2023 Handling Fee Final Report

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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 handling fee cost survey.

Executive Summary

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). The Handling Fee Final Report:

- Provides [1]an estimate of the statewide, weighted-average certified recycler cost per container to recycle for handling fee recyclers (HF recyclers) and processing fee recyclers (PF recyclers). The difference between the cost per container for handling fee and processing fee recyclers results in the handling fee payment to recycling centers for July 2024.[2]
- Summarizes tasks that Crowe and its subcontractors conducted to obtain the final, statewide, weighted-average handling fee and processing fee recycler costs per container.
- Provides analyses of the results of this handling fee cost survey.

AB 3056 (Committee on Natural Resources, 2006) mandates that CalRecycle conduct this survey biennially alongside the processing fee cost survey. The handling fee is determined by deducting the average recycling cost per container for certified recycling centers not receiving handling fees (PF recyclers) from the average cost per container of certified recycling centers that do receive handling fees (HF recyclers).

The Beverage Container Recycling Program encourages recycling and litter reduction. As part of this, AB 2020 (Margolin, 1986) established specific goals for convenient recycling through a system of Convenience Zones, defined as the area within a half-mile radius of a supermarket with annual sales of $2 million or more.[3] To help cover the generally higher costs of operating within a Convenience Zone, the program established a system of payments to support convenient recycling.

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[1] A handling fee recycler is a certified recycling center that receives the handling fee payment in addition to the processing fee payment. A processing fee recycler is a certified recycling center that only receives a processing fee payment.

[2] Through the passage of AB 203 (Committee on Budget, 2022), CalRecycle was able to issue a revised handling fee rate. This rate, based on a cost-of-living adjustment to prior handling fees has been used for FY 2022/2023 and FY 2023/2024.

[3] This definition was still in place during 2022, the cost year surveyed. Recent legislative changes through SB 1013 (Atkins, 2022) expanded the convenience zone. Effective January 1, 2023, the convenience zone area expanded from a one-half mile radius to a one-mile radius of a supermarket, and from a three-mile radius to a five-mile radius in a rural region.

Since the passage of AB 3056, CalRecycle has conducted a handling fee cost survey in conjunction with the processing fee cost survey to determine the amount of the handling fee payment.

A. Handling Fee Cost Survey Results

The statewide, weighted-average, cost per container for handling fee recyclers and processing fee recyclers are presented in **Exhibit 1.** The statewide, weighted-average, cost to recycle for handling fee recyclers in 2022 was 1.994 cents per container, 40% higher than the statewide, weighted-average, cost to recycle for processing fee recyclers in 2022, which was 1.421 cents per container. The handling fee payment, as calculated based on the difference between the cost per container for handling fee recyclers and processing fee recyclers, is 0.573 cents ($0.00573).

Exhibit 2 compares 2022 handling fee payments to the seven prior cost surveys in which CalRecycle measured recycler costs (even years 2008 through 2022). Note that costs per container in Exhibit 2 are not adjusted for inflation or cost of living (COLA). Compared to 2020, the HF cost survey calculated 2022 handling fee payment increased by 12% to $0.00573.

Exhibit 3 compares 2022 handling fee recycler and processing fee recycler cost per container to the seven prior cost surveys. Compared to 2020, the 2022 cost per container for handling fee recyclers increased by 20%, while cost per container for processing fee recyclers increased by 23%.

Exhibit 1
Statewide Recycler Costs per Container (2022)

Recycler Type	2022 Statewide, Weighted-Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90% Confidence Interval
1. Handling Fee Recycler	1.994 Cents	+40%	6.12%
2. Processing Fee Recycler	1.421 Cents	n/a	4.55%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.573 Cents	n/a	n/a

Exhibit 2
Handling Fee Cost Survey Calculated Handling Fee Payments (without COLA) (2008 to 2022)

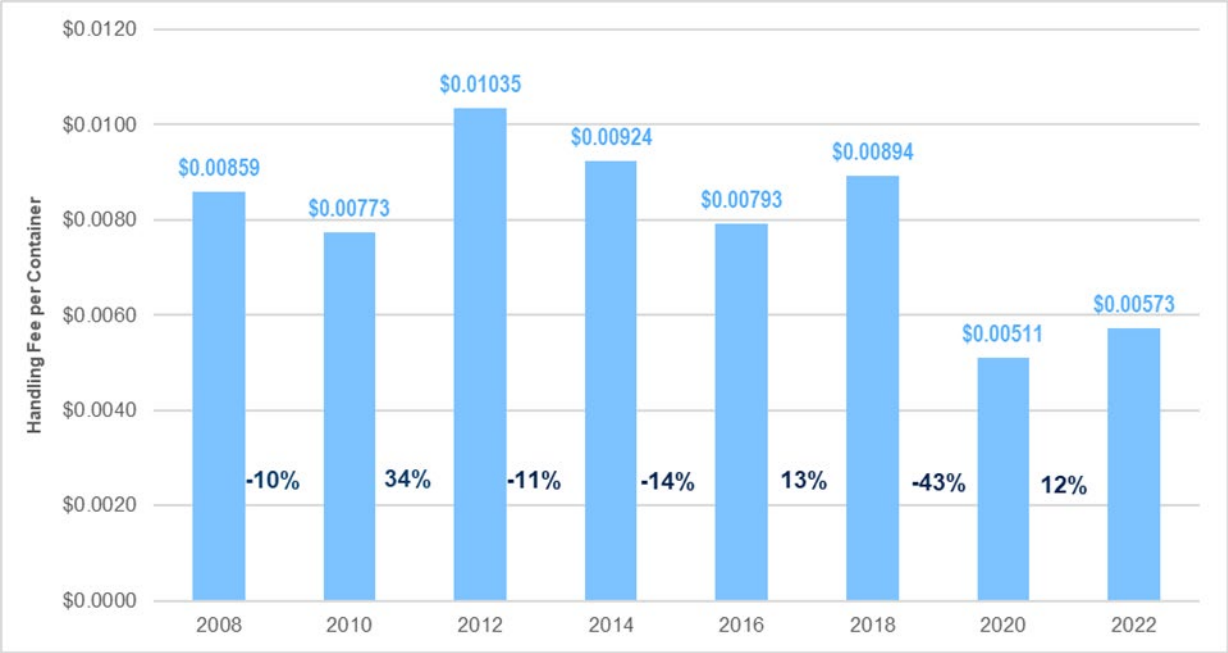
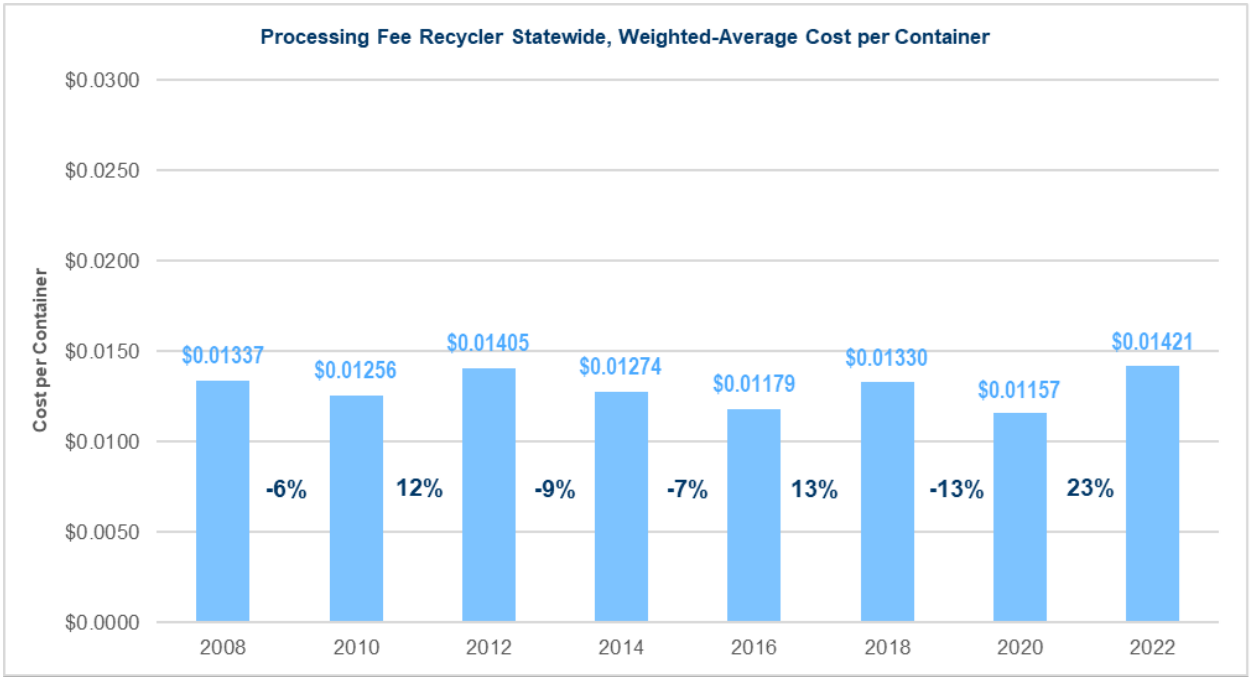
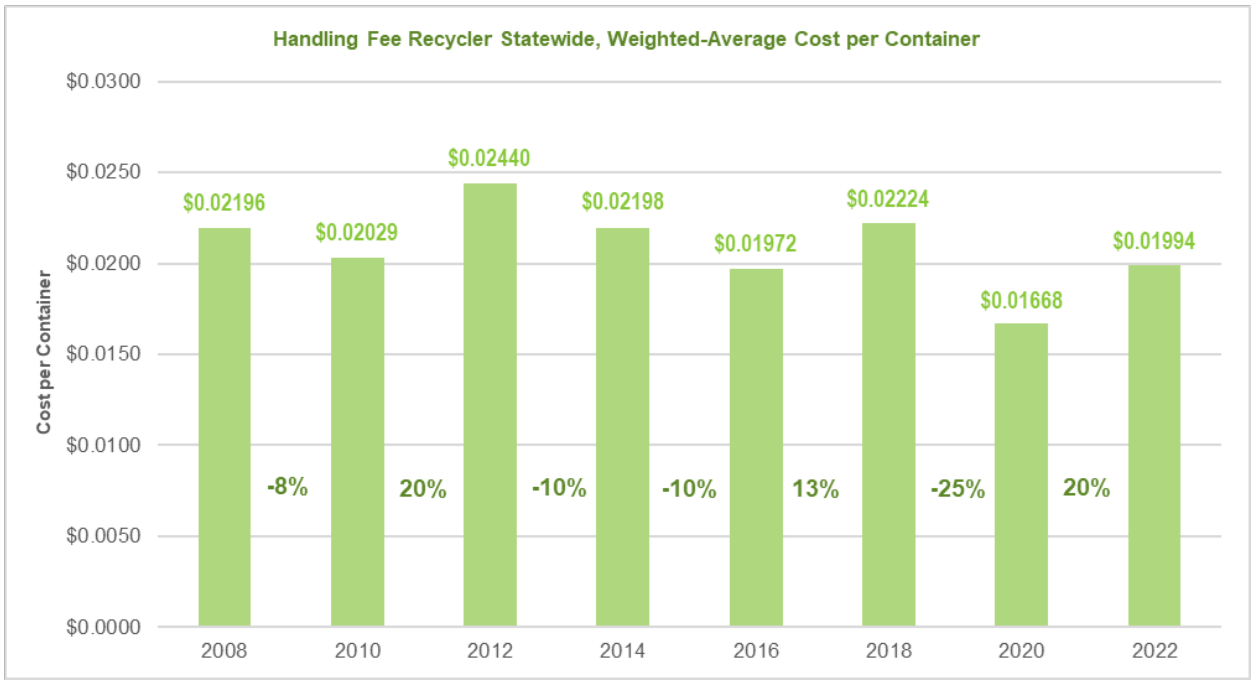


