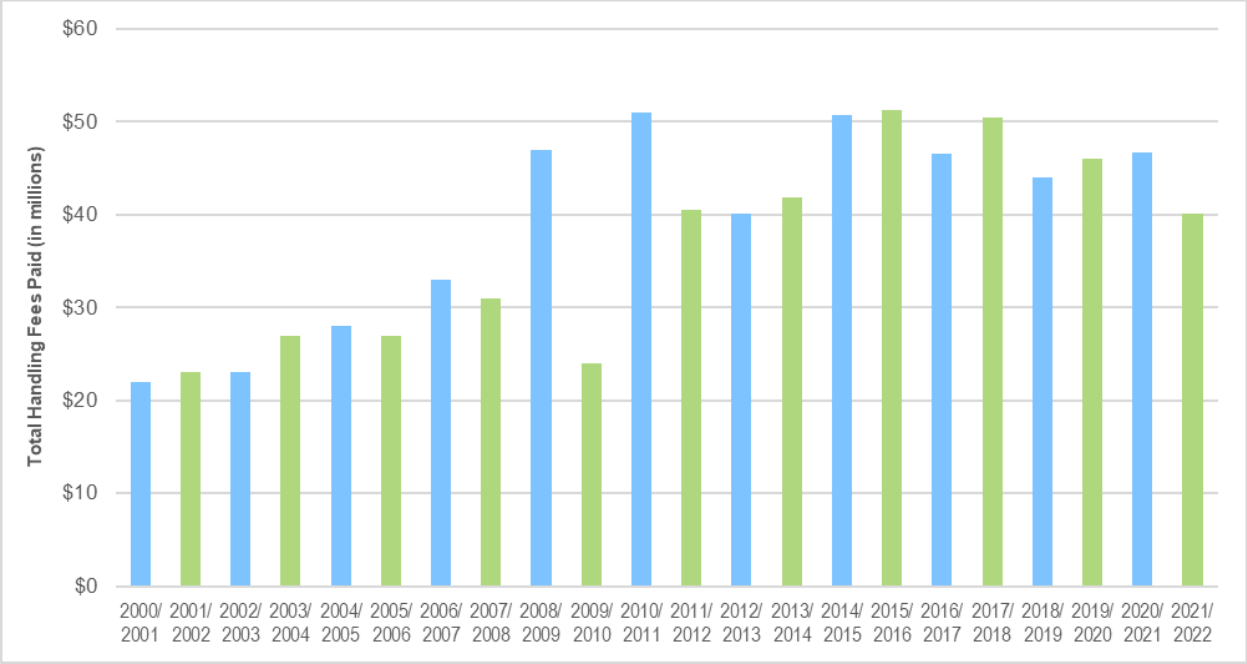
Processing Fee Recycler



C. Total Annual Handling Fee Payments

Exhibit 3-23 provides total annual handling fee payments between fiscal year 2000/2001 and FY 2020/2021 and estimated for FY 2021/2022. Based on 2020 containers recycled, the 42 percent decrease in the handling fee between 2021/2022 and 2022/2023 will decrease overall handling fee payments further, by $22.7 million in FY 2022/2023. Although the significant decrease in handling fee payments is mostly offset by the increase in the price of scrap aluminum, recyclers are subject to market volatility and profit margins fluctuate regularly.

Exhibit 3-23
Total Annual Handling Fee Payments (FY 2000/2001 through FY 2021/2022)

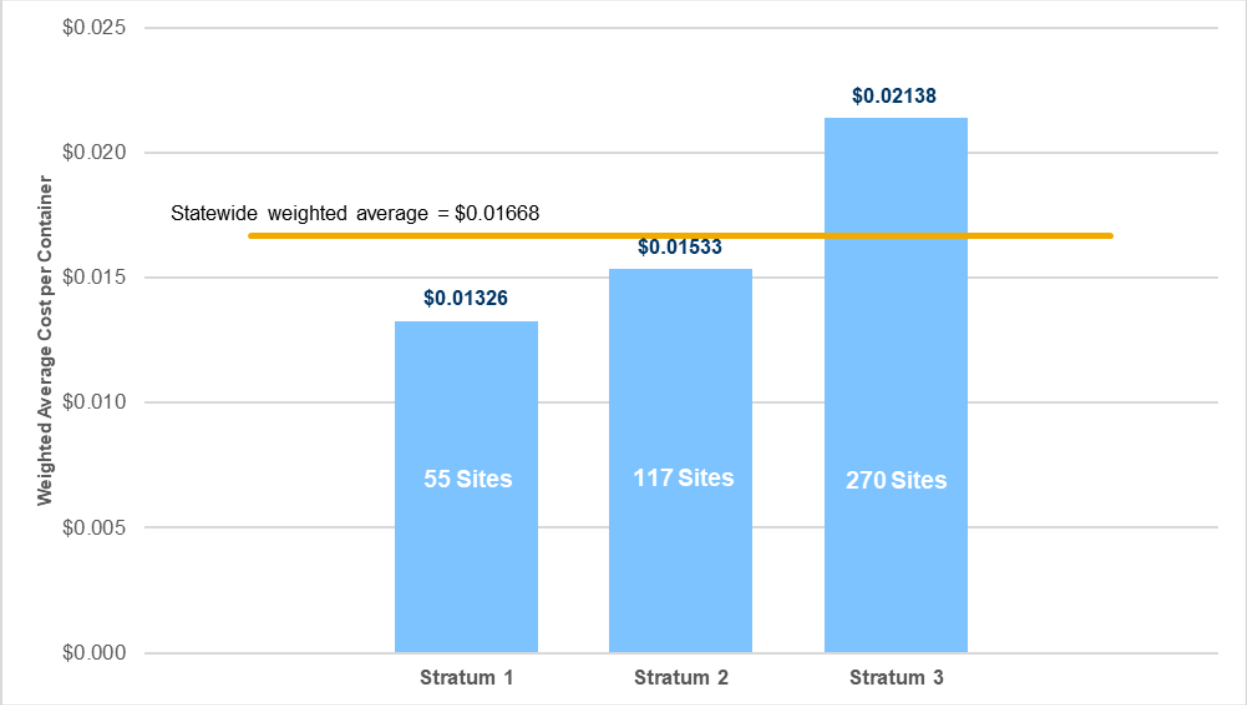


Note: FY2021/2022 total handling fee payments is an estimate.

D. Comparison of Population Size, Containers Recycled, and Costs by Strata

Exhibit 3-24 compares the average cost per container for each of the three handling fee recycler container strata, and the statewide, weighted average cost per container of 1.668 cents. For handling fee recyclers, the average cost per container increases as the size of the recycling center decreases.

Exhibit 3-24
Handling Fee Recycler Costs per Container and Population Size, by Strata (2020)



While the handling fee is not intended to cover the full cost of recycling for handling fee recyclers, the per container handling fee payment will provide less coverage for stratum 3 recyclers than for strata 1 or 2 recyclers. The 0.511 cent handling fee covers 38 percent of the average cost of recycling for stratum 1 recyclers, 33 percent of the average cost of recycling for stratum 2 recyclers, and only 23 percent of the average cost of recycling for stratum 3 recyclers. The coverage is lower than in 2018, when the handling fee covered 53 percent of the average cost of recycling for stratum 1, 45 percent for stratum 2, and 30 percent for stratum 3.

Exhibit 3-25 compares the average cost per container for each of the three processing fee recycler container strata, and the statewide, weighted average cost per container of 1.157 cents. Similar to handling fee recyclers, stratum 1 recyclers had the lowest average cost per container to recycle and stratum 3 recyclers had the highest average cost per container to recycle.

Exhibit 3-25
Processing Fee Recycler Costs per Container and Population Size, by Strata (2020)

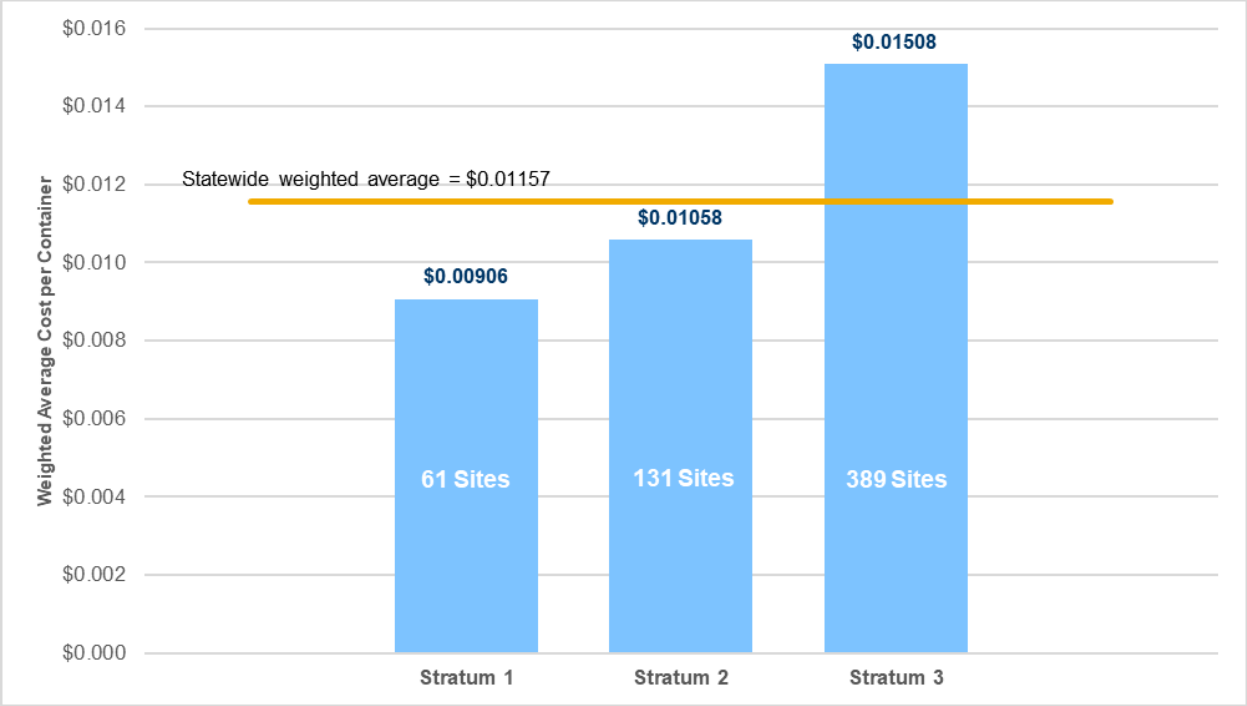


Exhibit 3-26 provides a comparison of population and total containers recycled by strata for handling fee recyclers over the seven handling fee cost surveys. The full population of handling fee recyclers remained relatively stable over the first four years, 2006 to 2010, then declined by 10 percent in 2012, declined another 5 percent in 2014, a substantial 24 percent in 2016, and another 5 percent in 2018. The most significant drop was between 2018 and 2020. The number of containers recycled by HF RCs statewide increased significantly between 2006 and 2010; declined between 2010 and 2012 by 16 percent; increased by 11 percent between 2012 and 2014, increased 9 percent between 2014 and 2016, and increased by a smaller 3 percent between 2016 and 2018. From 2018 to 2020, the number of containers recycled by HF RCs dropped 8 percent. The number of HF recyclers in each of the three strata is the lowest it has been since the start of the Handling Fee Cost Survey; while the number of containers recycled by each of the strata decreased only slightly.

Exhibit 3-26
Population and Container Detail, by Strata, for Handling Fee Recyclers (2006-2020)

Population

Year	Stratum 1	Stratum 2	Stratum 3	Total Population
2006	145	295	643	1,083
2008	136	292	649	1,077
2010	125	298	669	1,092
2012	115	254	616	985
2014	121	243	567	931
2016	97	193	416	706
2018	92	177	400	669
2020	55	117	270	442

Containers Recycled

Year	Stratum 1	Stratum 2	Stratum 3	Total Containers
2006	1,068,310,624	1,016,102,754	1,024,108,940	3,108,522,318
2008	1,325,348,960	1,347,029,614	1,319,939,998	3,992,318,572
2010	1,518,736,173	1,513,367,002	1,530,305,416	4,562,408,591
2012	1,274,311,289	1,277,893,538	1,285,011,280	3,837,216,107
2014	1,443,740,805	1,420,326,860	1,389,821,107	4,253,888,772
2016	1,505,533,487	1,500,543,415	1,514,114,030	4,520,190,932
2018	1,532,633,780	1,566,572,421	1,541,664,675	4,640,870,876
2020	1,405,118,838	1,424,364,796	1,430,436,203	4,259,919,837

Exhibit 3-27 provides a similar comparison of the full population and total containers recycled by strata for processing fee recyclers over the eight handling fee cost surveys. Similar to handling fee recyclers, the number of recyclers decreased significantly between 2016 and 2018 and again between 2018 and 2020, with reductions across all three strata. Generally, between 2006 and 2012, the number of recyclers in each strata had increased between each survey, until 2014 when the downward trend started. The number of containers recycled by strata increased significantly between 2006 and 2008, just slightly between 2008 and 2010, and between 6 and 11 percent between 2010 and 2012. The total number of containers recycled by the full population of PF recyclers was essentially flat between 2012 and 2014, at 10.1 billion, and only slightly lower in 2016, at 10.0 billion. The number of containers recycled by the survey population has declined each survey since 2016.

Exhibit 3-27
Population and Container Detail, by Strata, for Processing Fee Recyclers (2006-2020)

Population

Year	Stratum 1	Stratum 2	Stratum 3	Total Population
2006	63	133	483	679
2008	61	144	524	729
2010	69	162	611	842
2012	88	214	730	1,032
2014	103	218	676	997
2016	77	179	522	778
2018	73	154	447	674
2020	61	131	389	581

Containers Recycled

Year	Stratum 1	Stratum 2	Stratum 3	Total Containers
2006	2,323,206,412	2,251,549,410	2,301,491,919	6,876,247,741
2008	2,990,883,260	3,035,367,297	2,940,584,855	8,966,835,412
2010	3,044,270,529	3,048,789,601	3,144,984,680	9,238,044,810
2012	3,357,130,353	3,387,872,789	3,335,801,537	10,100,804,679
2014	3,628,846,790	3,267,773,758	3,210,941,420	10,107,561,968
2016	3,349,130,123	3,336,484,969	3,326,746,142	10,012,361,234
2018	3,254,846,789	3,208,744,521	3,219,995,245	9,683,586,555
2020	3,117,964,406	3,143,110,677	3,115,144,687	9,376,219,770

E. Comparison of Population Characteristics of Processing Fee and Handling Fee Recyclers

Processing fee recyclers and handling fee recyclers represent two unique populations of CRV recycling centers. In general, processing fee recyclers are: (1) larger, (2) more likely to accept scrap metal, paper and other non-CRV materials, and (3) not necessarily located near supermarkets. Handling fee recyclers tend to: (1) be smaller, (2) accept only CRV containers, and (3) be located at or near supermarkets.[6]

The handling fee and processing fee recycler populations serve different purposes. The primary objective of handling fee recyclers is to provide convenient redemption opportunities as an alternative to in-store take-back of containers. The primary objective of processing fee recyclers is to provide profitable recycling services for CRV and non-CRV materials. Both types of recyclers are important to the CRV program.