Exhibit 3
Statewide Processing Fee and Handling Fee
Recycler Cost per Container (2008 to 2022)





B. Summary of Results

Overall, cost per container increased between 2020 and 2022, but to a somewhat lesser extent than the Processing Fee Cost Survey results. Our analyses identify a combination of factors that may be impacting recycling costs. Between 2020 and 2022 there was an increase in the overall survey population of HF recycling centers and a slight decrease of PF recycling centers. The increase in HF recycler cost per container between 2020 and 2022 is due to overall increases in operating expenses rather than recycler dynamics. In fact, despite increased volumes per recycler, cost per container increased. This indicates that the increase to operating expenses were significant enough to overcome the increases in recycler productivity. The following factors led to increased costs:

- **Higher labor costs** – Driven by the 15% increase in minimum wage, average hourly wages increased by 14% for HF recyclers and 15% for PF recyclers. Labor and indirect labor account for about 60% of recycler costs, therefore an increase of 14% would result in an 8% increase to overall costs if everything else is held equal. Higher labor costs contribute to higher overall costs.
- **Higher transportation costs** – Driven by a 79% increase in diesel gasoline prices, transportation costs per ton increased by 38% for HF recyclers and 36% for PF recyclers. Transportation accounts for about 10% to 12% of recycler costs, therefore an increase of 38% would result in 4% to 5% increase to overall costs if everything else is held equal. Higher transportation costs contribute to higher overall costs.
- **High inflation and cost of living** – Driven by a 12.9% increase in consumer price index (CPI), the overall cost of living is higher in 2022 compared to 2020. The CPI increased nearly three times higher over a two-year period compared to an average increase of 4.5%. If everything else stayed the same, a CPI increase of 12.9% would generally result in a 12.9% increase to recycler costs.
    - Nearly all cost categories among handling fee and processing fee recyclers increased with direct labor, indirect labor, general business overhead, and transportation, accounting for roughly 90% of the increase in costs per recycler.

The handling fee cost survey is a complex, primary data gathering exercise. We drew from 249 diverse recycling centers (115 HF, 134 PF) across the state to determine a single cost-per-container result for each population. The cost-per-container results must make sense in the historical context of prior cost surveys, and within the context of current recycling operations and market dynamics. The handling fee recycler cost-per-container results presented in this Handling Fee Report are both reasonable in a historical context and reflect a recovery period after the peak of the pandemic.

1. Handling Fee Cost Survey Methodology

This section describes the cost survey methodology, from establishing the survey sample frame, to quality control procedures, and all the supporting tasks in between. Subsection A summarizes major tasks accomplished over an 11-month period to complete this handling fee cost survey, as well as additional detail for four key areas:

A. Overview of Cost Survey Methodology

B. Survey Design

C. Conducting Site Visit Surveys

D. Quality Control and Confidentiality Procedures

E. Cost Survey Methodology Validation.

A. Overview of Cost Survey Methodology

1. **Developed and documented a sample survey design framework and selected recycling centers for the cost survey.** Crowe determined the number of recycling centers selected for the stratified random sample used to measure costs per container for handling fee and processing fee sites. Following the sample design, Crowe randomly selected certified recycling centers to participate in the cost survey.
2. **Monitored site completion characteristics to sample design for both handling fee recyclers and processing fee recyclers.** Crowe surveyed 134 processing fee (PF) recyclers and 115 handling fee (HF) recyclers to calculate recycler costs for specific components of the processing fee and handling fee cost surveys.
3. **Updated and calibrated the Labor Allocation Cost Survey Model.** The cost survey model is a 14-worksheet, Microsoft Excel-based model Crowe used to allocate recycling center costs to beverage container material types, based on labor allocations. Crowe updated the cost survey model to reflect 2022 container per pound, CRV payment information, and procedural changes to the cost survey. In addition, Crowe calibrated the Indirect Cost Allocation Sub-Models for Aluminum/Bi-Metal and All-Plastics with the most recent prior survey information. These sub-models are incorporated into the Labor Allocation Cost Survey Model and ensure 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 to determine costs per container for all CRV material types.

4. **Revised and updated the Cost Survey Training Manual and training materials.** Crowe updated the evolving training manual based on the heavily streamlined 2016 Cost Survey Training Manual. The Manual consists of 10 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 conduct cost surveys successfully. In addition, Crowe updated PowerPoint presentations covering topics in the Training Manual. The presentations include videos of recycling centers, quizzes, and activities specific to each training module.
5. **Revised and conducted cost survey training.** Training consisted of five days of interactive sessions, two days of self-paced study, site visits, and two follow-up sessions. Activities during the initial trainings included conducting cost survey interview role playing activities, mentoring from experienced survey team members, and completing a site visit cost model and associated documentation. As part of training, each new survey team member conducted a cost survey site visit with a highly experienced team member to provide "real-world" experience. Following the field visits, new survey members spent one to two days completing the site files. The entire survey team reconvened in person after the training site visits to present and discuss the site visits and review the remainder of the training materials. For this 2022 cost survey, Crowe also conducted a one-hour training for quality control reviewers.
6. **Scheduled, conducted, and completed 349 recycling center on-site visits during eight months between May 2023 and December 2023.** Throughout the scheduling and site visits, the Crowe team built upon the 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 surveyors, including accountants and/or recycling experts. It typically took between one and three hours to complete an 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 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 online file review system for team members to upload and review survey files. The survey files include all functional survey components (site procedure checklist, site memorandum, site equipment list, Excel cost model, signed affidavit, and supporting site labor and financial information).