[6] There are some exceptions to these generalizations. For example, some handling fee recyclers located in rural regions are not near supermarkets and accept a variety of materials. At the same time, some supermarket lot recyclers were in the 2018 processing fee recycler population because they did not receive handling fees (if there is more than one recycler in a convenience zone, neither recycler is eligible to receive handling fees).

Exhibit 3-28 compares the percent of containers of CRV material recycled by processing fee recyclers, handling fee recyclers, and curbside programs between 2001 and 2020. This graphic illustrates long-term trends in CRV recycling by the three major categories of recyclers: those receiving only processing fees ("traditional recyclers"), those receiving processing fees and handling fees ("supermarket recyclers"), and curbside programs (receiving CRV, processing fees, and curbside supplemental payments). The majority of CRV recycling takes place at PF recycling centers. There were slight shifts in recycling year over year; between 2013 and 2014, PF quantities decreased slightly, and HF and curbside increased slightly. The share of containers recycled by program type remained consistent between 2015 and 2018. In 2020, there was a small shift away from processing fee recyclers and handling fee recyclers towards curbside. However, there do not appear to be significant changes in the overall trend over the last few years. The shifts occurring in 2009 are likely due to proportional reductions reducing the number of recyclers receiving handling fees, not to any significant change in recycler characteristics or practices.

Exhibit 3-28
Comparison of Percent of CRV Containers Recycled by Major Recycler Type (2001 to 2020)

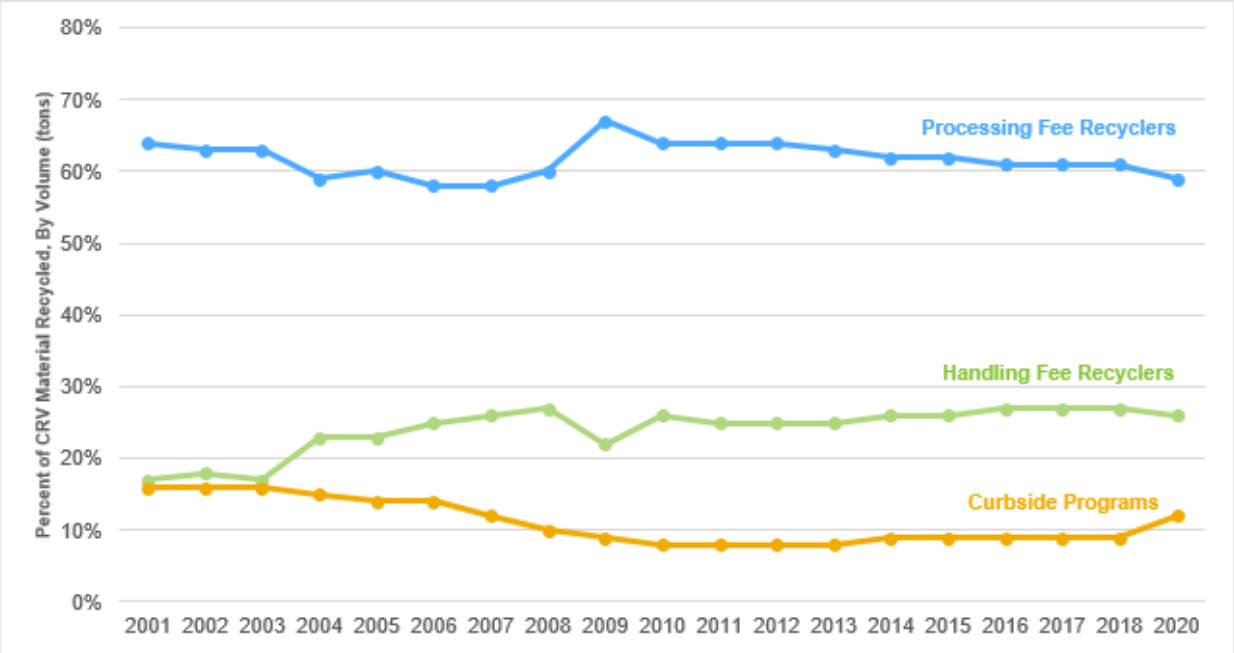
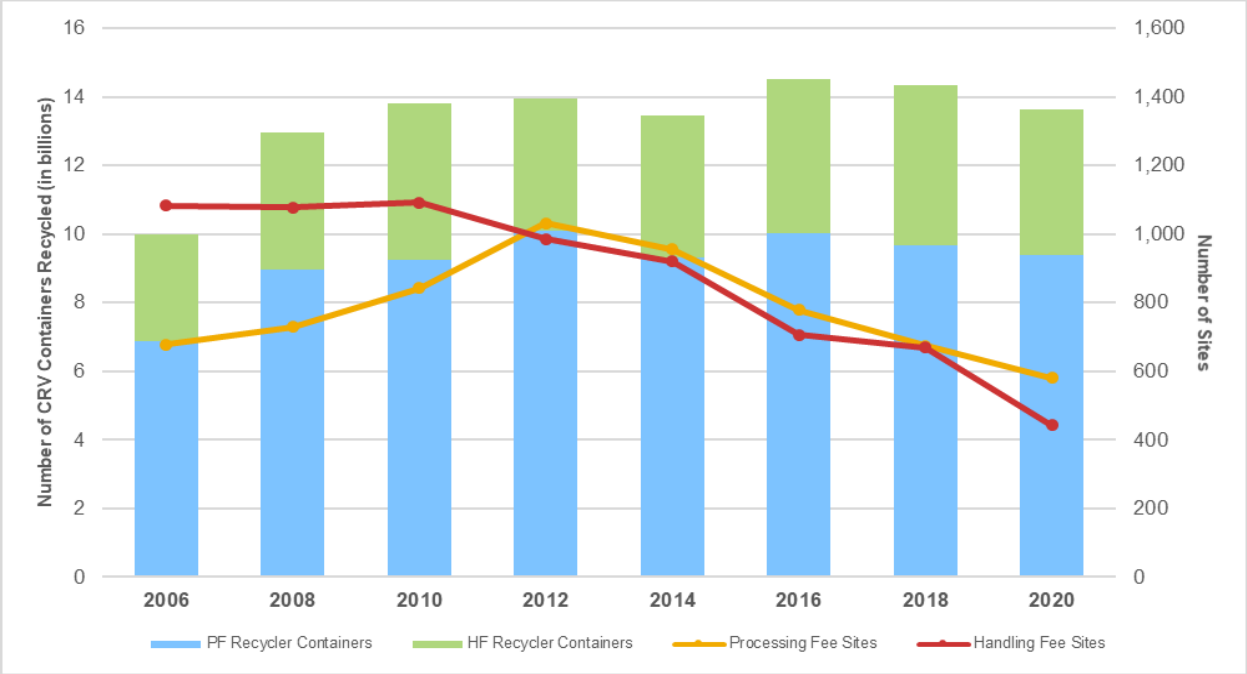


Exhibit 3-29 illustrates the total number of containers recycled by processing fee and handling fee recyclers from 2006 to 2020, as well as the number of processing fee and handling fee recyclers during the same time period. Handling fee recyclers recycled just over 3.1 billion containers in 2006, increasing to just fewer than 4 billion containers in 2008, increasing to 4.5 billion containers in 2010, declining to just over 3.8 billion containers in 2012, and increasing each survey year to 4.6 billion containers in 2018. In 2020, the number of containers recycled by handling fee recyclers decreased from 4.6 billion in 2018 to 4.2 billion in 2020. Processing fee recyclers recycled over 6.8 billion containers in 2006, increasing to just fewer than 9 billion containers in 2008, increasing to a peak of 10.1 billion containers in 2012, and then alternately decreasing and increasing over the last three survey years to 9.6 billion containers in 2018. In 2020, the processing fee recyclers recycled approximately 9.3 billion containers. In total, during the 2020 survey year, the total number of containers recycled by PF and HF recyclers decreased to 13.6 billion.

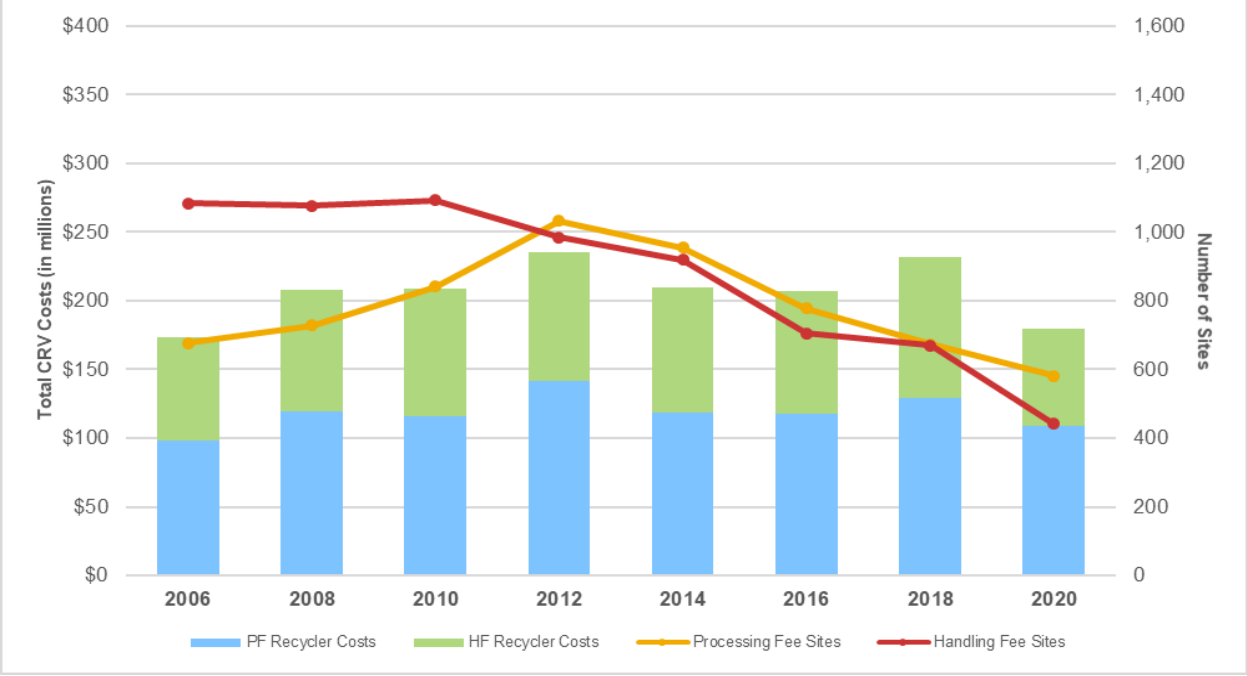
Exhibit 3-29
Total Number of Containers Recycled by Handling Fee and Processing Fee Recyclers (2006 to 2020)



In total, processing fee recyclers handled over twice as many containers as handling fee recyclers. The relative number of containers recycled by the two recycler types was relatively stable, with handling fee recyclers accounting for around 30 percent of containers recycled in all seven cost survey years. The two lines in **Exhibit 3-29**, representing number of recycling centers, show a steady decline in the number of HF sites, and a 2012 peak, followed by a steady decline, in the number of PF sites. There does not appear to be a direct correlation between the number of recycling centers and the volume of containers recycled.

Exhibit 3-30 illustrates the total CRV recycling cost by processing fee and handling fee recyclers for 2006 to 2020, as well as the number of processing fee and handling fee recyclers during the same time period. Over the eight handling fee cost surveys, handling fee recycler costs represent between 40 percent and 44 percent of total combined costs. Total costs for both recycler types and overall were lower in 2020 than 2018. For handling fee sites, 2020 had the lowest total CRV recycling costs since the start of the program in 2006. For processing fee sites, 2020 had the second lowest total CRV recycling costs after 2006. Similar to **Exhibit 3-29**, the two lines represent the number of handling fee and processing fee recycling centers.

Exhibit 3-30
Total Cost of CRV Recycling for Handling Fee and Processing Fee Recyclers (2006 to 2020)



F. Summary of Handling Fee Cost Survey Analyses

The cost per container to recycle for handling fee recyclers decreased between 2018 and 2020. The current cost per container results, and the 0.511 cent handling fee, are within the range of expected results given the combination of changes to the population that drove costs downward.

- Handling fee recycler costs per container are typically inversely dependent on the number of containers recycled. Between 2018 and 2020, the number of containers recycled by the full population of HF recyclers decreased 25 percent, and the average number of containers recycled per handling fee recycler increased by 39 percent. In addition to this, consistent with the processing fee cost survey results, other factors, such as lower labor and transportation costs, drove costs per container downward.
- Labor accounts for approximately 50 percent of recycler costs. Between 2018 and 2020, labor costs decreased for both processing fee and handling fee recyclers. Overall, wages between 2018 and 2020 increased by 4 percent across all handling fee recyclers, which was less than the CPI. Although wages slightly increased, there were more low wage recyclers in 2020 compared to 2018, and labor hours per container decreased.
- Decreased transportation costs were another factor in lower costs per container. Transportation and fuel costs per container for sampled HF recyclers decreased 13 percent and PF recyclers increased 17 percent. During this same time, the average cost per gallon of diesel decreased by 13 percent. The decrease in costs for HF recyclers and the decrease in diesel price per gallon directly contributes to a decrease in transportation and fuel costs, most of which was caused by abnormal market conditions throughout 2020.
- There is no longer one dominate handling fee recycler that heavily influences costs and containers recycled as the market is more diluted. In 2020, there were seven companies that made up 20 percent of recycled containers compared to 80 percent in 2018.
- Overall annual handling fee payments (with a COLA) are expected to decrease by 42 percent in FY 2022/2023, which is a decrease in payments by $22.7 million based on 2020 total population containers. The significant decrease in handling fee payments is offset, at least temporarily, by a net increase scrap price. The shift from relying on handling fee payments to the sale of scrap exposes recyclers to more risk by increasing exposure to market forces.
- The percent of owners earning below the poverty level decreased from 54 to 48 percent between 2016 and 2018 and further decreased to 46 percent in 2020. These decreases indicate that low-profit recyclers continue to close, and volumes are shifted to generally larger, more profitable recyclers. In both comparisons, the proportion of low profit recyclers for strata 2 and 3 recyclers decreased while stratum 1 increased.