8. **Developed and implemented an intensive quality control procedure.** The quality control procedure included eight hours for each site file, spread across five different levels of review (site team review, independent first level review, manager review, CPA partner review, and project director review). This quality control procedure 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 were generally 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 249 completed labor-hour allocation cost models. Crowe 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. Using defined and documented statistical procedures, Crowe calculated error rates at a 90% confidence interval.

B. Survey Design

Crowe followed processing fee and handling fee cost survey procedures consistent with the eight prior cost surveys. The population of handling fee, or HF, recycling centers eligible for the cost survey was defined as all recycling centers:

- Receiving at least one handling fee payment for any of the months between January 2022 and December 2022,
- Certified and operational on or before March 1, 2022,
- Reporting redemption volume between January 2022 and December 2022,
- Not subsidized by the Department of Rehabilitation, and
- Not subject to CalRecycle investigation for major infractions.

There were 11 handling fee sites removed from the population due to investigations, leaving 529 HF recycling centers in this total traditional recycling center population.

The population of processing fee, or PF, recycling centers eligible for the cost survey was defined as all recycling centers:

- Not receiving handling fees between January 2022 and December 2022,
- Certified and operational on or before March 1, 2022,
- Reporting redemption volume between January 2022 and December 2022,
- Not subsidized by the Department of Rehabilitation, and
- Not subject to CalRecycle investigation for major infractions.

There were 18 sites removed from the population due to investigations, leaving 559 recycling centers in this total traditional recycling center population.

This overall 2023 handling fee cost survey had a slightly larger sample size than previous handling fee cost surveys. The Crowe team completed 134 PF and 115 HF recycler cost surveys during eight months of field work between May 2023 through December 2023 to obtain results for this cost survey. These 134 PF recycling centers within the Handling Fee Cost Survey are also referred to as PF for HF in this report. These 115 HF recycling centers within the Handling Fee Cost Survey are also referred to as HF for HF in this report. 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 2022 costs, the survey design consisted of two stratified random samples:

- A statistically defensible, stratified random sample of 115 sites, drawn from the 529 qualifying HF recycling centers. Three strata were defined based on 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 HF recycling centers. HF recycler strata definitions are provided in **Exhibit 4.**
- A statistically defensible, stratified random sample of 134 sites, drawn from the 559 qualifying PF recycling centers. Three strata were defined based on the total annual containers handled by a site. This stratified random sample was used to measure the costs of recycling CRV containers for PF recycling centers. PF recycler strata definitions are provided in **Exhibit 5.**

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 Crowe made a distinction between the two groups. Because of the parallel strata definitions for HF and PF recyclers, Crowe was able to directly compare cost-per-container results for the two populations. Furthermore, because of this survey design, the cost surveys conducted for 2022 costs per container treated the two recycler populations with equal statistical rigor.

To increase precision and confidence in random sample results for all recycling centers while minimizing overall sample size the traditional recycling center survey population was divided into three strata, based on number of containers recycled, as shown in Exhibit 4 for HF recyclers and Exhibit 5 for PF recyclers.

Exhibit 4
Handling Fee Recycler Container Stratum Definitions (2022)

Strata	2022 Number of Containers Recycled
1	Greater than, or equal to, 19.4 million containers
2	Greater than, or equal to, 10.1 million containers, up to less than 19.4 million containers
3	Less than 10.1 million containers

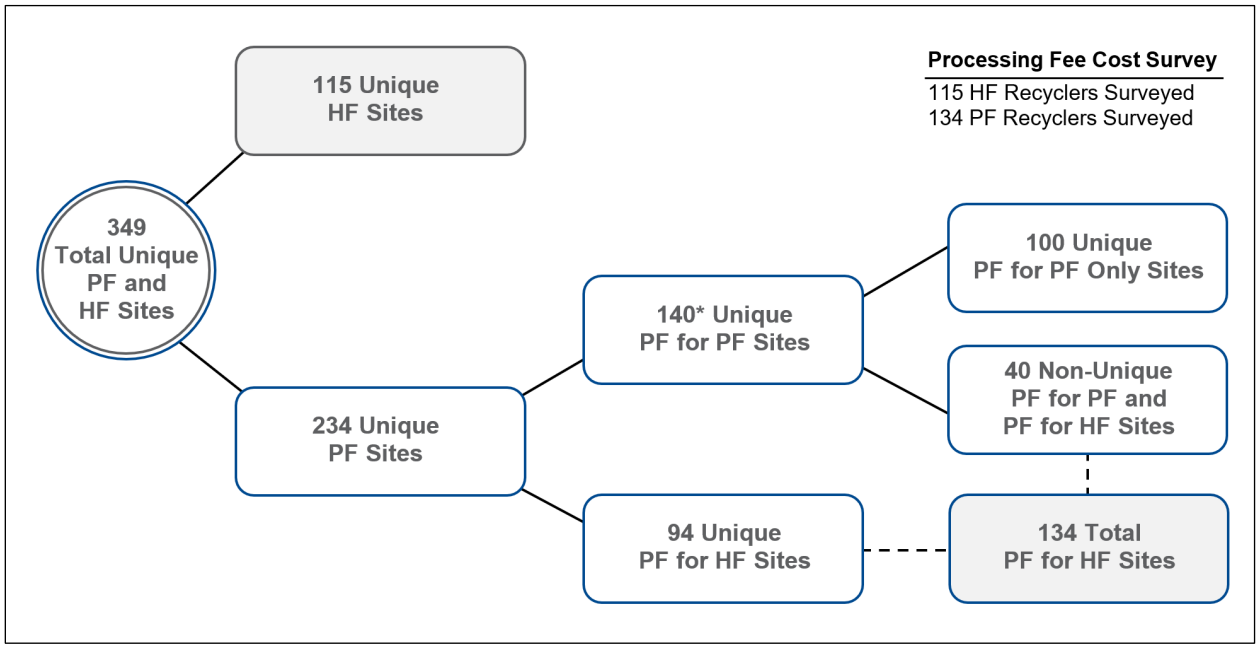
Exhibit 5
Processing Fee Recycler Container Stratum Definitions (2022)

Strata	2022 Number of Containers Recycled
1	Greater than, or equal to, 34.4 million containers
2	Greater than, or equal to, 18.3 million containers, up to less than 34.4 million containers
3	Less than 18.3 million containers

Sample Selection

This handling fee cost survey was part of a broader combined processing fee and handling fee cost survey that included 234 processing fee and 115 HF recyclers. The final 234 PF recyclers included 140 unique sites for the processing fee cost survey. **Exhibit 6** illustrates the total number of PF and HF recyclers surveyed, 349 unique sites, and the number of recyclers in the handling fee cost survey.

Exhibit 6
Processing Fee and Handling Fee Cost Survey Sample (2022)



Note: 40 PF sites within the 140 also were within the handling fee cost survey PF for HF sites, for a total 134 (94 + 40) PF sites used for the cost-per-container calculation.

C. Conducting Site Visit Surveys

A significant component of the cost survey involved scheduling site visits and communicating with recyclers chosen from the sample frame. Because conducting a cost survey entails the collection of proprietary financial information, sensitivity to stakeholder relations is essential. Without willing and active cooperation from the selected recycling center operators, determining the actual 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 we were seeking to obtain, and, perhaps most importantly, to correct misunderstandings about the purpose of the cost survey.

Starting in late April 2023, introduction letters on CalRecycle letterhead were sent to all selected recyclers to:

- Inform them that they were selected to participate in a processing fee and handling fee cost survey,
- Outline what was expected of the recycler and
- Introduce Crowe as CalRecycle's cost survey contractor.

In the second stage of communication, a Crowe scheduling coordinator established contact with the recyclers to schedule site visits. In addition to a call, the scheduler typically sent a confirmation email to recyclers, and the survey team contacted recyclers the week before each site visit.

There were three phases of an individual cost survey, illustrated in **Exhibit 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 7
Three Phases of the Cost Survey (2022)

Phases	1. Pre-Site Visit	2. On-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 2022 into the cost model Excel file for each site. The survey team evaluated the number of tons of beverage containers recycled 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 handling, equipment, recycling procedures, and material shipping.

Another critical on-site task was reviewing the financial information with site management or a financial officer to identify and categorize allowable and non-allowable costs and where possible, direct specific costs to a subset of material types for calculating handling fees. 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 over 8 hours further compiling the site data, entering information into the cost model, completing the Site Memorandum and site files, and reviewing the site files. In many cases, site managers did not have all the necessary information available at the site visit, and the survey team had to contact the recycler to request additional information or to ask specific questions about the data.

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 and overall costs per beverage container recycled. Finally, the survey team compiled and checked all work papers and conducted a reasonableness check of survey results before uploading the files to the secure SharePoint site for the review team to perform the first of several independent office review steps.