4. Macroeconomic Factors and Implications

This section provides an overview of key macroeconomic factors that help explain the overall environment recyclers operated in over the last two years. This section begins with a general summary of COVID-19 impacts to recyclers' operations that surveyors identified during on-site visits. This is followed by a detailed overview of additional analyses Crowe conducted to estimate the fiscal impact of fluctuating market dynamics and other fiscal pressures. This section is organized as follows:

A. COVID-19 Impacts

B. Program Payment and Scrap Market Dynamics

A. COVID-19 Impacts

Crowe sampled 50 handling fee recyclers to identify the potential impacts that COVID-19 pandemic had on HF recycler operations during the 2020 survey year. The recyclers were selected from the three HF result categories (113 HF for HF recyclers, 127 PF for HF recyclers, and 102 HF tiered recyclers). To ensure the 50 set of recyclers could accurately represent the greater HF report sample, they included at least one recycler site from a multi-site business (businesses with at least 1 or more recycler sites surveyed) and ensured the set of 50 recyclers had similar strata demographics to the report sample.

In general, approximately two-thirds the 50 samples taken from the HF report sample identified COVID-19 impacts to their business in 2020. These sites cited the following factors as COVID-19 impacts:

- Shutdowns
- Shortened hours
- Fewer employees
- Additional supplies
- PPP loans and other

As a comparison, Crowe assessed the COVID-19 impacts for the 50 samples from the HF survey with the 146 recyclers in the PF report. **Exhibit 4-1** and **Exhibit 4-2** illustrate a summary of the COVID-19 impacts by factor for the PF report (146 PF for PF sites) and a sample of 50 sites within this report drawn from the 113 HF for HF, the 127 PF for HF, and the 102 HF tiered. "Other" COVID-19 impacts included factors such as volume changes, pre-sorting requirements, higher turnover rates, or switching processors.

Exhibit 4-1
PF for PF Summary of COVID-19 Impacts

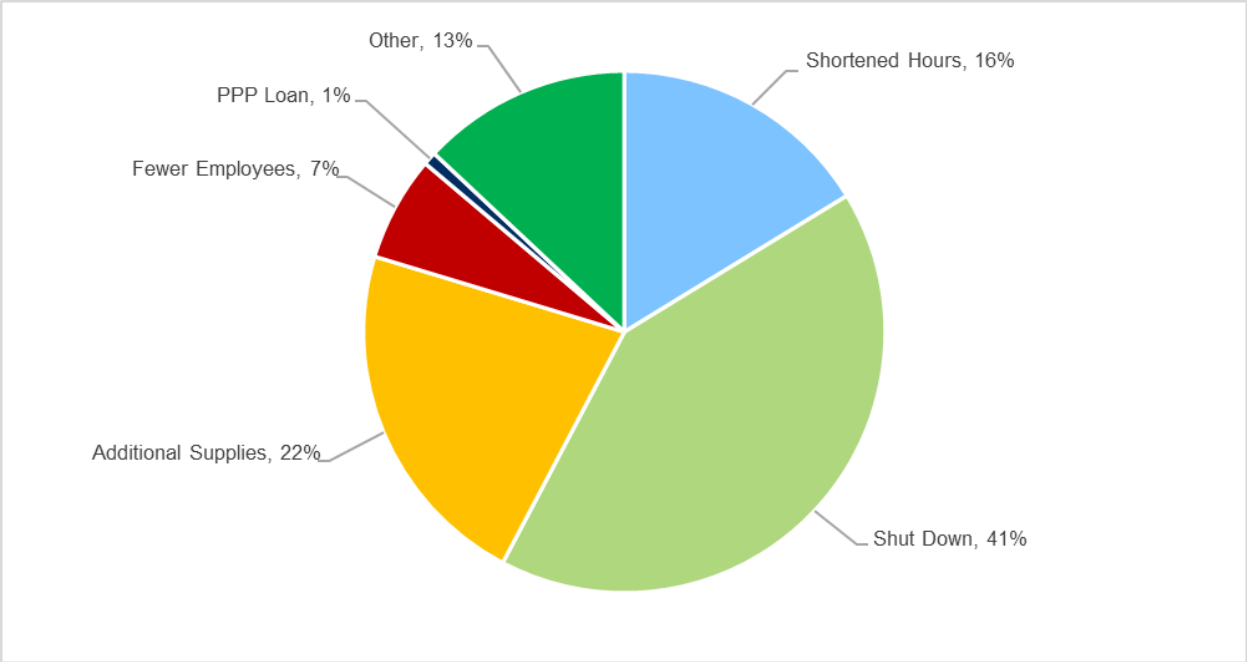
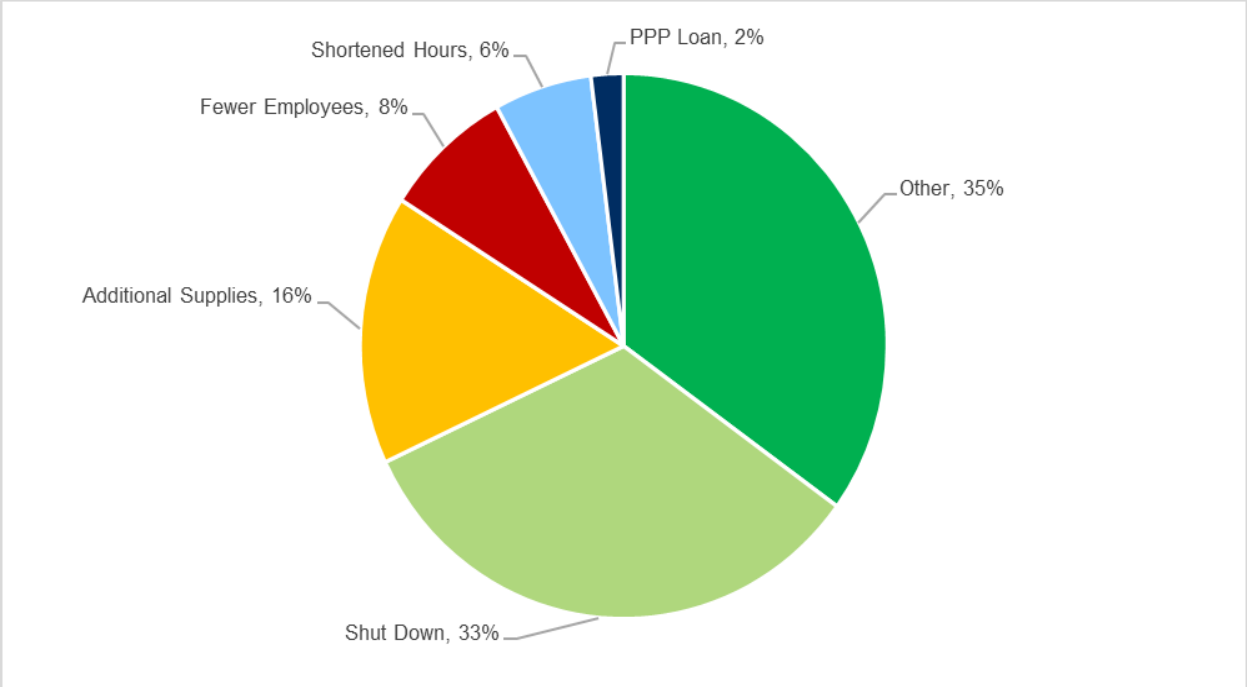


Exhibit 4-2
HF Report Summary of COVID-19 Impacts



COVID-19 Impact Differences between PF and HF Recyclers

As **Exhibit 4-1** displays, shutdowns account for most reported COVID-19 impacts for PF recyclers, followed by additional supplies, and shortened hours. Other accounted for around 13 percent of responses. For the sample of HF recyclers, **Exhibit 4-2** shows that Other accounted for the majority of reported COVID-19 impacts, followed by shutdowns, and additional supplies.

Around ninety percent of HF sites that stated other COVID-19 impacts were related to volume changes due to the pandemic. This is different from the PF for PF COVID-19 analysis, which showed other impacts to include a wider range of operational and labor changes, in addition to volume changes. A possible explanation for this could be that because most HF sites are located near places such as grocery stores, malls, or gas stations, the pandemic had a greater impact on their volumes, as customers switched to curbside and delivery services as opposed to active shopping, and trips to the gas station dropped. Unsurprisingly, shutdowns accounted for roughly 35 to 40 percent of the described COVID-19 impacts to both PF and HF recyclers. For HF sites especially, shutdowns were likely common during the pandemic, as many HF sites operate with few employees, often one to two employees at a time. With limited backups, if the employees cannot work, the site is unable to operate.

Shutdowns

The stay-at-home orders and shutdowns affected recyclers differently. In California, recyclers were deemed as essential under the “Essential Critical Infrastructure Workers” document released by the Governor. However, general restrictions and overall COVID-19 guidance was largely left up to individual counties. In some cases, recyclers received quick approvals to operate during the quarantine, only shutting down for a few days or not at all. In other cases, recyclers stayed closed for several weeks to months due to severe outbreaks.

From the 50 HF sites sampled, about one third stated they had to shut down for a period of time. Of those that shut down, they were closed an average of 3.9 weeks, mostly during the beginning of the pandemic starting in mid-March 2020. In many cases, ceasing operations for a few weeks to months, forced recyclers to operate with greater efficiency during re-opening as customers would hold onto materials and take them with fewer trips. On the other hand, a few sites sampled had closed operations completely after shutting down a few months. They were likely sites that were on the verge of closure already.

Shortened Hours

In addition to shutdowns, several recyclers noted changes in their operating hours in 2020, largely due to the pandemic. On April 23, 2020, the California Governor released executive order N-54-20 which suspended the requirement for recycling centers to operate a minimum number of hours per week or remain open during specific periods of time. Following this, in June of 2020, the Governor released N-70-20 to extend the suspension for 60 more days, allowing recycling centers to shorten their operating hours during the pandemic.

During the 2020 survey, several recyclers cited shorter operation hours, with earlier closures, later opening times, or reducing days of operations. With less business hours, recyclers likely became more efficient with reduced downtime as customers brought in nearly the same amount of material (as evidenced by a slight decline in population volumes) in a compressed timeframe.

Fewer Employees and High Turnover

Of the recyclers that identified COVID-19 impacts, about a quarter mentioned having fewer employees, difficulty keeping staff, or higher turnover rates than usual during the year. In many cases, recyclers cited that it was hard to compete with the increased unemployment benefits that rose during and after forced shutdowns. In order to attract future employees or retain their current employees, many recyclers noted having to increase hourly wages beyond minimum wage, which would increase labor costs.

The results from the cost survey show that overall average hourly wages increased from 2018 to 2020 for both HF and PF recyclers in the HF report sample. Though much of this could be contributed to the increase in minimum wage, the pressure created by the increased unemployment benefits during the pandemic likely impacted wages. For HF sites, the average wages per hour increased $0.97 (6 percent) from $17.12 per hour to $18.09 per hour. For PF sites, the average wage per hour increased by $0.39 (2 percent) from $18.11 per hour to $18.50 per hour.

Additional Supplies

Many, if not all, recyclers had to purchase additional supplies as a response to the COVID-19 pandemic even if they did not explicitly notify the survey team. Some examples of the additional supplies purchased were items such as hand sanitizer, face masks, gloves, physical barriers such as plastic or wooden screens, hand-washing stations, caution tape, and signs. Though this has a relatively minor effect on overall costs, recyclers purchased additional supplies in order to operate in the new COVID-19 environment. The average cost of supplies per HF recycler increased between 2018 and 2020.

Social Distancing and Pre-Sorting

Additional COVID-19 impacts included social distancing requirements and pre-sorting. Many, if not all, recyclers required their customers to practice social distancing while in the yard or waiting in line. Some even indicated they moved their employees to altered positions for COVID-19 specific tasks, such as parking attendants or greeters to help space out customers while they waited or manage the increase flow of customers during the months following re-opening. Additionally, to make dropping off material more efficient/less time consuming, many recyclers started requiring customers to pre-sort their materials prior to arriving at the site. This likely helped increase labor efficiency and decreased costs as sites could service more customers and therefore handle more materials in a shorter amount of time.

Volume Changes

Lastly, recyclers indicated that COVID-19 may have influenced changes in their volumes during the year. For some, recyclers saw their volumes decrease steeply during the lockdown and then increase dramatically after restrictions softened as customers held onto their materials during stay-at-home orders and then came with bigger loads later in the year. Others noted greater volumes in 2020 because their competitors or other close-by recycling sites shut down or closed, increasing their own customer base. While others stated decreases in volumes due to bar closures and general inactivity.

The population volumes show that overall tons redeemed decreased slightly from 2018 to 2020, primarily due to a decrease in tons redeemed by stratum 3 recyclers. This can likely be attributed to the decrease in number of stratum 3 recyclers from 2018 to 2020.

B. Program Payment and Scrap Market Dynamics

Crowe conducted additional analysis of the 2020 handling fee survey results to estimate how program payments and scrap market dynamics during the last two "pandemic" years impacted recyclers' cost coverage.[7] The evaluation considered whether if recyclers' costs were adequately covered by estimated revenues generated from a combination of scrap income and processing and handling payments over the last two calendar years. Crowe was also interested in identifying the estimated fiscal impact of the updated per container handling payment rate, effective July 1, 2022, on recyclers' cost coverage.

To conduct this analysis, Crowe utilized a combination of the 2020 cost data and results presented in Section 2 of this report along with historical and current scrap value per ton data[8] to calculate the estimated fiscal impact of 2020, 2021 and 2022 to-date scrap market values for the Program's primary materials – aluminum, PET #1, glass, and HDPE #2. This analysis includes all 215 handling fee recyclers surveyed as part of the 2020 handling fee cost survey, which includes the 113 stratified HF for HF sites and 102-tiered handling fee sites.

Summary of Results

Exhibit 4-3 to **Exhibit 4-6** presents the overall results of Crowe's additional analysis of recyclers' cost coverage from estimated processing payments, handling payments, and scrap revenue sources in 2020, 2021, and 2022 for the 215 handling fee recyclers surveyed. The "PF revenue" bar represents the average revenue generated from per ton processing payments from PET #1, HDPE #2, and glass. The "HF revenue" bar represents the average revenue generated from per container handling payments. The "scrap revenue" coverage bar represents the average estimated scrap income from mostly aluminum and PET #1. The "break-even" threshold represents 100 percent cost coverage from estimated processing payments, handling payments, and scrap revenue sources. The "reasonable profitability" threshold represents 110 percent cost coverage (i.e., 10 percent profit return) from estimated processing payments, handling payments, and scrap revenue sources.

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[7] "Cost coverage" refers to the levels of revenue generated from estimated scrap sales and handling and processing payments that cover recyclers' costs related to aluminum, glass, PET #1 and HDPE #2.

[8] Crowe utilized CalRecycle's scrap value per ton data for PET #1, glass, and HDPE#2 to conduct this analysis, and utilized Secondary Materials Market's scrap value per pound data for aluminum.

Exhibit 4-3
Summary of HF Recycler Cost Coverage Results (2020)

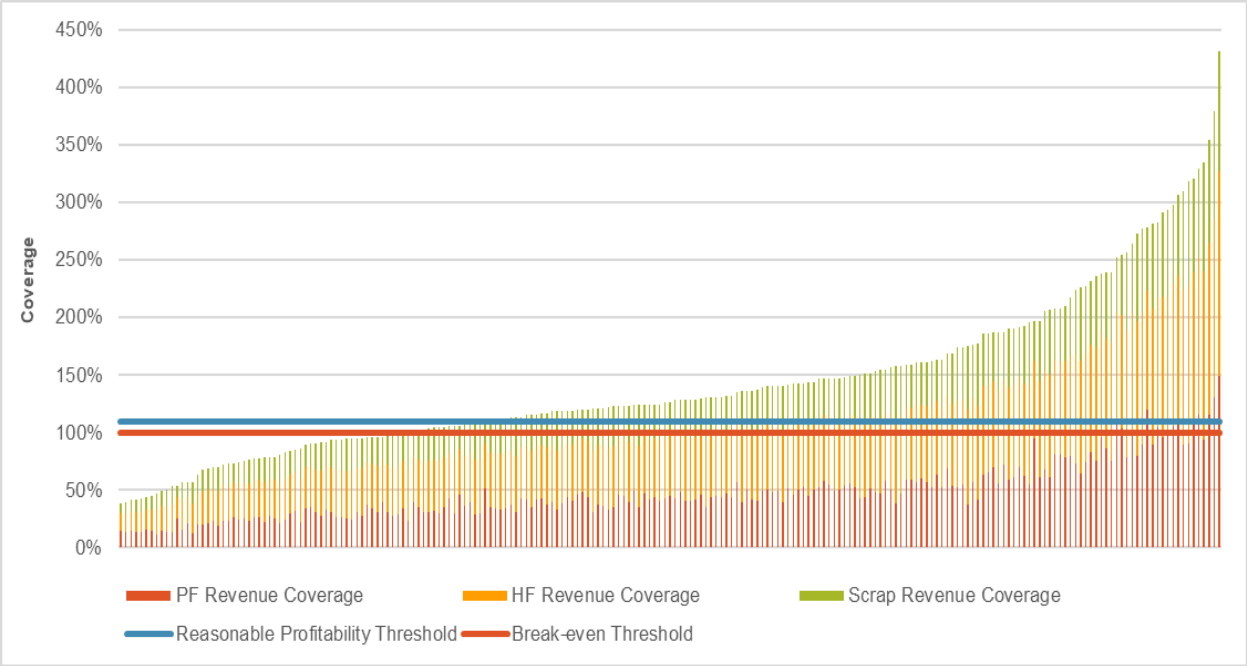


Exhibit 4-4
Summary of HF Recycler Cost Coverage Results (2021)

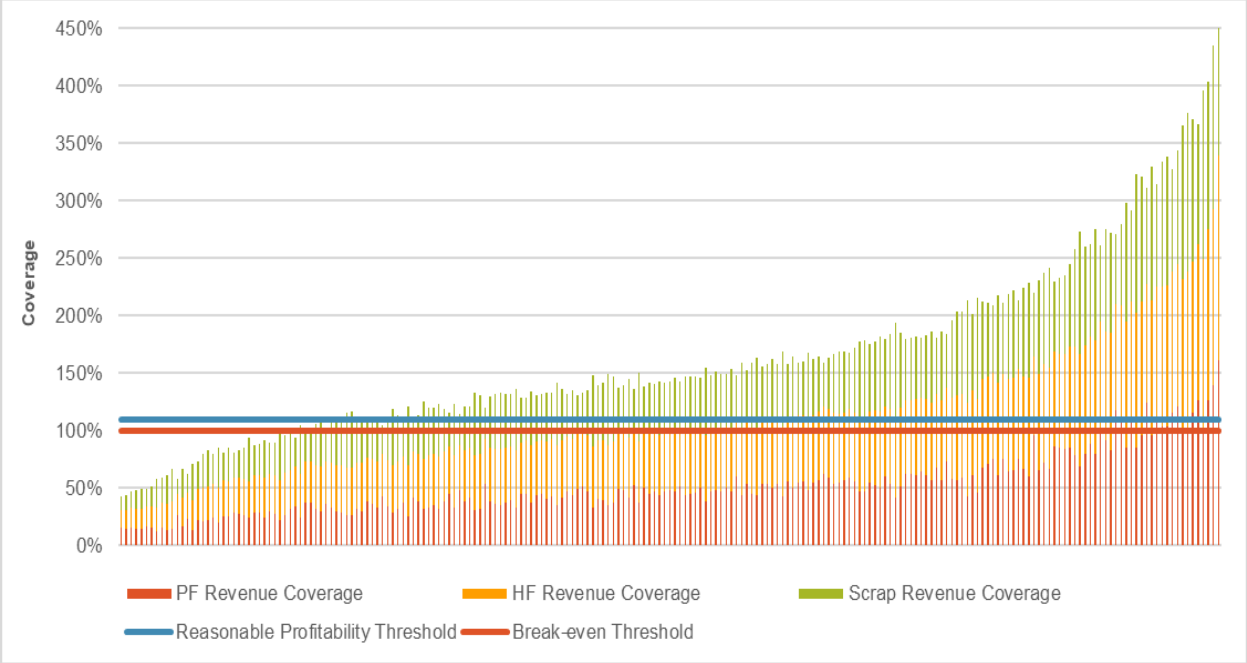


Exhibit 4-5
Summary of HF Recycler Cost Coverage Results (2022)

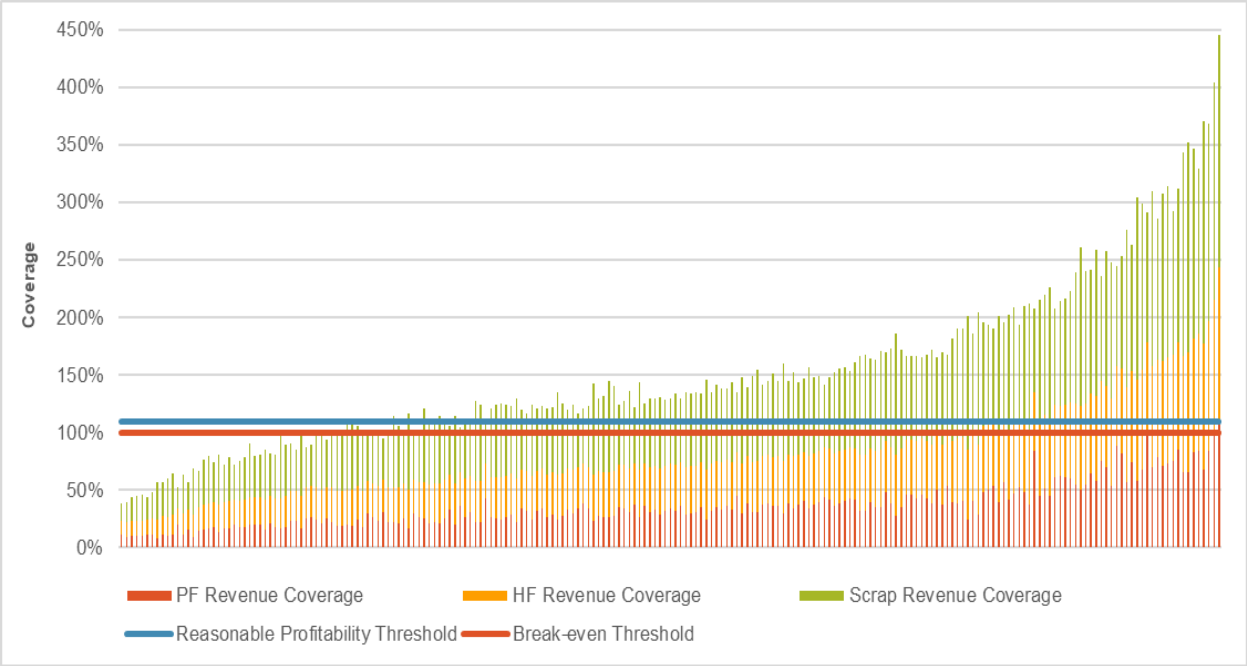
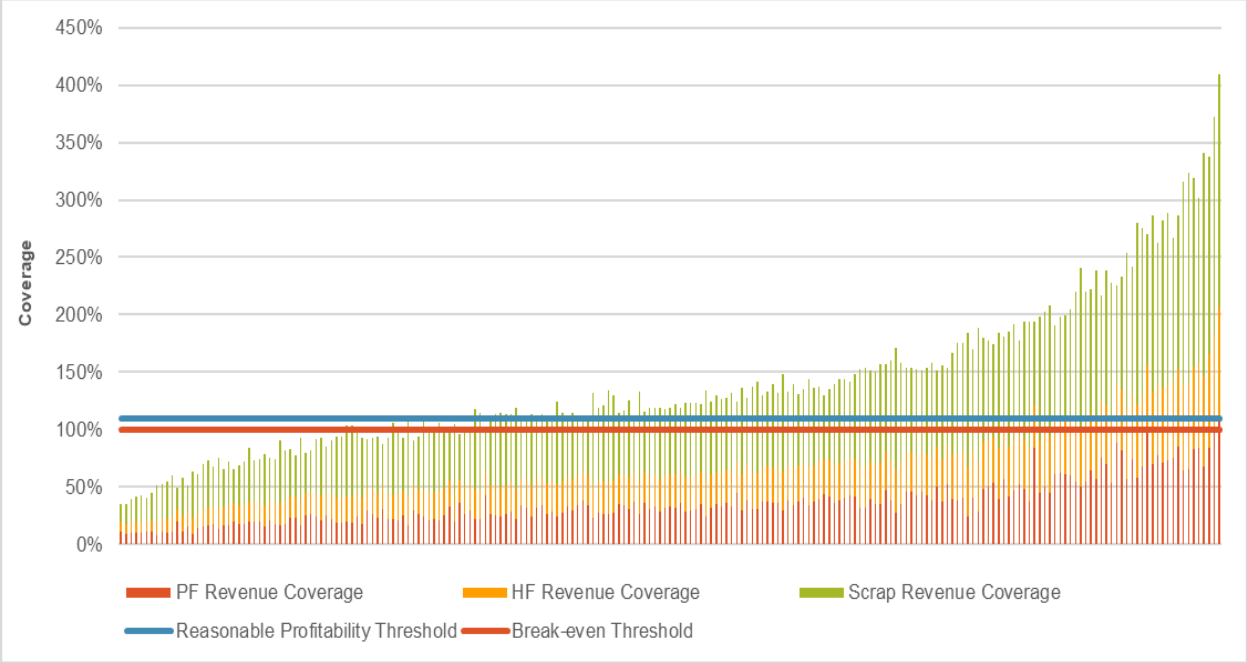


Exhibit 4-6
Summary of HF Recyclers Break-Even (July 2022)



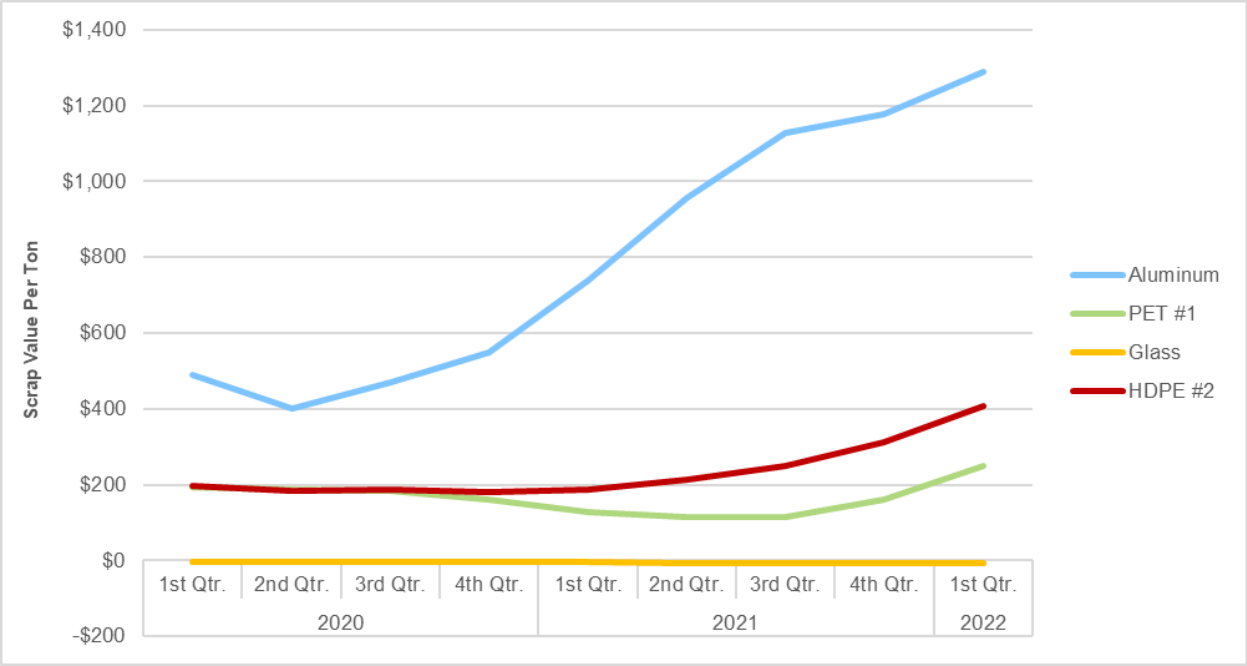
The results indicate the following:

- In 2020, approximately 73 percent of surveyed handling fee recyclers (158 of 215) had their costs covered by estimated revenue generated from processing payments, handling payments, and scrap income, as shown in **Exhibit 4-3**.
- In 2021, approximately 83 percent of surveyed handling fee recyclers (179 of 215) had their costs covered by estimated revenue generated from processing payments, handling payments, and scrap income, as shown in **Exhibit 4-4**. The increase in recyclers' overall cost coverage from 2020 to 2021 is largely due to increases in estimated scrap income from aluminum.
- In 2022, approximately 81 percent of surveyed handling fee recyclers (174 of 215) will likely have their costs covered by estimated revenue generated from processing payments, handling payments, and scrap income, as shown in **Exhibit 4-5**.
- Starting July 2022, approximately 73 percent of surveyed handling fee recyclers will have their costs covered. These decreases in recyclers' overall estimated cost coverage from 2021 to 2022 are due to decreases in estimated processing and handling payments, as shown in **Exhibit 4-6**.
- In 2020, 2021 and 2022, nearly all the sites with cost coverage below the "break-even" threshold were Stratum 3 sites signaling that the combination of handling and processing payments (and estimated scrap income) is not sufficient for smaller sites to cover their expenditures.
- Exhibit 4-3 to Exhibit 4-6 illustrate estimated processing payments, handling fee payments, and scrap income cover most HF recyclers' costs. However, there are many recycling centers (mostly smaller sized recyclers) that do not generate enough revenue from estimated processing payments, handling payments and scrap income to cover their costs, increasing the risk of closure.