D. Quality Control and Confidentiality Procedures

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

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 necessary for the cost survey. The data collected from each recycling site were not to be disclosed, as the release of the data could potentially be compromising to a recycling business. As a result, Crowe developed formal policies regarding confidentiality. Every Crowe and subcontractor employee who 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. Also, each company contractor – Crowe LLP (Prime Contractor); Geiss Consulting (Subcontractor); Encina Advisors LLC (Subcontractor); Boisson Consulting (Subcontractor); DVBABA LLC (Disabled Veteran Business Enterprise Subcontractor); and Vet Business Services LLC (Disabled Veteran Business Enterprise Subcontractor) also signed company confidentiality agreements.

All electronic files related to site visits were stored on the secure SharePoint site within Crowe's domain, accessible by password only, to authorized survey team members. Financial printouts and worksheet drafts with site-specific information were securely shredded. The final electronic site files will be delivered to CalRecycle for its secure record retention. Crowe laptop computers were protected against unauthorized access by security encryption software that requires a password/multi-factor authentication to use the laptops.

E. Cost Survey Methodology Validation

Crowe conducted additional analysis to test the validity of the survey results. This subsection discusses the distribution of cost-per-container results. Based on the analyses described below and throughout this section, we conclude that our methodology is consistent with prior years. We are confident that the cost-per-container results consistently reflect recycler operations and costs.

Distribution of Cost per Container Results

Crowe evaluated the distribution of 2022 cost-per-container results for HF and PF recyclers. These data confirm the validity of our survey results. Crowe evaluated the distribution of 2022 cost-per-container results. Crowe generally expects a right-skewed normal cost distribution per container results from its sample. That is, cost per container can never be less than $0 per container, and there is no fixed upper limit on the cost per container. A distribution of recycling centers by cost per container is expected to be bunched up toward the left, with a tail stretching toward the right.

Exhibit 8 and **Exhibit 9** provide frequency histograms of the cost-per-container results for sampled HF and PF recyclers. The vertical axis is the number of recycling centers, and the horizontal axis is the cost per container. The horizontal axis is in one-quarter cent increments. Both histograms are right-skewed normal distributions, as were the PF for PF histograms from the processing fee cost survey.

The histograms demonstrate consistent distributions with the prior cost-survey frequency histograms, which were similarly right-skewed. The distributions are right-skewed with a tail to the right as the cost per container increases.

The two histograms also show a slight bump to the right-hand side, with slightly more recycling centers having higher cost per container values than might be expected on a pure right-skewed standard distribution curve. In prior years, Crowe evaluated whether this could be a bimodal distribution. Crowe determined that rather than a clear pattern of two sub-populations that would explain a typical bimodal distribution, each with a distinct and somewhat equal mode (height of each curve), the slight bump reflects minor inconsistencies in recycler costs and operations, which generally do not follow a straight linear relationship between costs and number of containers recycled.

Exhibit 8
2022 Sampled Handling Fee Recyclers,
Distribution of Cost per Container

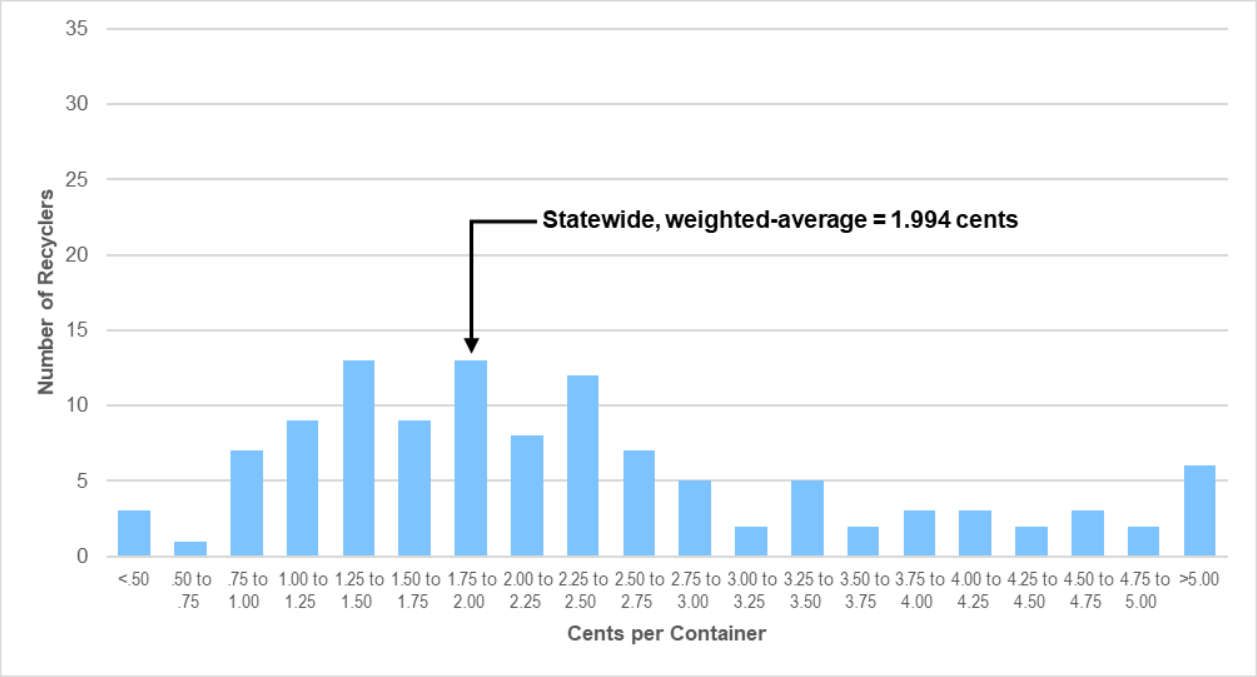
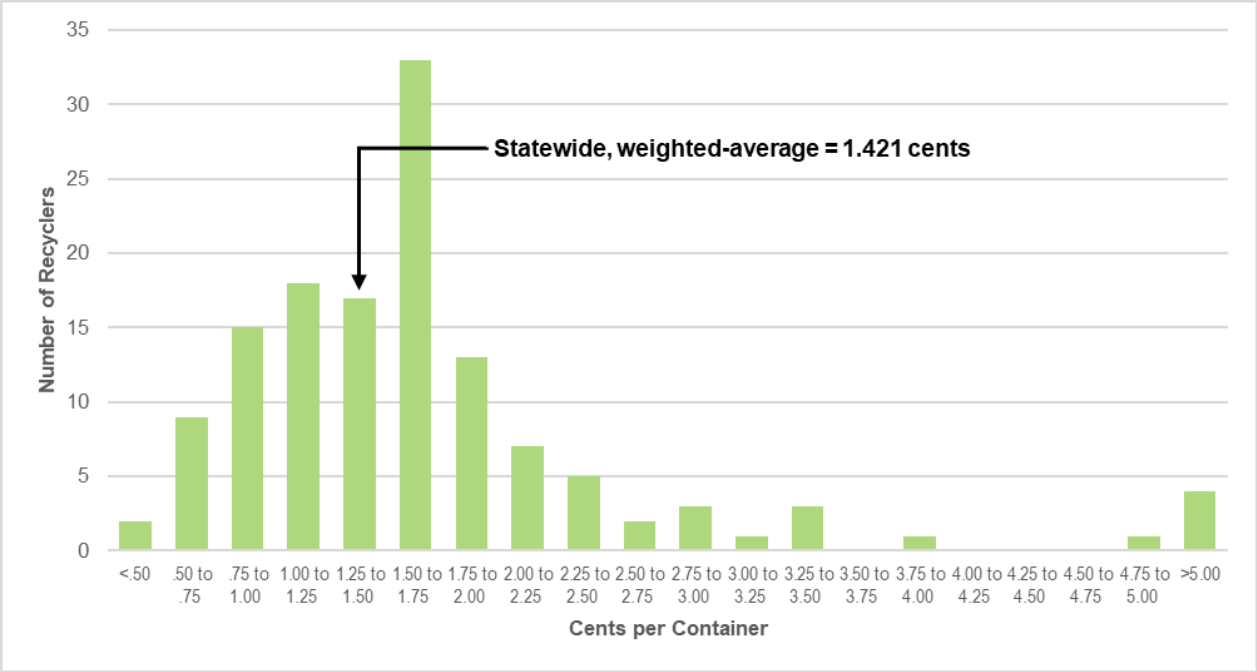


Exhibit 9
2022 Sampled Processing Fee Recyclers,
Distribution of Cost per Container



2. Processing 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 PF recyclers and HF recyclers. This section is organized as follows:

A. Cost Calculations

B. Cost Results

C. Comparison Cost per Container, 2008 to 2022

D. Handling Fee Recycler Cost per Container Increase

A. Cost Calculations

This handling fee cost survey was the ninth 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 was incorporated into the sample design.[4] 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 10** illustrates the weighted average by strata calculation approach for calculating cost per container.

[4] The California Beverage Container Recycling and Litter Reduction Act specifies that cost-per-ton and cost per container calculations be based on a statewide weighted average and not a simple average (taking the average of each site and dividing by the total number of sites).

Exhibit 10
Cost per Container Calculation (2022)

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

$$+$$

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

$$+$$

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

$$\frac{\text{Container Stratum 1 Total Population Costs} + \text{Container Stratum 2 Total Population Costs} + \text{Container Stratum 3 Total Population Costs}}{\text{Total Population Costs}}$$

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

The handling fee cost survey consisted of two stratified random samples: one for HF recyclers and one for PF recyclers. Within each population, recyclers were grouped into one of three strata based on the reported 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 strata were similar. That is, 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 us 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 each site's completed labor allocation cost model. For each recycling site, Crowe calculated total California Redemption Value (CRV) costs by summing CRV costs for each of the 10 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 2022 × 2,000 × CPP, where CPP was the 2022 statewide average containers per pound for each material type, as determined by CalRecycle. Crowe determined the total CRV containers by calculating the number of CRV containers for each material type and summing across all 10 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) × (30.35 containers/pound) = 6,070,000 containers.

Once Crowe determined individual site CRV costs and CRV containers, it determined statewide weighted-average costs per container. For the weighted average by stratum calculation for cost per container, we 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. Crowe then multiplied that stratum average cost per container by total containers in the stratum population. They then summed total CRV costs for the three strata and divided by total containers in the population. This calculation is illustrated in **Exhibit 11.** This exhibit provides the weighted average by strata sample calculation for HF recycler cost per container.

Exhibit 11
Weighted Average by Strata Calculation Example
Handling Fee Recycler Cost per Container (2022)

Strata	Sample CRV Costs	Sample CRV Containers	Sample Cost per Container[5]
1	$11,423,759.26	846,413,447	$0.01350
2	8,784,727.90	471,776,820	0.01862
3	8,216,255.30	297,174,420	0.02765

Strata	Population CRV Costs[6]	Population CRV Containers	Population Cost per Container
1	$25,164,478.25	1,864,495,942	–
2	34,933,534.44	1,876,077,663	–
3	51,944,353.72	1,878,779,641	–
Total	$112,042,366.41	5,619,353,246	**$0.01994[7]**

[5] Simple weighted-average cost per container for each sample stratum.

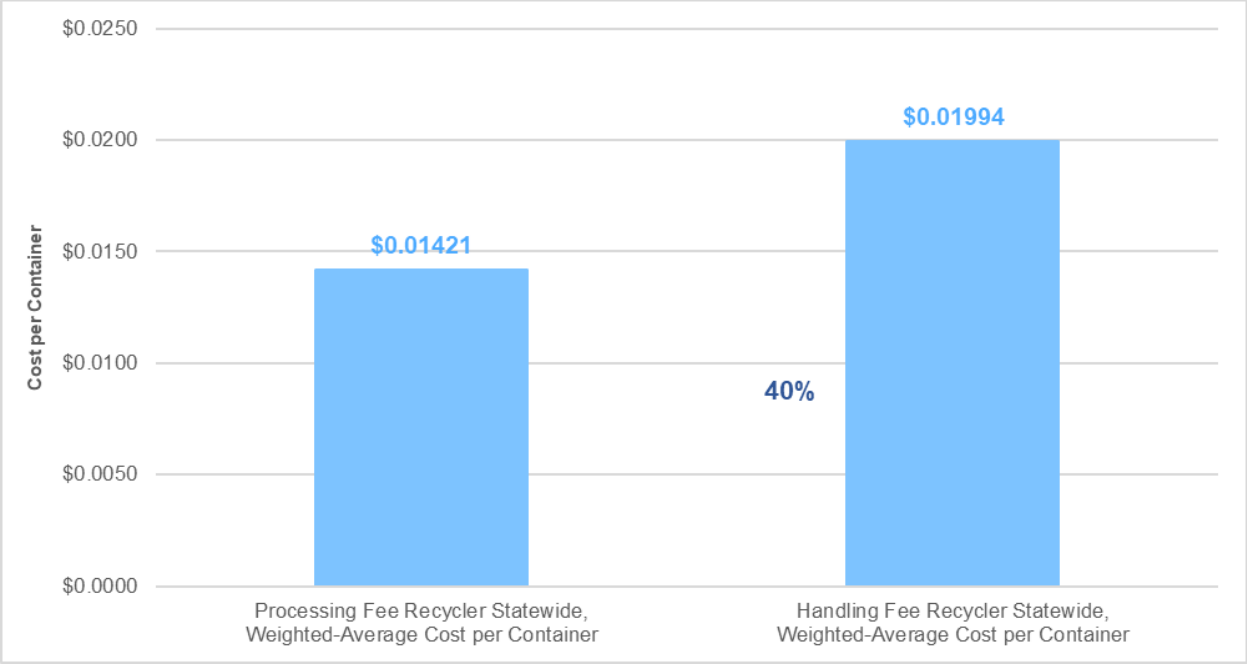
[6] Total costs for each population stratum, calculated by multiplying cost per container from above, by total CRV containers, summed for entire population.

[7] A statewide, weighted-average result of $0.01994 calculated by dividing total population CRV costs by total population CRV containers.

B. Cost Results

The statewide weighted-average recycler cost per container for HF recyclers and PF recyclers is presented in **Exhibit 12.** The cost to recycle for HF recyclers in 2023 was 1.994 cents per container, 40% higher than the cost to recycle for PF recyclers in 2022, at 1.421 cents per container.

Exhibit 12
Handling Fee and Processing Fee Recycler Cost per Container (2022)



Note: Statewide, weighted-average cost per container recycled.

Exhibit 13 includes the new handling fee payment calculation, 0.573 cents per recycled container, equal to the difference between the HF 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, CalRecycle is scheduled to implement this new handling fee payment starting July 1, 2024.

Exhibit 13
Statewide Recycler Costs per Container (2022)

Recycler Type	2022 Statewide, Weighted-Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90% Confidence Interval
1. Handling Fee Recycler	1.994 Cents	+40%	6.12%
2. Processing Fee Recycler	1.421 Cents	n/a	4.55%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.573 Cents	n/a	n/a

The sample sizes used to determine the costs per container were estimated to achieve a 90% confidence interval. This standard was higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85% confidence interval. The 2022 cost per container results for both HF recyclers and PF recyclers exceeded this target, with low error rates at the 90% confidence level of 6.12% and 4.55%, respectively.

Exhibit 14 compares total number of containers recycled, sample population size, and sample size for HF and PF recyclers. **Exhibit 15** illustrates the cost per container calculations for the two populations of recyclers.

This 2022 handling fee cost survey resulted in an upward shift of the calculated handling fee payment. Between the 2008 and 2020 cost years, the calculated handling fee payments fluctuated between 0.51 cents and 1.04 cents per container. The resulting 2022 cost year, at 0.573 is 12.1% higher than the 2020 cost year. Although there was an increase, the calculated handling fee payment in 2022 is still significantly less than 2010 another problematic year that resulted in a 0.77-cent handling fee payment. The 2022 calculated handling fee payment is 26% less than in 2010.

Exhibit 14
Handling Fee and Processing Fee Recyclers Number of Containers Recycled, Population Sizes, and Sample Sizes (2022)

Recycler Type	Total Number of Containers Recycled	Sample Population Size (sites)	Sample Size (sites)
1. Handling Fee Recyclers	5.6 billion	529	115
2. Processing Fee Recyclers	9.6 billion	559	134

Exhibit 15
Strata and Population Costs and Volumes (2022)

Handling Fee Recyclers

Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$11,423,759.26	846,413,447	$0.01350	$25,164,478.25	1,864,495,942
2	$8,784,727.90	471,776,820	$0.01862	$34,933,534.44	1,876,077,663
3	$8,216,255.30	297,174,420	$0.02765	$51,944,353.72	1,878,779,641
Total	n/a	n/a	n/a	**$112,042,366.41**	**5,619,353,246**

Handling Fee Recycler Statewide, Weighted-Average Cost per Container: **$0.01994**