Scrap Income Per Ton

Recyclers' cost coverage from scrap income fluctuates year-to-year based on market conditions. Fluctuations in scrap values per ton over the last two calendar years have varied by material type, as shown in **Exhibit 4-7.** From the first quarter of 2020 to the first quarter of 2022, aluminum tripled in value, PET #1 increased nearly 30 percent, glass remained valueless, and HDPE #2 doubled in value. These fluctuations signal an improvement in scrap market values for aluminum, PET #1, and HDPE #2, but expound the volatile scrap market conditions recyclers experienced in 2020 and 2021.

Exhibit 4-7
Quarterly Scrap Income Per Ton: Aluminum, PET #1, Glass, and HDPE #2 (2020 through 2022)



In 2020, aluminum averaged $477 per ton in value, PET#1 averaged $182 per ton in value, and HDPE #2 averaged $187 per ton in value. In 2021, aluminum averaged $1,000 per ton in value, PET#1 averaged $130 per ton in value, and HDPE #2 averaged $240 per ton in value. Finally, in the first quarter of 2022, aluminum averaged $1,290 per ton in value, PET#1 averaged $250 per ton in value, and HDPE #2 averaged $408 per ton in value. The improvement in scrap conditions in 2021 are reflected in recyclers' overall cost coverage results, as shown in Exhibit 4-4.

Appendix A:
Accessibility Additional Information

This appendix provides additional data and explanations for the various bar graph and line chart exhibits presented in this report.

Exhibit ES-2
Processing Fee and Handling Fee Cost Survey Sample (2020)

- This relationship diagram illustrates the total number of processing fee and handling fee recyclers surveyed, and the number of recyclers in the processing fee cost survey. A total of 453 total unique PF and HF sites is broken down into 215 unique HF sites and 238 unique PF sites. For the 215 unique HF sites, it is further broken down into 113 unique HF for HF sites and 102 unique HF tier sites.

Exhibit ES-3
Handling Fee Cost Survey Calculated Handling Fee Payments (without COLA)
2006 to 2020 Cost Years

Year	Cost per Container	Percent Change
2006	$0.00980	n/a
2008	$0.00859	-12%
2010	$0.00773	-10%
2012	$0.01035	34%
2014	$0.00924	-11%
2016	$0.00793	-14%
2018	$0.00894	13%
2020	$0.00511	-43%

Exhibit ES-4
Statewide Processing Fee and Handling Fee Recycler Cost per Container (2006–2020)

Processing Fee Recycler

Year	Cost per Container	Percent Change
2006	$0.01430	n/a
2008	$0.01337	-7%
2010	$0.01256	-6%
2012	$0.01405	12%
2014	$0.01274	-9%
2016	$0.01179	-7%
2018	$0.01330	13%
2020	$0.01157	-13%

Handling Fee Recycler

Year	Cost per Container	Percent Change
2006	$0.02410	n/a
2008	$0.02196	-9%
2010	$0.02029	-8%
2012	$0.02440	20%
2014	$0.02198	-10%
2016	$0.01972	-10%
2018	$0.02224	13%
2020	$0.01668	-25%

Exhibit 1-6
Processing Fee and Handling Fee Cost Survey Sample (2020)

- This relationship diagram illustrates the total number of processing fee and handling fee recyclers surveyed, and the number of recyclers in the processing fee cost survey. A total of 453 total unique PF and HF sites is broken down into 215 unique HF sites and 238 unique PF sites. For the 215 unique HF sites, it is further broken down into 113 unique HF for HF sites and 102 unique HF tier sites.

Exhibit 1-8
2020 Sampled Handling Fee Recyclers, Distribution of Cost per Container

Cents per Container	Frequency
<.50	0
.50 to .75	11
.75 to 1.00	6
1.00 to 1.25	11
1.25 to 1.50	14
1.50 to 1.75	23
1.75 to 2.00	14
2.00 to 2.25	10
2.25 to 2.50	4
2.50 to 2.75	2
2.75 to 3.00	5
3.00 to 3.25	2
3.25 to 3.50	2
3.50 to 3.75	1
3.75 to 4.00	2
4.00 to 4.25	2
4.25 to 4.50	0
4.50 to 4.75	0
4.75 to 5.00	2
>5.00	2

Exhibit 1-9
2020 Sampled Processing Fee Recyclers, Distribution of Cost per Container

Cents per Container	Frequency
<.50	5
.50 to .75	16
.75 to 1.00	19
1.00 to 1.25	23
1.25 to 1.50	27
1.50 to 1.75	10
1.75 to 2.00	3
2.00 to 2.25	5
2.25 to 2.50	2
2.50 to 2.75	1
2.75 to 3.00	2
3.00 to 3.25	1
3.25 to 3.50	2
3.50 to 3.75	1
3.75 to 4.00	1
4.00 to 4.25	1
4.25 to 4.50	2
4.50 to 4.75	0
4.75 to 5.00	1
>5.00	5

Exhibit 2-1
Cost per Container Calculation (2020)

- This diagram illustrates the calculation approach that was used for determining the statewide stratified weighted average recycling cost per beverage container.
- The equation for cost per container is as follows: Part (1) – container stratum 1 sample costs divided by container stratum 1 sample containers multiplied by container stratum 1 population containers equals container stratum 1 total population costs; Part (2) – container stratum 2 sample costs divided by container stratum 2 sample containers multiplied by container stratum 2 population containers equals container stratum 2 total population costs; Part (3) – container stratum 3 sample costs divided by container stratum 3 sample containers multiplied by container stratum 3 population containers equals container stratum 3 total population costs. Then, all three parts are summed to determine the total population costs, then divided by total population containers, which equal statewide stratified weighted average cost per container.

Exhibit 2-2
Handling Fee and Processing Fee Recycler Cost per Container (2020)

Year	Cost per Container	Percent Change
2020 Processing Fee Recycler Statewide, Weighted Average Cost per Container	$0.01157	n/a
2020 Handling Fee Recycler Statewide, Weighted Average Cost per Container	$0.01668	44%

Exhibit 2-6
Processing Fee and Handling Fee Recycler Cost per Container (2006 – 2020)

Processing Fee Recycler

Year	Cost per Container	Percent Change
2006	$0.01430	n/a
2008	$0.01337	-7%
2010	$0.01256	-6%
2012	$0.01405	12%
2014	$0.01274	-9%
2016	$0.01179	-7%
2018	$0.01330	13%
2020	$0.01157	-13%

Handling Fee Recycler

Year	Cost per Container	Percent Change
2006	$0.02410	n/a
2008	$0.02196	-9%
2010	$0.02029	-8%
2012	$0.02440	20%
2014	$0.02198	-10%
2016	$0.01972	-10%
2018	$0.02224	13%
2020	$0.01668	-25%

Exhibit 2-9
Handling Fee Cost Survey Calculated Handling Fee Payments (2006 to 2020)

Year	Cost per Container	Percent Change
2006	$0.00980	n/a
2008	$0.00859	-12%
2010	$0.00773	-10%
2012	$0.01035	34%
2014	$0.00924	-11%
2016	$0.00793	-14%
2018	$0.00894	13%
2020	$0.00511	-43%

Exhibit 2-11
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2006 to 2020 Populations)

Year	Processing Fee Recyclers	Handling Fee Recyclers
2006	6,876,247,742	3,108,522,318
2008	8,966,835,412	3,992,318,572
2010	9,238,044,810	4,562,408,591
2012	10,100,804,679	3,837,216,107
2014	9,307,083,284	4,157,132,629
2016	10,012,361,234	4,520,190,932
2018	9,683,586,555	4,640,870,876
2020	9,376,219,770	4,259,919,837

Exhibit 3-1
2006 through 2020 Populations, Number of Handling Fee Recycling Centers and Processing Fee Recycling Centers

Year	Handling Fee Recyclers	Processing Fee Recyclers
2006	1,083	677
2008	1,077	729
2010	1,092	842
2012	985	1,032
2014	931	997
2016	706	778
2018	669	705
2020	459	611

Exhibit 3-2
Population CRV Costs and Containers of Handling Fee Recyclers (2006 through 2020)

Year	Handling Fee Total Costs	Handling Fee Containers
2006	$74,915,388	3,108,522,318
2008	$87,671,316	3,992,318,572
2010	$92,571,270	4,562,408,591
2012	$93,628,073	3,837,216,107
2014	$93,500,475	4,253,888,785
2016	$89,000,000	4,500,000,000
2018	$103,000,000	4,640,000,000
2020	$71,056,800	4,260,000,000

Exhibit 3-3
Population CRV Costs and Containers of Processing Fee Recyclers (2006 through 2020)

Year	Processing Fee Total Costs	Processing Fee Containers
2006	$98,330,343	6,876,247,742
2008	$119,886,589	8,966,835,412
2010	$116,029,843	9,238,044,810
2012	$141,916,306	10,100,804,679
2014	$128,770,339	10,107,561,968
2016	$118,000,000	10,107,561,968
2018	$128,800,000	9,680,000,000
2020	$108,480,320	9,376,000,000

Exhibit 3-4
Average Containers Recycled per Handling Fee Recycler and Processing Fee Recycler (2006 through 2020)

Year	Processing Fee Recyclers	Handling Fee Recyclers
2006	10,156,939	2,870,288
2008	12,300,186	3,706,888
2010	10,971,550	4,178,030
2012	9,787,601	3,895,651
2014	9,745,637	4,518,622
2016	12,869,359	6,402,537
2018	14,370,000	6,940,000
2020	16,138,072	9,637,828

Exhibit 3-5
Average Containers Recycled per Handling Fee Recycler with Number of Handling Fee Recyclers (2006 through 2020)

Year	Handling Fee Recyclers	Handling Fee Population
2006	2,870,288	1,083
2008	3,706,888	1,077
2010	4,178,030	1,092
2012	3,895,651	985
2014	4,518,622	931
2016	6,402,537	706
2018	6,940,000	669
2020	9,637,828	459

Exhibit 3-6
Average Containers Recycled per Processing Fee Recycler with Number of Processing Fee Recyclers (2006 through 2020)

Year	Processing Fee Recyclers	Processing Fee Population
2006	10,156,939	677
2008	12,300,186	729
2010	10,971,550	842
2012	9,787,601	1,032
2014	9,745,637	997
2016	12,869,359	778
2018	14,370,000	705
2020	16,138,072	611

Exhibit 3-7
2018 and 2020 Sampled Handling Fee and Processing Fee Recyclers Percent Change in Containers per Recycler, Percent Change in Costs per Recycler, and Percent Change in Statewide, Weighted Average Handling Fee Recycler and Processing Fee Recycler Cost per Container

Measure	Handling Fee RCs Percent Change	Processing Fee RCs Percent Change
Containers per Recycling Center	39%	12%
Cost per Recycling Center	4%	-2%
Cost per Container	-25%	-13%

Exhibit 3-8
2012 to 2020 Sampled Handling Fee Recyclers and Processing Fee Recyclers Average Labor Hours per 1,000 Containers Recycled

Year	HF Hours per 1,000 Containers	HF Percent Change	PF Hours per 1,000 Containers	PF Percent Change
2012	0.80	n/a	0.51	n/a
2014	0.63	-21%	0.43	-16%
2016	0.61	-3%	0.38	-12%
2018	0.63	3%	0.37	-2%
2020	0.47	-25%	0.31	-16%

Exhibit 3-11
2012 to 2020 Sampled Handling Fee and Processing Fee Recyclers Average Wages per Hour

Year	Handling Fee Recyclers	Processing Fee Recyclers
2012	$12.20	$13.94
2014	$14.75	$14.42
2016	$14.21	$15.27
2018	$17.12	$18.11
2020	$18.09	$18.50

Exhibit 3-12
2012 to 2020 Sampled Handling Fee Recyclers Labor and Non-Labor Costs per Container

Year	Labor Costs	Non-Labor Costs
2012	$0.01038	$0.01402
2014	$0.00932	$0.01049
2016	$0.00865	$0.00963
2018	$0.01072	$0.00939
2020	$0.00852	$0.00706

Exhibit 3-13
2012 to 2020 Sampled Processing Fee Recyclers Labor and Non-Labor Costs per Container

Year	Labor Costs	Non-Labor Costs
2012	$0.00713	$0.00692
2014	$0.00625	$0.00522
2016	$0.00574	$0.00504
2018	$0.00677	$0.00565
2020	$0.00578	$0.00510

Exhibit 3-14
Comparison of HF CRV Hourly Wages Overall and by Strata (2018 and 2020)

Stratum	2018	2020
Overall	$17.12	$17.81
Stratum 1	$20.36	$19.03
Stratum 2	$15.11	$19.07
Stratum 3	$14.65	$15.27

Exhibit 3-15
Comparison of PF CRV Hourly Wages Overall and by Strata (2018 and 2020)

Stratum	2018	2020
Overall	$17.65	$19.48
Stratum 1	$19.26	$21.45
Stratum 2	$17.30	$19.44
Stratum 3	$16.31	$17.52

Exhibit 3-19
Proportion of Handling Fee RCs with Owner Income Under Minimum Wage by Strata (2016-2020)

Stratum	2016	2018	2020
Stratum 1	0%	4%	6%
Stratum 2	23%	19%	17%
Stratum 3	61%	52%	49%
Overall	30%	34%	29%

Exhibit 3-20
Percent of HF Recycler Owners Earning Under the Poverty Level by Strata (2016-2020)

Stratum	2016	2018	2020
Stratum 1	13%	21%	23%
Stratum 2	62%	44%	33%
Stratum 3	83%	61%	66%
Overall	54%	48%	46%

Exhibit 3-21
Transportation and Fuel Costs Per Container (2018 and 2020)

Year	Handling Fee Recycler	Processing Fee Recycler	Diesel Price per Gallon
2018	$0.00179	$0.00083	$3.87
2020	$0.00156	$0.00097	$3.38

Exhibit 3-22
Handling Fee Recycler Transportation Cost Per Container (2018 vs 2020)

Year	Stratum 1	Stratum 2	Stratum 3	Overall
2018	$0.00114	$0.00208	$0.00322	$0.00179
2020	$0.00085	$0.00191	$0.00262	$0.00156

Processing Fee Recycler Transportation Cost Per Container by Strata (2018 vs 2020)

Year	Stratum 1	Stratum 2	Stratum 3	Overall
2018	$0.00048	$0.00092	$0.00146	$0.00083
2020	$0.00046	$0.00124	$0.00148	$0.00097

Exhibit 3-23
Total Annual Handling Fee Payments (FY 2000/2001 through FY 2021/2022)

Year	Total Handling Fees Paid
2000/2001	$22,000,000.00
2001/2002	$23,000,000.00
2002/2003	$23,000,000.00
2003/2004	$27,000,000.00
2004/2005	$28,000,000.00
2005/2006	$27,000,000.00
2006/2007	$33,000,000.00
2007/2008	$31,000,000.00
2008/2009	$47,000,000.00
2009/2010	$24,000,000.00
2010/2011	$51,000,000.00
2011/2012	$40,500,000.00
2012/2013	$40,140,000.00
2013/2014	$41,900,000.00
2014/2015	$50,800,000.00
2015/2016	$51,300,000.00
2016/2017	$46,600,000.00
2017/2018	$50,500,000.00
2018/2019	$44,000,000.00
2019/2020	$46,000,000.00
2020/2021	$46,700,000.00
2021/2022	$40,128,444.87

Exhibit 3-24
Handling Fee Recycler Costs per Container and Population Size, by Strata (2020)

Stratum	Costs per Container	Benchmark	Sites
Stratum 1	$0.01326	$0.01668	55
Stratum 2	$0.01533	$0.01668	117
Stratum 3	$0.02138	$0.01668	270

Exhibit 3-25
Processing Fee Recycler Costs per Container and Population Size, by Strata (2020)

Stratum	Costs per Container	Benchmark	Sites
Stratum 1	$0.00906	$0.01157	61
Stratum 2	$0.01058	$0.01157	131
Stratum 3	$0.01508	$0.01157	389

Exhibit 3-28
Comparison of Percent of CRV Containers Recycled by Major Recycler Type (2001 to 2020)

Year	Processing Fee Recyclers	Handling Fee Recyclers	Curbside Programs
2001	64%	17%	16%
2002	63%	18%	16%
2003	63%	17%	16%
2004	59%	23%	15%
2005	60%	23%	14%
2006	58%	25%	14%
2007	58%	26%	12%
2008	60%	27%	10%
2009	67%	22%	9%
2010	64%	26%	8%
2011	64%	25%	8%
2012	64%	25%	8%
2013	63%	25%	8%
2014	62%	26%	9%
2015	62%	26%	9%
2016	61%	27%	9%
2017	61%	27%	9%
2018	61%	27%	9%
2020	59%	26%	12%

Exhibit 3-29
Total Number of Containers Recycled by Handling Fee and Processing Fee Recyclers (2006 to 2020)

Year	PF Recycler Containers	HF Recycler Containers	Processing Fee Sites	Handling Fee Sites
2006	6,876,247,742	3,108,522,318	677	1,083
2008	8,966,835,412	3,992,318,572	729	1,077
2010	9,238,044,810	4,562,408,591	842	1,092
2012	10,100,804,679	3,837,216,107	1,032	985
2014	9,307,083,284	4,157,132,629	955	920
2016	10,012,361,234	4,520,190,932	778	706
2018	9,683,586,555	4,640,870,876	674	669
2020	9,376,219,770	4,259,919,837	581	442

Exhibit 3-30
Total Cost of CRV Recycling for Handling Fee and Processing Fee Recyclers (2006 to 2020)

Year	PF Recycler Costs	HF Recycler Costs	Processing Fee Sites	Handling Fee Sites
2006	$98,330,343	$74,915,388	677	1,083
2008	$119,886,589	$87,671,316	729	1,077
2010	$116,029,843	$92,571,270	842	1,092
2012	$141,916,306	$93,628,073	1,032	985
2014	$118,572,241	$91,373,775	955	920
2016	$118,026,096	$89,143,563	778	706
2018	$128,769,232	$103,234,372	674	669
2020	$108,517,017	$71,053,936	581	442

Exhibit 4-1
PF for PF Summary of COVID-19 Impacts

COVID-19 Impact	Percent
Shut Down	41%
Additional Supplies	22%
Shortened Hours	16%
Other	13%
Fewer Employees	7%
PPP Loan	1%

Exhibit 4-2
HF Report Summary of COVID-19 Impacts

COVID-19 Impact	Percent
Other	35%
Shut Down	33%
Additional Supplies	16%
Fewer Employees	8%
Shortened Hours	6%
PPP Loan	2%

Exhibit 4-3
Summary of HF Recycler Cost Coverage Results (2020) *(These are not actual RC numbers)*

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC1	8%	15%	15%	110%	100%
RC2	9%	14%	16%	110%	100%
RC3	10%	14%	18%	110%	100%
RC4	11%	14%	18%	110%	100%
RC5	11%	13%	18%	110%	100%
RC6	10%	15%	18%	110%	100%
RC7	11%	15%	18%	110%	100%
RC8	15%	11%	21%	110%	100%
RC9	14%	15%	21%	110%	100%
RC10	15%	13%	22%	110%	100%
RC11	16%	14%	23%	110%	100%
RC12	10%	25%	19%	110%	100%
RC13	16%	16%	25%	110%	100%
RC14	12%	21%	23%	110%	100%
RC15	18%	13%	26%	110%	100%
RC16	16%	20%	27%	110%	100%
RC17	19%	20%	29%	110%	100%
RC18	19%	21%	29%	110%	100%
RC19	17%	23%	29%	110%	100%
RC20	21%	19%	31%	110%	100%
RC21	18%	23%	31%	110%	100%
RC22	19%	23%	31%	110%	100%
RC23	17%	27%	30%	110%	100%
RC24	18%	25%	32%	110%	100%
RC25	19%	25%	31%	110%	100%
RC26	21%	24%	32%	110%	100%
RC27	19%	27%	32%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC28	19%	27%	32%	110%	100%
RC29	22%	23%	34%	110%	100%
RC30	19%	28%	32%	110%	100%
RC31	20%	26%	33%	110%	100%
RC32	25%	21%	36%	110%	100%
RC33	22%	25%	36%	110%	100%
RC34	20%	30%	34%	110%	100%
RC35	19%	32%	35%	110%	100%
RC36	26%	22%	38%	110%	100%
RC37	19%	35%	36%	110%	100%
RC38	20%	35%	36%	110%	100%
RC39	23%	31%	37%	110%	100%
RC40	24%	28%	39%	110%	100%
RC41	21%	33%	37%	110%	100%
RC42	23%	31%	39%	110%	100%
RC43	26%	27%	41%	110%	100%
RC44	26%	27%	41%	110%	100%
RC45	28%	25%	41%	110%	100%
RC46	29%	24%	42%	110%	100%
RC47	25%	31%	39%	110%	100%
RC48	26%	27%	42%	110%	100%
RC49	21%	37%	37%	110%	100%
RC50	23%	35%	39%	110%	100%
RC51	24%	31%	40%	110%	100%
RC52	20%	40%	37%	110%	100%
RC53	25%	31%	41%	110%	100%
RC54	28%	27%	42%	110%	100%
RC55	26%	29%	42%	110%	100%
RC56	24%	34%	41%	110%	100%
RC57	31%	24%	45%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC58	22%	39%	40%	110%	100%
RC59	24%	35%	41%	110%	100%
RC60	29%	30%	43%	110%	100%
RC61	28%	31%	45%	110%	100%
RC62	28%	32%	45%	110%	100%
RC63	29%	30%	46%	110%	100%
RC64	26%	35%	44%	110%	100%
RC65	22%	43%	41%	110%	100%
RC66	30%	30%	46%	110%	100%
RC67	21%	46%	39%	110%	100%
RC68	26%	36%	44%	110%	100%
RC69	25%	39%	43%	110%	100%
RC70	32%	29%	48%	110%	100%
RC71	32%	29%	48%	110%	100%
RC72	19%	51%	39%	110%	100%
RC73	29%	35%	47%	110%	100%
RC74	30%	34%	48%	110%	100%
RC75	31%	33%	49%	110%	100%
RC76	30%	35%	48%	110%	100%
RC77	29%	37%	47%	110%	100%
RC78	33%	31%	50%	110%	100%
RC79	26%	43%	45%	110%	100%
RC80	27%	42%	47%	110%	100%
RC81	31%	35%	50%	110%	100%
RC82	28%	42%	47%	110%	100%
RC83	27%	43%	47%	110%	100%
RC84	30%	38%	49%	110%	100%
RC85	29%	40%	49%	110%	100%
RC86	34%	33%	52%	110%	100%
RC87	31%	38%	50%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC88	27%	44%	48%	110%	100%
RC89	29%	40%	49%	110%	100%
RC90	26%	46%	48%	110%	100%
RC91	25%	48%	47%	110%	100%
RC92	27%	44%	49%	110%	100%
RC93	36%	31%	53%	110%	100%
RC94	32%	38%	51%	110%	100%
RC95	33%	36%	52%	110%	100%
RC96	36%	33%	53%	110%	100%
RC97	35%	35%	53%	110%	100%
RC98	28%	46%	49%	110%	100%
RC99	29%	45%	50%	110%	100%
RC100	32%	39%	52%	110%	100%
RC101	26%	49%	48%	110%	100%
RC102	36%	35%	54%	110%	100%
RC103	28%	47%	50%	110%	100%
RC104	31%	42%	52%	110%	100%
RC105	30%	44%	51%	110%	100%
RC106	32%	40%	53%	110%	100%
RC107	30%	43%	52%	110%	100%
RC108	30%	45%	52%	110%	100%
RC109	32%	43%	54%	110%	100%
RC110	29%	48%	52%	110%	100%
RC111	33%	41%	55%	110%	100%
RC112	33%	41%	55%	110%	100%
RC113	33%	42%	54%	110%	100%
RC114	31%	47%	53%	110%	100%
RC115	38%	35%	58%	110%	100%
RC116	32%	43%	55%	110%	100%
RC117	32%	45%	53%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC118	32%	44%	54%	110%	100%
RC119	31%	47%	53%	110%	100%
RC120	34%	44%	55%	110%	100%
RC121	27%	57%	51%	110%	100%
RC122	37%	40%	59%	110%	100%
RC123	31%	50%	55%	110%	100%
RC124	36%	42%	58%	110%	100%
RC125	38%	41%	59%	110%	100%
RC126	33%	50%	57%	110%	100%
RC127	33%	50%	57%	110%	100%
RC128	36%	48%	57%	110%	100%
RC129	34%	50%	58%	110%	100%
RC130	40%	39%	61%	110%	100%
RC131	33%	52%	56%	110%	100%
RC132	36%	46%	60%	110%	100%
RC133	33%	51%	59%	110%	100%
RC134	33%	53%	58%	110%	100%
RC135	38%	45%	61%	110%	100%
RC136	34%	50%	59%	110%	100%
RC137	34%	53%	60%	110%	100%
RC138	31%	58%	58%	110%	100%
RC139	33%	55%	59%	110%	100%
RC140	36%	50%	61%	110%	100%
RC141	36%	51%	60%	110%	100%
RC142	36%	54%	59%	110%	100%
RC143	34%	55%	60%	110%	100%
RC144	36%	53%	60%	110%	100%
RC145	42%	43%	65%	110%	100%
RC146	42%	44%	65%	110%	100%
RC147	38%	51%	62%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC148	40%	48%	65%	110%	100%
RC149	41%	47%	66%	110%	100%
RC150	37%	58%	60%	110%	100%
RC151	41%	50%	66%	110%	100%
RC152	49%	38%	70%	110%	100%
RC153	43%	48%	68%	110%	100%
RC154	37%	59%	64%	110%	100%
RC155	37%	59%	64%	110%	100%
RC156	38%	57%	66%	110%	100%
RC157	37%	60%	65%	110%	100%
RC158	39%	57%	66%	110%	100%
RC159	42%	52%	68%	110%	100%
RC160	35%	64%	64%	110%	100%
RC161	42%	52%	69%	110%	100%
RC162	35%	69%	64%	110%	100%
RC163	44%	54%	71%	110%	100%
RC164	47%	52%	75%	110%	100%
RC165	46%	54%	74%	110%	100%
RC166	56%	38%	81%	110%	100%
RC167	45%	57%	74%	110%	100%
RC168	55%	42%	81%	110%	100%
RC169	46%	63%	77%	110%	100%
RC170	44%	66%	76%	110%	100%
RC171	42%	70%	75%	110%	100%
RC172	50%	56%	81%	110%	100%
RC173	42%	72%	74%	110%	100%
RC174	50%	59%	80%	110%	100%
RC175	50%	61%	80%	110%	100%
RC176	44%	70%	78%	110%	100%
RC177	50%	62%	80%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC178	55%	54%	86%	110%	100%
RC179	35%	94%	67%	110%	100%
RC180	53%	61%	84%	110%	100%
RC181	52%	68%	86%	110%	100%
RC182	56%	62%	89%	110%	100%
RC183	45%	80%	83%	110%	100%
RC184	47%	80%	81%	110%	100%
RC185	47%	78%	84%	110%	100%
RC186	50%	80%	88%	110%	100%
RC187	57%	73%	94%	110%	100%
RC188	64%	65%	97%	110%	100%
RC189	58%	74%	95%	110%	100%
RC190	54%	83%	94%	110%	100%
RC191	62%	75%	99%	110%	100%
RC192	49%	96%	93%	110%	100%
RC193	57%	87%	95%	110%	100%
RC194	61%	76%	102%	110%	100%
RC195	48%	112%	93%	110%	100%
RC196	52%	104%	98%	110%	100%
RC197	68%	78%	110%	110%	100%
RC198	59%	100%	105%	110%	100%
RC199	76%	79%	117%	110%	100%
RC200	71%	90%	116%	110%	100%
RC201	55%	120%	103%	110%	100%
RC202	74%	90%	118%	110%	100%
RC203	65%	105%	114%	110%	100%
RC204	74%	96%	122%	110%	100%
RC205	74%	97%	123%	110%	100%
RC206	69%	106%	123%	110%	100%
RC207	70%	112%	125%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC208	86%	89%	135%	110%	100%
RC209	89%	91%	139%	110%	100%
RC210	81%	108%	132%	110%	100%
RC211	77%	116%	137%	110%	100%
RC212	94%	94%	146%	110%	100%
RC213	89%	116%	150%	110%	100%
RC214	94%	130%	154%	110%	100%
RC215	105%	150%	178%	110%	100%

Exhibit 4-4
Summary of HF Recycler Cost Coverage Results (2021) *(These are not actual RC numbers)*