Processing Fee Recyclers

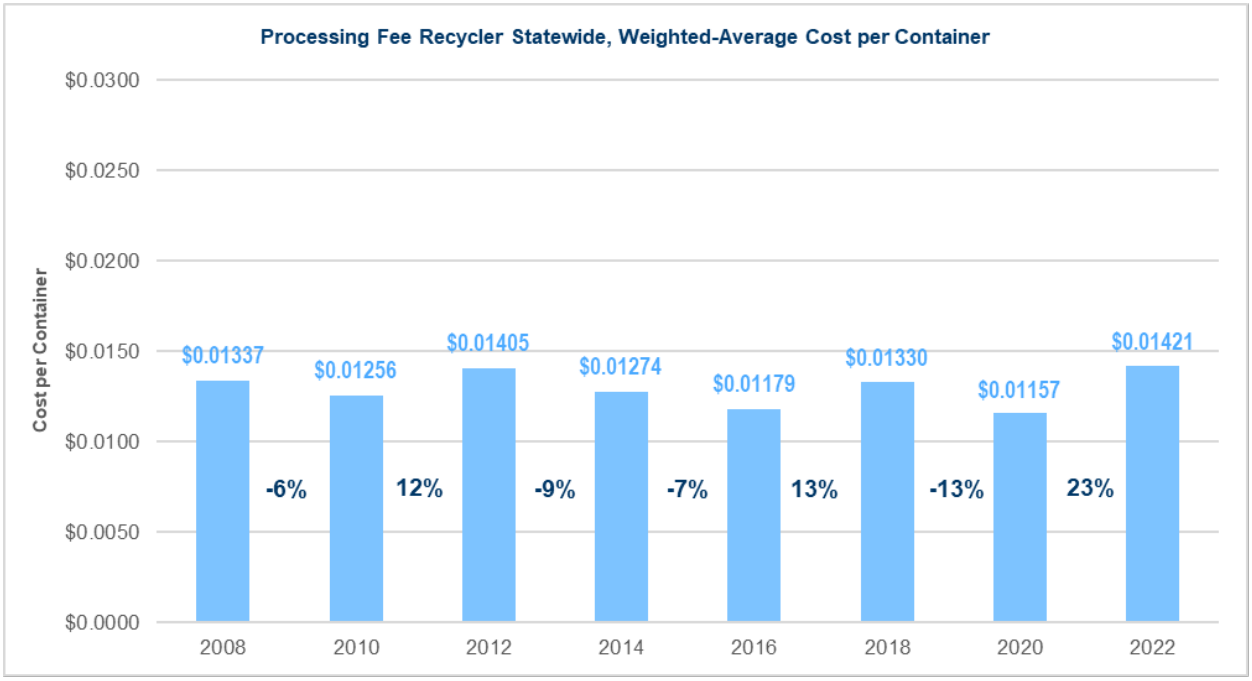
Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$16,064,085.12	1,392,606,976	$0.01154	$36,279,488.11	3,145,094,654
2	$11,409,083.09	942,564,746	$0.01210	$38,910,202.42	3,214,577,785
3	$11,519,060.26	609,621,467	$0.01890	$61,029,918.91	3,229,877,077
Total	n/a	n/a	n/a	**$136,219,609.44**	**9,589,549,516**

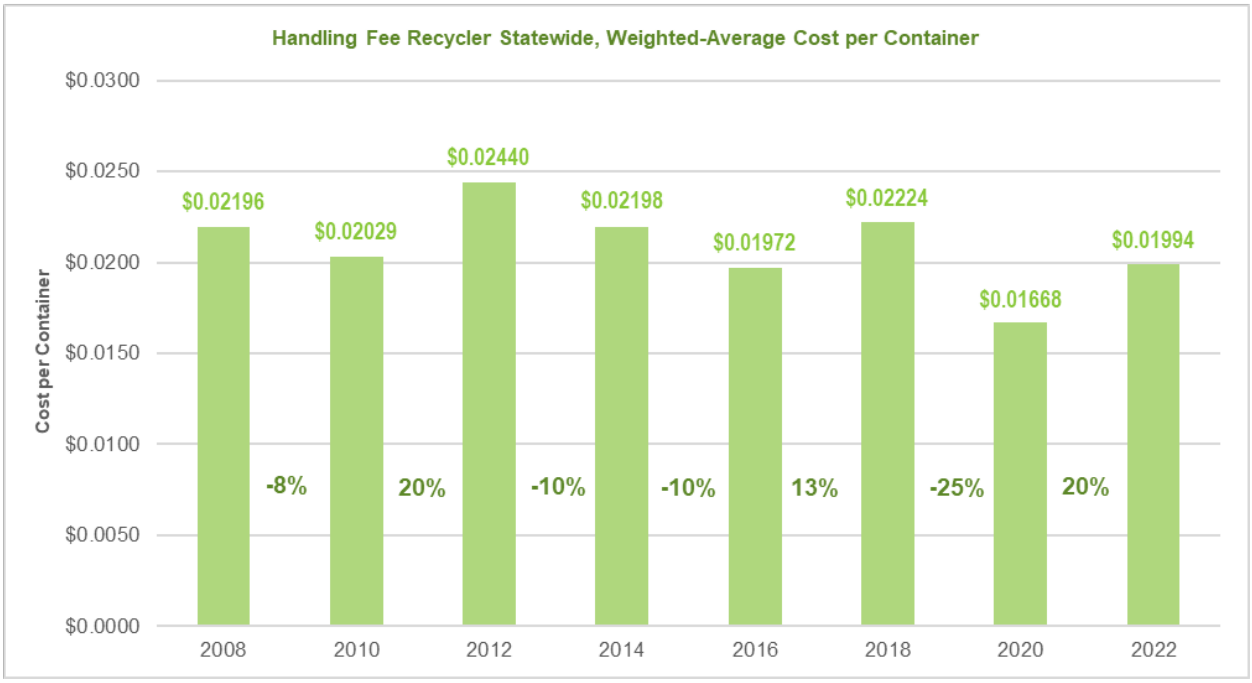
Processing Fee Recycler Statewide, Weighted-Average Cost per Container: **$0.01421**

C. Comparison Cost per Container, 2008 to 2022

Exhibit 16 compares the statewide, weighted-average cost per container for PF and HF recyclers from the most recent eight handling fee cost surveys (even years, from 2008 to 2022). Costs per container increased by 23% in 2022 for PF recyclers and 20% for HF recyclers. The PF recycler increase in cost per container between 2020 and 2022 is consistent with the processing fee cost survey results, in which the 2022 costs per ton for all major materials increased.

Exhibit 16
Processing Fee and Handling Fee Recycler Cost per Container (2008–2022)





Note: Statewide, weighted-average cost per container recycled.

Between 2010 and 2012, recycling costs per container for both PF and HF recyclers went up, with a sharper increase for handling fee recyclers. From 2012 to 2016, these costs consistently decreased, and despite a slight rise in 2018, they stayed below the 2012 peak.

The increases in HF recycler cost per container between 2020 and 2022 are due to overall increases in operating costs. In fact, despite increased volumes per recycler, cost per container increased. This indicates that cost of living increases were significant enough to overcome the increases in recycler productivity.

To test the full cost survey results' credibility, Crowe examined several selected factors that may have caused the increase in cost per container for HF recyclers and PF recyclers. As a result of the analyses, Crowe is confident that the cost-per-container results are a valid reflection of both HF and PF recyclers' CRV recycling operations during 2022.

Several factors, such as population size, recycling volumes, labor costs, and fuel costs, influence recycling center costs, containers, and cost per container, both upward and downward. Consistent with the processing fee cost survey, costs per container increased for both PF and HF recyclers.

Exhibit 17 and **Exhibit 18** provide comparisons of the results for the last eight handling fee cost surveys, including 2022. The handling fee payment, as of July 1, 2024, would result in an increase of 12% in the calculated per container handling fee payments from the prior handling fee cost survey.[8] The error rates for the 2022 handling fee cost survey were consistent with prior years. Both error rates, calculated at the 90% confidence level, were well below 10%.

[8] CalRecycle opted to issue a revised handling fee rate for FY 2022/2023 based on a cost-of-living adjustment to prior handling fees. Based on the current applied handling fee rate, the result would be a decreased rate if using the current Handling Fee Cost Survey calculated per container handling fee payment.