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC1	12%	16%	15%	110%	100%
RC2	12%	15%	16%	110%	100%
RC3	14%	16%	18%	110%	100%
RC4	16%	15%	18%	110%	100%
RC5	18%	14%	18%	110%	100%
RC6	14%	17%	18%	110%	100%
RC7	18%	16%	18%	110%	100%
RC8	25%	12%	21%	110%	100%
RC9	23%	16%	21%	110%	100%
RC10	26%	14%	22%	110%	100%
RC11	28%	15%	23%	110%	100%
RC12	13%	26%	19%	110%	100%
RC13	25%	17%	25%	110%	100%
RC14	17%	23%	23%	110%	100%
RC15	31%	14%	26%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC16	24%	22%	27%	110%	100%
RC17	30%	22%	29%	110%	100%
RC18	32%	22%	29%	110%	100%
RC19	26%	25%	29%	110%	100%
RC20	34%	20%	31%	110%	100%
RC21	24%	26%	31%	110%	100%
RC22	29%	25%	31%	110%	100%
RC23	22%	29%	30%	110%	100%
RC24	25%	27%	32%	110%	100%
RC25	27%	27%	31%	110%	100%
RC26	37%	25%	32%	110%	100%
RC27	27%	29%	32%	110%	100%
RC28	27%	29%	32%	110%	100%
RC29	33%	25%	34%	110%	100%
RC30	27%	30%	32%	110%	100%
RC31	28%	28%	33%	110%	100%
RC32	43%	22%	35%	110%	100%
RC33	33%	27%	36%	110%	100%
RC34	31%	32%	34%	110%	100%
RC35	25%	34%	35%	110%	100%
RC36	43%	24%	38%	110%	100%
RC37	25%	37%	36%	110%	100%
RC38	26%	38%	36%	110%	100%
RC39	36%	32%	37%	110%	100%
RC40	38%	30%	39%	110%	100%
RC41	30%	36%	37%	110%	100%
RC42	34%	33%	39%	110%	100%
RC43	40%	29%	41%	110%	100%
RC44	40%	29%	41%	110%	100%
RC45	48%	27%	41%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC46	49%	26%	42%	110%	100%
RC47	40%	32%	39%	110%	100%
RC48	38%	30%	42%	110%	100%
RC49	32%	39%	37%	110%	100%
RC50	34%	37%	39%	110%	100%
RC51	37%	34%	40%	110%	100%
RC52	26%	42%	37%	110%	100%
RC53	36%	34%	41%	110%	100%
RC54	48%	29%	42%	110%	100%
RC55	40%	32%	42%	110%	100%
RC56	33%	37%	41%	110%	100%
RC57	51%	26%	44%	110%	100%
RC58	28%	42%	40%	110%	100%
RC59	33%	38%	41%	110%	100%
RC60	50%	32%	43%	110%	100%
RC61	41%	34%	45%	110%	100%
RC62	40%	35%	45%	110%	100%
RC63	45%	32%	46%	110%	100%
RC64	37%	38%	44%	110%	100%
RC65	30%	45%	41%	110%	100%
RC66	45%	33%	46%	110%	100%
RC67	28%	49%	39%	110%	100%
RC68	39%	39%	44%	110%	100%
RC69	36%	42%	43%	110%	100%
RC70	54%	31%	48%	110%	100%
RC71	51%	32%	48%	110%	100%
RC72	27%	54%	39%	110%	100%
RC73	44%	38%	47%	110%	100%
RC74	48%	37%	48%	110%	100%
RC75	49%	36%	49%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC76	47%	37%	48%	110%	100%
RC77	45%	40%	47%	110%	100%
RC78	54%	33%	50%	110%	100%
RC79	39%	45%	45%	110%	100%
RC80	37%	45%	47%	110%	100%
RC81	47%	38%	50%	110%	100%
RC82	40%	44%	47%	110%	100%
RC83	40%	46%	47%	110%	100%
RC84	42%	41%	49%	110%	100%
RC85	41%	43%	49%	110%	100%
RC86	55%	35%	52%	110%	100%
RC87	45%	41%	50%	110%	100%
RC88	37%	47%	48%	110%	100%
RC89	43%	44%	49%	110%	100%
RC90	33%	50%	48%	110%	100%
RC91	35%	52%	47%	110%	100%
RC92	39%	48%	49%	110%	100%
RC93	62%	33%	53%	110%	100%
RC94	48%	41%	51%	110%	100%
RC95	50%	39%	52%	110%	100%
RC96	62%	35%	52%	110%	100%
RC97	57%	38%	53%	110%	100%
RC98	38%	50%	49%	110%	100%
RC99	41%	48%	50%	110%	100%
RC100	51%	42%	52%	110%	100%
RC101	35%	52%	48%	110%	100%
RC102	59%	37%	54%	110%	100%
RC103	38%	50%	50%	110%	100%
RC104	44%	46%	52%	110%	100%
RC105	43%	48%	50%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC106	46%	44%	53%	110%	100%
RC107	42%	47%	52%	110%	100%
RC108	42%	49%	52%	110%	100%
RC109	46%	47%	54%	110%	100%
RC110	40%	51%	52%	110%	100%
RC111	48%	44%	55%	110%	100%
RC112	47%	45%	55%	110%	100%
RC113	47%	46%	54%	110%	100%
RC114	43%	50%	53%	110%	100%
RC115	59%	38%	58%	110%	100%
RC116	46%	47%	55%	110%	100%
RC117	50%	48%	53%	110%	100%
RC118	48%	48%	54%	110%	100%
RC119	46%	51%	53%	110%	100%
RC120	52%	47%	55%	110%	100%
RC121	38%	60%	51%	110%	100%
RC122	57%	44%	59%	110%	100%
RC123	44%	54%	55%	110%	100%
RC124	56%	45%	58%	110%	100%
RC125	61%	44%	59%	110%	100%
RC126	46%	54%	57%	110%	100%
RC127	48%	54%	57%	110%	100%
RC128	55%	51%	56%	110%	100%
RC129	47%	53%	58%	110%	100%
RC130	65%	43%	61%	110%	100%
RC131	46%	55%	56%	110%	100%
RC132	55%	50%	60%	110%	100%
RC133	45%	55%	59%	110%	100%
RC134	47%	56%	58%	110%	100%
RC135	58%	49%	60%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC136	49%	54%	59%	110%	100%
RC137	48%	57%	60%	110%	100%
RC138	39%	63%	58%	110%	100%
RC139	45%	59%	59%	110%	100%
RC140	52%	54%	61%	110%	100%
RC141	54%	54%	60%	110%	100%
RC142	53%	57%	59%	110%	100%
RC143	49%	59%	60%	110%	100%
RC144	56%	56%	60%	110%	100%
RC145	65%	47%	65%	110%	100%
RC146	66%	47%	65%	110%	100%
RC147	59%	55%	62%	110%	100%
RC148	59%	52%	65%	110%	100%
RC149	65%	51%	66%	110%	100%
RC150	59%	60%	60%	110%	100%
RC151	65%	53%	66%	110%	100%
RC152	82%	42%	70%	110%	100%
RC153	65%	52%	68%	110%	100%
RC154	54%	63%	63%	110%	100%
RC155	54%	63%	64%	110%	100%
RC156	55%	61%	66%	110%	100%
RC157	52%	64%	65%	110%	100%
RC158	55%	61%	66%	110%	100%
RC159	62%	57%	68%	110%	100%
RC160	49%	68%	64%	110%	100%
RC161	60%	57%	69%	110%	100%
RC162	48%	73%	64%	110%	100%
RC163	66%	58%	71%	110%	100%
RC164	73%	57%	75%	110%	100%
RC165	71%	59%	74%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC166	89%	43%	81%	110%	100%
RC167	66%	62%	74%	110%	100%
RC168	89%	46%	81%	110%	100%
RC169	67%	68%	77%	110%	100%
RC170	64%	71%	76%	110%	100%
RC171	59%	75%	75%	110%	100%
RC172	75%	61%	81%	110%	100%
RC173	62%	76%	74%	110%	100%
RC174	74%	64%	80%	110%	100%
RC175	77%	66%	80%	110%	100%
RC176	60%	76%	78%	110%	100%
RC177	78%	67%	80%	110%	100%
RC178	82%	60%	86%	110%	100%
RC179	56%	97%	67%	110%	100%
RC180	81%	66%	84%	110%	100%
RC181	79%	73%	86%	110%	100%
RC182	87%	67%	88%	110%	100%
RC183	61%	86%	83%	110%	100%
RC184	67%	85%	81%	110%	100%
RC185	68%	84%	84%	110%	100%
RC186	71%	86%	88%	110%	100%
RC187	85%	79%	94%	110%	100%
RC188	106%	69%	97%	110%	100%
RC189	85%	80%	95%	110%	100%
RC190	80%	89%	94%	110%	100%
RC191	97%	80%	99%	110%	100%
RC192	66%	102%	93%	110%	100%
RC193	89%	91%	95%	110%	100%
RC194	87%	83%	102%	110%	100%
RC195	61%	118%	93%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC196	71%	111%	98%	110%	100%
RC197	103%	85%	110%	110%	100%
RC198	79%	107%	105%	110%	100%
RC199	120%	86%	117%	110%	100%
RC200	109%	97%	116%	110%	100%
RC201	84%	125%	103%	110%	100%
RC202	116%	96%	118%	110%	100%
RC203	89%	112%	113%	110%	100%
RC204	108%	104%	122%	110%	100%
RC205	112%	104%	122%	110%	100%
RC206	89%	116%	123%	110%	100%
RC207	98%	121%	125%	110%	100%
RC208	135%	97%	134%	110%	100%
RC209	138%	99%	139%	110%	100%
RC210	124%	115%	132%	110%	100%
RC211	104%	126%	136%	110%	100%
RC212	147%	103%	146%	110%	100%
RC213	128%	126%	149%	110%	100%
RC214	142%	139%	154%	110%	100%
RC215	149%	161%	178%	110%	100%

Exhibit 4-5
Summary of HF Recycler Cost Coverage Results (2022) *(These are not actual RC numbers)*

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC1	16%	12%	11%	110%	100%
RC2	17%	10%	12%	110%	100%
RC3	20%	11%	13%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC4	22%	10%	13%	110%	100%
RC5	23%	10%	13%	110%	100%
RC6	20%	11%	14%	110%	100%
RC7	23%	11%	14%	110%	100%
RC8	32%	8%	16%	110%	100%
RC9	29%	11%	16%	110%	100%
RC10	33%	10%	17%	110%	100%
RC11	36%	11%	18%	110%	100%
RC12	18%	20%	14%	110%	100%
RC13	33%	12%	18%	110%	100%
RC14	23%	16%	17%	110%	100%
RC15	40%	10%	19%	110%	100%
RC16	32%	14%	20%	110%	100%
RC17	39%	16%	22%	110%	100%
RC18	41%	16%	22%	110%	100%
RC19	35%	18%	22%	110%	100%
RC20	44%	14%	23%	110%	100%
RC21	33%	16%	23%	110%	100%
RC22	38%	17%	23%	110%	100%
RC23	30%	20%	23%	110%	100%
RC24	34%	18%	24%	110%	100%
RC25	37%	18%	24%	110%	100%
RC26	47%	20%	24%	110%	100%
RC27	36%	20%	24%	110%	100%
RC28	37%	20%	24%	110%	100%
RC29	44%	16%	26%	110%	100%
RC30	37%	21%	24%	110%	100%
RC31	38%	18%	25%	110%	100%
RC32	55%	17%	27%	110%	100%
RC33	45%	17%	27%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC34	41%	24%	25%	110%	100%
RC35	35%	23%	26%	110%	100%
RC36	55%	17%	28%	110%	100%
RC37	35%	26%	27%	110%	100%
RC38	36%	27%	27%	110%	100%
RC39	48%	24%	28%	110%	100%
RC40	50%	21%	29%	110%	100%
RC41	41%	25%	28%	110%	100%
RC42	46%	23%	29%	110%	100%
RC43	53%	19%	31%	110%	100%
RC44	53%	19%	31%	110%	100%
RC45	61%	20%	31%	110%	100%
RC46	62%	19%	31%	110%	100%
RC47	53%	24%	30%	110%	100%
RC48	52%	18%	32%	110%	100%
RC49	42%	30%	28%	110%	100%
RC50	45%	27%	29%	110%	100%
RC51	49%	23%	30%	110%	100%
RC52	36%	31%	28%	110%	100%
RC53	48%	22%	31%	110%	100%
RC54	62%	22%	31%	110%	100%
RC55	53%	21%	32%	110%	100%
RC56	45%	25%	31%	110%	100%
RC57	66%	17%	33%	110%	100%
RC58	39%	30%	30%	110%	100%
RC59	46%	26%	31%	110%	100%
RC60	64%	25%	33%	110%	100%
RC61	55%	21%	34%	110%	100%
RC62	54%	22%	34%	110%	100%
RC63	59%	21%	34%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC64	50%	25%	33%	110%	100%
RC65	41%	33%	30%	110%	100%
RC66	59%	21%	35%	110%	100%
RC67	39%	36%	29%	110%	100%
RC68	52%	27%	33%	110%	100%
RC69	49%	30%	32%	110%	100%
RC70	70%	22%	36%	110%	100%
RC71	67%	22%	36%	110%	100%
RC72	37%	43%	30%	110%	100%
RC73	59%	26%	35%	110%	100%
RC74	63%	25%	36%	110%	100%
RC75	64%	24%	36%	110%	100%
RC76	62%	26%	36%	110%	100%
RC77	59%	29%	35%	110%	100%
RC78	70%	23%	37%	110%	100%
RC79	52%	34%	34%	110%	100%
RC80	51%	32%	35%	110%	100%
RC81	62%	25%	37%	110%	100%
RC82	54%	32%	35%	110%	100%
RC83	54%	34%	35%	110%	100%
RC84	57%	27%	37%	110%	100%
RC85	56%	29%	37%	110%	100%
RC86	72%	24%	39%	110%	100%
RC87	60%	27%	38%	110%	100%
RC88	50%	33%	36%	110%	100%
RC89	57%	30%	37%	110%	100%
RC90	47%	34%	36%	110%	100%
RC91	48%	38%	35%	110%	100%
RC92	53%	34%	36%	110%	100%
RC93	79%	24%	40%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC94	63%	28%	38%	110%	100%
RC95	67%	26%	39%	110%	100%
RC96	79%	26%	39%	110%	100%
RC97	74%	28%	40%	110%	100%
RC98	53%	35%	37%	110%	100%
RC99	56%	34%	38%	110%	100%
RC100	67%	30%	39%	110%	100%
RC101	49%	38%	36%	110%	100%
RC102	77%	27%	40%	110%	100%
RC103	52%	36%	37%	110%	100%
RC104	60%	31%	39%	110%	100%
RC105	58%	34%	38%	110%	100%
RC106	62%	29%	40%	110%	100%
RC107	58%	32%	39%	110%	100%
RC108	57%	34%	39%	110%	100%
RC109	62%	32%	40%	110%	100%
RC110	55%	36%	39%	110%	100%
RC111	65%	29%	41%	110%	100%
RC112	64%	29%	41%	110%	100%
RC113	63%	31%	41%	110%	100%
RC114	59%	35%	40%	110%	100%
RC115	78%	25%	43%	110%	100%
RC116	63%	32%	41%	110%	100%
RC117	66%	35%	40%	110%	100%
RC118	64%	33%	41%	110%	100%
RC119	61%	37%	40%	110%	100%
RC120	69%	34%	41%	110%	100%
RC121	52%	45%	38%	110%	100%
RC122	75%	29%	44%	110%	100%
RC123	59%	39%	41%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC124	74%	31%	43%	110%	100%
RC125	79%	31%	44%	110%	100%
RC126	62%	37%	42%	110%	100%
RC127	65%	38%	43%	110%	100%
RC128	73%	36%	42%	110%	100%
RC129	64%	37%	43%	110%	100%
RC130	85%	30%	46%	110%	100%
RC131	63%	39%	42%	110%	100%
RC132	73%	35%	45%	110%	100%
RC133	62%	37%	44%	110%	100%
RC134	63%	40%	43%	110%	100%
RC135	77%	34%	45%	110%	100%
RC136	66%	38%	44%	110%	100%
RC137	65%	39%	45%	110%	100%
RC138	55%	44%	44%	110%	100%
RC139	62%	42%	45%	110%	100%
RC140	70%	36%	46%	110%	100%
RC141	72%	39%	45%	110%	100%
RC142	71%	41%	44%	110%	100%
RC143	66%	43%	45%	110%	100%
RC144	74%	41%	45%	110%	100%
RC145	86%	32%	49%	110%	100%
RC146	87%	32%	49%	110%	100%
RC147	78%	40%	47%	110%	100%
RC148	79%	35%	49%	110%	100%
RC149	85%	36%	49%	110%	100%
RC150	77%	48%	45%	110%	100%
RC151	86%	38%	49%	110%	100%
RC152	105%	28%	53%	110%	100%
RC153	86%	35%	51%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC154	73%	47%	48%	110%	100%
RC155	73%	46%	48%	110%	100%
RC156	74%	43%	49%	110%	100%
RC157	70%	46%	49%	110%	100%
RC158	75%	43%	50%	110%	100%
RC159	83%	39%	51%	110%	100%
RC160	67%	50%	48%	110%	100%
RC161	81%	37%	52%	110%	100%
RC162	66%	53%	48%	110%	100%
RC163	89%	40%	53%	110%	100%
RC164	96%	39%	56%	110%	100%
RC165	94%	41%	55%	110%	100%
RC166	116%	24%	61%	110%	100%
RC167	89%	41%	56%	110%	100%
RC168	116%	29%	61%	110%	100%
RC169	90%	48%	58%	110%	100%
RC170	87%	50%	57%	110%	100%
RC171	80%	54%	56%	110%	100%
RC172	101%	40%	61%	110%	100%
RC173	84%	57%	55%	110%	100%
RC174	100%	42%	60%	110%	100%
RC175	101%	47%	60%	110%	100%
RC176	83%	52%	58%	110%	100%
RC177	102%	48%	60%	110%	100%
RC178	110%	37%	65%	110%	100%
RC179	73%	84%	51%	110%	100%
RC180	108%	46%	63%	110%	100%
RC181	105%	51%	64%	110%	100%
RC182	114%	46%	66%	110%	100%
RC183	84%	62%	62%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC184	91%	63%	61%	110%	100%
RC185	92%	61%	63%	110%	100%
RC186	97%	61%	66%	110%	100%
RC187	114%	55%	71%	110%	100%
RC188	138%	50%	73%	110%	100%
RC189	114%	54%	71%	110%	100%
RC190	107%	64%	70%	110%	100%
RC191	128%	58%	74%	110%	100%
RC192	92%	75%	70%	110%	100%
RC193	117%	70%	71%	110%	100%
RC194	118%	53%	77%	110%	100%
RC195	86%	89%	70%	110%	100%
RC196	98%	82%	74%	110%	100%
RC197	137%	57%	83%	110%	100%
RC198	110%	75%	79%	110%	100%
RC199	158%	58%	88%	110%	100%
RC200	144%	68%	87%	110%	100%
RC201	112%	102%	77%	110%	100%
RC202	153%	70%	88%	110%	100%
RC203	123%	78%	85%	110%	100%
RC204	146%	71%	91%	110%	100%
RC205	149%	73%	92%	110%	100%
RC206	125%	76%	92%	110%	100%
RC207	134%	85%	94%	110%	100%
RC208	177%	65%	101%	110%	100%
RC209	182%	66%	104%	110%	100%
RC210	165%	83%	99%	110%	100%
RC211	143%	84%	102%	110%	100%
RC212	193%	68%	110%	110%	100%
RC213	172%	84%	112%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC214	189%	100%	116%	110%	100%
RC215	202%	110%	133%	110%	100%