Exhibit 17
Statewide Handling Fee and Processing Fee Recycler Costs per Container and Calculated Handling Fee (2008 to 2022)

Statewide, Weighted-Average, Cost per Container

Recycler Type	2022	2020	2018	2016	2014	2012	2010	2008
1. Handling Fee Recycler	1.994 Cents	1.157 Cents	2.224 Cents	1.972 Cents	2.198 Cents	2.440 Cents	2.029 Cents	2.196 Cents
2. Processing Fee Recycler	1.421 Cents	1.668 Cents	1.330 Cents	1.179 Cents	1.274 Cents	1.405 Cents	1.256 Cents	1.337 Cents
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.573 Cents	0.511 Cents	0.894 Cents	0.793 Cents	0.924 Cents	1.035 Cents	0.773 Cents	0.859 Cents

Percentage Change

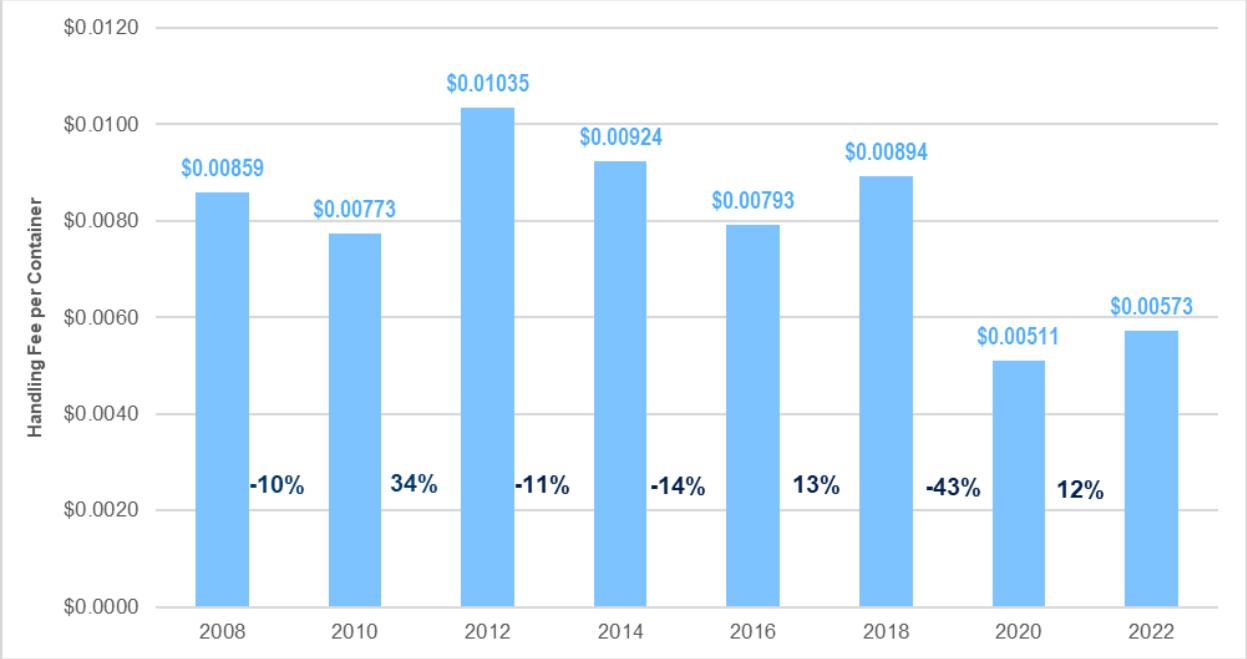
Recycler Type	2020 to 2022	2018 to 2020	2016 to 2018	2014 to 2016	2012 to 2014	2010 to 2012	2008 to 2010
1. Handling Fee Recycler	20%	-13%	13%	-10%	-10%	20%	-8%
2. Processing Fee Recycler	23%	-25%	13%	-7%	-9%	12%	-6%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	12%	-43%	13%	-14%	-11%	34%	-10%

Exhibit 18
Statewide Handling Fee and Processing Fee Recycler Cost Survey Error Rates at 90% Confidence Interval (2008 to 2022)

Recycler Type	2022	2020	2018	2016	2014	2012	2010	2008
1. Handling Fee Recycler	6.12%	6.07%	4.94%	5.07%	4.09%	4.37%	5.62%	5.17%
2. Processing Fee Recycler	4.55%	5.63%	6.70%	6.98%	7.03%	6.30%	5.79%	7.10%

Exhibit 19 illustrates the most recent eight per container handling fees, as measured by the eight cost surveys. The changes from survey to survey can be significant, depending on the varied factors impacting PF and HF recycler costs and the relative changes between PF and HF recyclers. 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 2022 determine the handling fee effective on July 1, 2024. Between the 2020 survey year and the 2022 survey year, the calculated handling fee increased by 12%. Due to changes in the HF recyclers population, the calculated handling fee decreased by 43% between the 2018 and 2020 survey years. CalRecycle made an administrative decision to maintain the $0.010-cent-per-container handling fee (the calculated rate plus a cost-of-living (COLA) increase from 2019) for July 2022. Note that CalRecycle applies a COLA adjustment to handling fees, so actual per-container payments are slightly higher than the calculated results.

Exhibit 19
Handling Fee Cost Survey Calculated Handling Fee Payments (without COLA) (2008 to 2022)



D. Handling Fee Recycler Cost per Container Increase

The handling fee cost per container increased by 20% between 2020 and 2022. This section discusses several factors that likely contributed to the higher handling fee cost per container and resulting higher handling fee payment. To test the credibility of the full cost survey results, Crowe examined several selected factors that may have caused the increase in cost per container for both HF recyclers and PF recyclers. The higher costs-per-container results from this handling fee cost survey are consistent with the higher 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 20** compares the HF recycler cost per container and the number of containers recycled by the HF recycler population for the eight handling fee cost surveys. This exhibit shows that in most years, the 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 2022, cost per container increased, even with a significant increase in the number of containers recycled. This indicates that non-volume factors contributed to the cost increase.

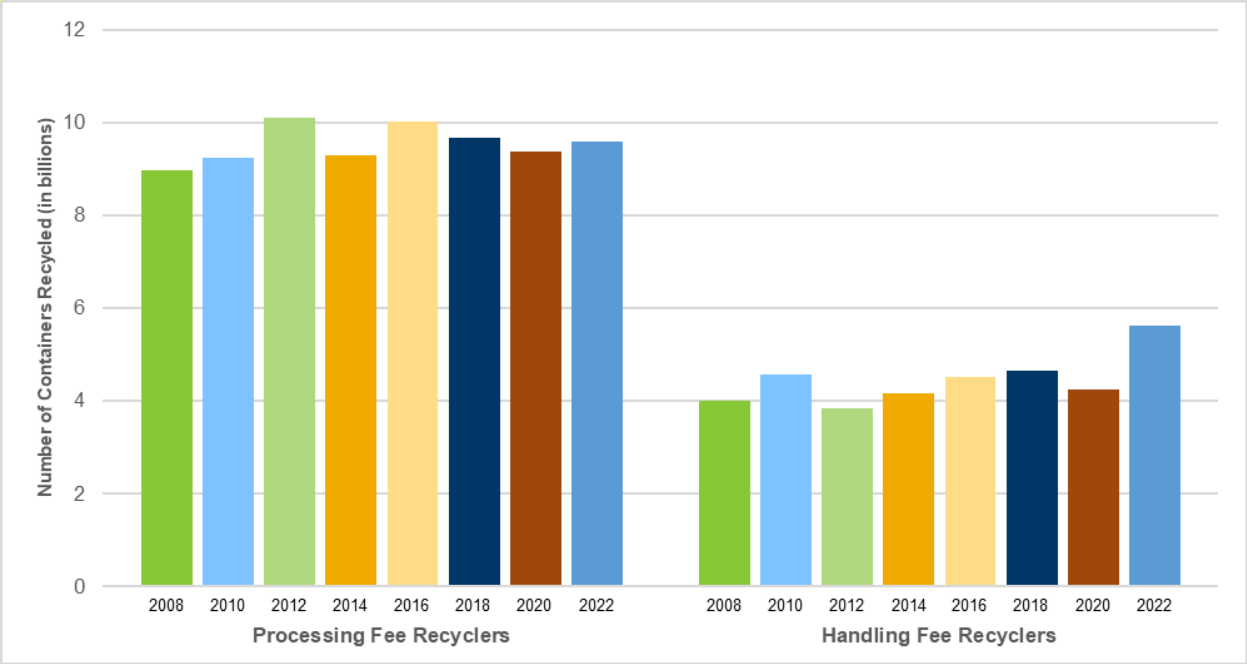
Exhibit 20
Cost per Container Results and Containers Recycled by the Survey Population
Handling Fee Recyclers (2008 to 2022)

Survey Year	Cost per Container (cents)	Percent Change in Cost per Container	Population Containers Recycled	Percent Change in Containers Recycled
2008	2.196	–	3,992,318,572	–
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%
2022	**1.994**	**20%**	**5,619,353,246**	**32%**

Note: Containers recycled by the full population of 985 HF recyclers in 2012 and by the survey populations of 920 HF recyclers in 2014, 706 recyclers in 2016, 669 recyclers in 2018, 442 recyclers in 2020, and 529 recyclers in 2022.

Once the survey team has identified CRV costs at the individual recycling center, the number of containers recycled is the only variable in the cost-per-container calculation: CRV costs ÷ CRV containers. **Exhibit 21** provides a comparison of containers recycled by the PF and HF cost survey populations over the most recent eight handling fee cost surveys. Comparing the equivalent full population data, PF containers recycled increased each year from 2008 to 2012, decreased in 2014, increased again in 2016, and then decreased yearly through 2020. In 2022, containers recycled by HF recyclers increased significantly.

Exhibit 21
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2008 to 2022 Populations)



Cost Differential between Handling Fee Recyclers and Processing Fee Recyclers

The increase in HF recycler cost per container 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 per Container – PF Cost per Container.