Exhibit 4-6
Summary of HF Recyclers Break-Even (July 2022) *(These are not actual RC numbers)*

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC1	16%	12%	8%	110%	100%
RC2	17%	10%	9%	110%	100%
RC3	20%	11%	10%	110%	100%
RC4	22%	10%	10%	110%	100%
RC5	23%	10%	10%	110%	100%
RC6	20%	11%	10%	110%	100%
RC7	23%	11%	10%	110%	100%
RC8	32%	8%	12%	110%	100%
RC9	29%	11%	12%	110%	100%
RC10	33%	10%	12%	110%	100%
RC11	36%	11%	13%	110%	100%
RC12	18%	20%	10%	110%	100%
RC13	33%	12%	13%	110%	100%
RC14	23%	16%	12%	110%	100%
RC15	40%	10%	14%	110%	100%
RC16	32%	14%	15%	110%	100%
RC17	39%	16%	16%	110%	100%
RC18	41%	16%	16%	110%	100%
RC19	35%	18%	16%	110%	100%
RC20	44%	14%	17%	110%	100%
RC21	33%	16%	17%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC22	38%	17%	17%	110%	100%
RC23	30%	20%	16%	110%	100%
RC24	34%	18%	17%	110%	100%
RC25	37%	18%	17%	110%	100%
RC26	47%	20%	17%	110%	100%
RC27	36%	20%	17%	110%	100%
RC28	37%	20%	17%	110%	100%
RC29	44%	16%	19%	110%	100%
RC30	37%	21%	17%	110%	100%
RC31	38%	18%	18%	110%	100%
RC32	55%	17%	19%	110%	100%
RC33	45%	17%	20%	110%	100%
RC34	41%	24%	18%	110%	100%
RC35	35%	23%	19%	110%	100%
RC36	55%	17%	21%	110%	100%
RC37	35%	26%	19%	110%	100%
RC38	36%	27%	19%	110%	100%
RC39	48%	24%	20%	110%	100%
RC40	50%	21%	21%	110%	100%
RC41	41%	25%	20%	110%	100%
RC42	46%	23%	21%	110%	100%
RC43	53%	19%	22%	110%	100%
RC44	53%	19%	22%	110%	100%
RC45	61%	20%	22%	110%	100%
RC46	62%	19%	23%	110%	100%
RC47	53%	24%	21%	110%	100%
RC48	52%	18%	23%	110%	100%
RC49	42%	30%	20%	110%	100%
RC50	45%	27%	21%	110%	100%
RC51	49%	23%	22%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC52	36%	31%	20%	110%	100%
RC53	48%	22%	22%	110%	100%
RC54	62%	22%	23%	110%	100%
RC55	53%	21%	23%	110%	100%
RC56	45%	25%	22%	110%	100%
RC57	66%	17%	24%	110%	100%
RC58	39%	30%	22%	110%	100%
RC59	46%	26%	22%	110%	100%
RC60	64%	25%	24%	110%	100%
RC61	55%	21%	24%	110%	100%
RC62	54%	22%	24%	110%	100%
RC63	59%	21%	25%	110%	100%
RC64	50%	25%	24%	110%	100%
RC65	41%	33%	22%	110%	100%
RC66	59%	21%	25%	110%	100%
RC67	39%	36%	21%	110%	100%
RC68	52%	27%	24%	110%	100%
RC69	49%	30%	23%	110%	100%
RC70	70%	22%	26%	110%	100%
RC71	67%	22%	26%	110%	100%
RC72	37%	43%	21%	110%	100%
RC73	59%	26%	26%	110%	100%
RC74	63%	25%	26%	110%	100%
RC75	64%	24%	26%	110%	100%
RC76	62%	26%	26%	110%	100%
RC77	59%	29%	25%	110%	100%
RC78	70%	23%	27%	110%	100%
RC79	52%	34%	24%	110%	100%
RC80	51%	32%	25%	110%	100%
RC81	62%	25%	27%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC82	54%	32%	25%	110%	100%
RC83	54%	34%	25%	110%	100%
RC84	57%	27%	27%	110%	100%
RC85	56%	29%	27%	110%	100%
RC86	72%	24%	28%	110%	100%
RC87	60%	27%	27%	110%	100%
RC88	50%	33%	26%	110%	100%
RC89	57%	30%	27%	110%	100%
RC90	47%	34%	26%	110%	100%
RC91	48%	38%	25%	110%	100%
RC92	53%	34%	26%	110%	100%
RC93	79%	24%	29%	110%	100%
RC94	63%	28%	28%	110%	100%
RC95	67%	26%	28%	110%	100%
RC96	79%	26%	28%	110%	100%
RC97	74%	28%	29%	110%	100%
RC98	53%	35%	27%	110%	100%
RC99	56%	34%	27%	110%	100%
RC100	67%	30%	28%	110%	100%
RC101	49%	38%	26%	110%	100%
RC102	77%	27%	29%	110%	100%
RC103	52%	36%	27%	110%	100%
RC104	60%	31%	28%	110%	100%
RC105	58%	34%	27%	110%	100%
RC106	62%	29%	29%	110%	100%
RC107	58%	32%	28%	110%	100%
RC108	57%	34%	28%	110%	100%
RC109	62%	32%	29%	110%	100%
RC110	55%	36%	28%	110%	100%
RC111	65%	29%	30%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC112	64%	29%	30%	110%	100%
RC113	63%	31%	30%	110%	100%
RC114	59%	35%	29%	110%	100%
RC115	78%	25%	31%	110%	100%
RC116	63%	32%	30%	110%	100%
RC117	66%	35%	29%	110%	100%
RC118	64%	33%	29%	110%	100%
RC119	61%	37%	29%	110%	100%
RC120	69%	34%	30%	110%	100%
RC121	52%	45%	28%	110%	100%
RC122	75%	29%	32%	110%	100%
RC123	59%	39%	30%	110%	100%
RC124	74%	31%	31%	110%	100%
RC125	79%	31%	32%	110%	100%
RC126	62%	37%	31%	110%	100%
RC127	65%	38%	31%	110%	100%
RC128	73%	36%	31%	110%	100%
RC129	64%	37%	31%	110%	100%
RC130	85%	30%	33%	110%	100%
RC131	63%	39%	31%	110%	100%
RC132	73%	35%	32%	110%	100%
RC133	62%	37%	32%	110%	100%
RC134	63%	40%	31%	110%	100%
RC135	77%	34%	33%	110%	100%
RC136	66%	38%	32%	110%	100%
RC137	65%	39%	32%	110%	100%
RC138	55%	44%	31%	110%	100%
RC139	62%	42%	32%	110%	100%
RC140	70%	36%	33%	110%	100%
RC141	72%	39%	33%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC142	71%	41%	32%	110%	100%
RC143	66%	43%	32%	110%	100%
RC144	74%	41%	33%	110%	100%
RC145	86%	32%	35%	110%	100%
RC146	87%	32%	35%	110%	100%
RC147	78%	40%	34%	110%	100%
RC148	79%	35%	35%	110%	100%
RC149	85%	36%	36%	110%	100%
RC150	77%	48%	33%	110%	100%
RC151	86%	38%	36%	110%	100%
RC152	105%	28%	38%	110%	100%
RC153	86%	35%	37%	110%	100%
RC154	73%	47%	34%	110%	100%
RC155	73%	46%	34%	110%	100%
RC156	74%	43%	36%	110%	100%
RC157	70%	46%	35%	110%	100%
RC158	75%	43%	36%	110%	100%
RC159	83%	39%	37%	110%	100%
RC160	67%	50%	35%	110%	100%
RC161	81%	37%	37%	110%	100%
RC162	66%	53%	35%	110%	100%
RC163	89%	40%	39%	110%	100%
RC164	96%	39%	40%	110%	100%
RC165	94%	41%	40%	110%	100%
RC166	116%	24%	44%	110%	100%
RC167	89%	41%	40%	110%	100%
RC168	116%	29%	44%	110%	100%
RC169	90%	48%	42%	110%	100%
RC170	87%	50%	41%	110%	100%
RC171	80%	54%	40%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC172	101%	40%	44%	110%	100%
RC173	84%	57%	40%	110%	100%
RC174	100%	42%	44%	110%	100%
RC175	101%	47%	43%	110%	100%
RC176	83%	52%	42%	110%	100%
RC177	102%	48%	43%	110%	100%
RC178	110%	37%	47%	110%	100%
RC179	73%	84%	37%	110%	100%
RC180	108%	46%	45%	110%	100%
RC181	105%	51%	47%	110%	100%
RC182	114%	46%	48%	110%	100%
RC183	84%	62%	45%	110%	100%
RC184	91%	63%	44%	110%	100%
RC185	92%	61%	45%	110%	100%
RC186	97%	61%	48%	110%	100%
RC187	114%	55%	51%	110%	100%
RC188	138%	50%	53%	110%	100%
RC189	114%	54%	51%	110%	100%
RC190	107%	64%	51%	110%	100%
RC191	128%	58%	54%	110%	100%
RC192	92%	75%	50%	110%	100%
RC193	117%	70%	52%	110%	100%
RC194	118%	53%	55%	110%	100%
RC195	86%	89%	50%	110%	100%
RC196	98%	82%	53%	110%	100%
RC197	137%	57%	60%	110%	100%
RC198	110%	75%	57%	110%	100%
RC199	158%	58%	64%	110%	100%
RC200	144%	68%	63%	110%	100%
RC201	112%	102%	56%	110%	100%

RC Cert #	Scrap Revenue Coverage	PF Revenue Coverage	HF Revenue Coverage	Reasonable Profitability Threshold	Break-even Threshold
RC202	153%	70%	64%	110%	100%
RC203	123%	78%	62%	110%	100%
RC204	146%	71%	66%	110%	100%
RC205	149%	73%	66%	110%	100%
RC206	125%	76%	67%	110%	100%
RC207	134%	85%	68%	110%	100%
RC208	177%	65%	73%	110%	100%
RC209	182%	66%	75%	110%	100%
RC210	165%	83%	71%	110%	100%
RC211	143%	84%	74%	110%	100%
RC212	193%	68%	79%	110%	100%
RC213	172%	84%	81%	110%	100%
RC214	189%	100%	84%	110%	100%
RC215	202%	110%	96%	110%	100%

Exhibit 4-7
Quarterly Scrap Income Per Ton: Aluminum, PET #1, Glass, and HDPE #2 (2020 through 2022)

Material	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1
Aluminum	$490	$400	$469	$550	$739	$958	$1,127	$1,177	$1,290
PET #1	$194	$188	$184	$160	$127	$116	$115	$162	$250
Glass	-$2	-$3	-$3	-$4	-$5	-$6	-$8	-$7	-$7
HDPE #2	$196	$185	$186	$180	$188	$212	$249	$311	$408