To determine the handling fee, Crowe compared 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 Crowe utilized parallel sample designs and stratification methods, we can be assured that we are making an appropriate comparison, to the extent possible.

The impact of the differential can move in both directions. In 2022, HF and PF recyclers changed in the same direction, with both increasing. The cost per container for PF recyclers increased slightly more than for HF recyclers.

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 recycling centers, and for the PF recycling centers, is a quotient determined by dividing the estimated statewide weighted cost of recycling CRV material — as calculated from the handling fee cost survey (numerator) — by the number of containers recycled as determined from CalRecycle reporting systems (denominator). Changes in the statewide weighted-average HF and PF costs per container between survey years result from changes in CRV costs and 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 is not necessarily the same.

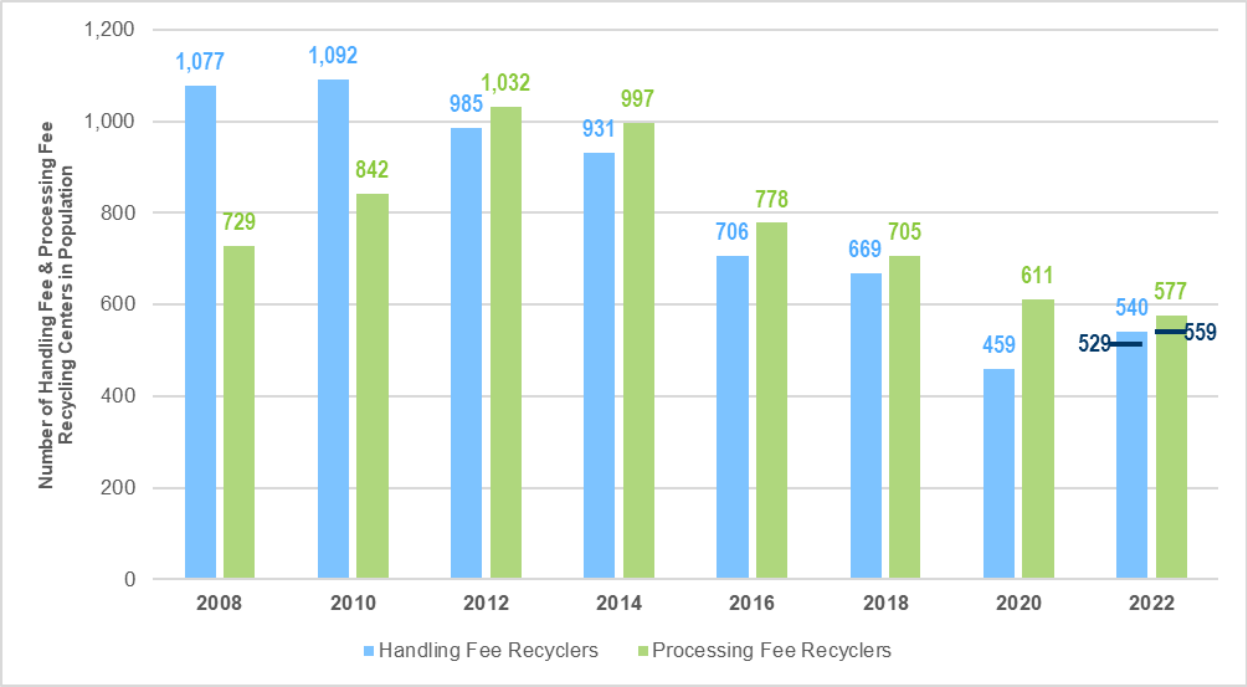
Below, Crowe presents a series of graphs that explore the relationship between population CRV costs and containers recycled over time, and how changes in these two variables impact changes in the cost per container over time. In the following subsection, Crowe examines the impact of these changes on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

Historical Trends in Population Number of Recyclers

To some extent, the population costs and recycled containers are related to the number of recycling centers 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 22 provides the number of HF and PF recyclers during each of the most recent handling fee cost survey years. The exhibit displays the downward trend in HF recyclers since 2010, with an increase in 2022. Excluding investigated sites, the number of HF recyclers increased by 20% between 2020 and 2022. This 81 HF recycler site increase in population between 2020 and 2022 is the largest increase in recycling centers in the most recent surveys. Though too early to tell, this increase may signal a reverse in the trend of declining HF recycler population. This may also signal a stabilization or re-adjustment since the closure of rePlanet LLC (rePlanet) sites through 2019.

Exhibit 22
2008 through 2022 Populations, Number of Handling Fee Recycling Centers and Processing Fee Recycling Centers



Note: The 2022 bar includes 11 HF recyclers and 18 PF recyclers being investigated that were removed from the survey population (529 HF recyclers and 559 PF recyclers). The 2020 bar includes 17 HF recyclers and 30 PF recyclers that were investigated and removed from the survey population (442 HF recyclers, 581 PF recyclers).

The volume of containers recycled by HF recyclers increased by 32% from 2020 to 2022. When the number of HF recyclers increases by a lower percentage than the number of containers recycled, the amount of recycled material available to each HF recycler, on average, increases.

The number of PF recyclers peaked in 2012 at 1,032. Since 2012, the total number of PF recyclers has trended downward, with a 6% decrease between 2020 and 2022. The increase in PF population container volumes and a reduced number of PF recyclers resulted in higher container volumes per site in 2022.

Commonly, higher container volumes translate to lower costs per container. In this case, the smaller recycler population and increased volumes per recycler have had little impact the resulting PF recycler population cost-per-container increases. As costs increased similarly between HF and PF recyclers, other factors are impacting the increase in cost rather than the overall container volume increases.

Containers recycled by HF recyclers increased between 2008 and 2010, declined between 2010 and 2012, increased from 2012 to 2018 before decreasing in 2020 and then increasing again in 2022. **Exhibits 23** and **24** provide historical trends in total population costs and total population containers, beginning with the 2008 handling fee cost survey and extending to the 2022 handling fee cost survey. Population cost data are estimated from the handling fee cost survey. Population container data are based on CalRecycle reports.

Exhibit 23
Population CRV Costs and Containers of Handling Fee Recyclers
(2008 through 2022)

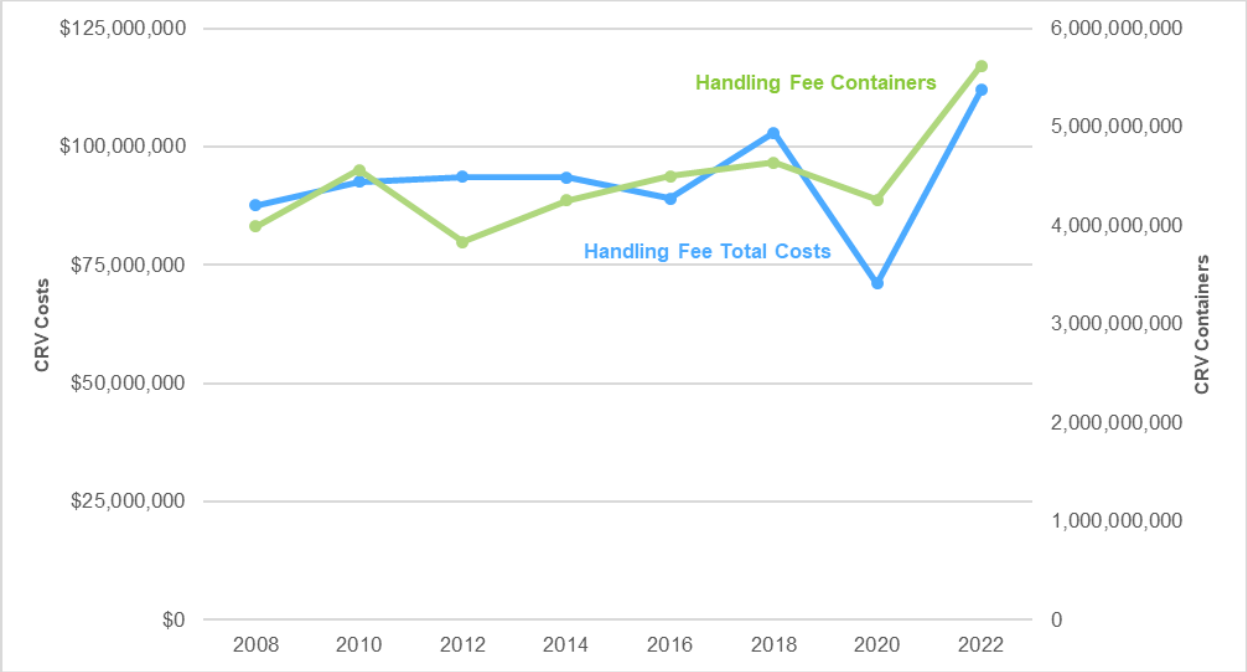
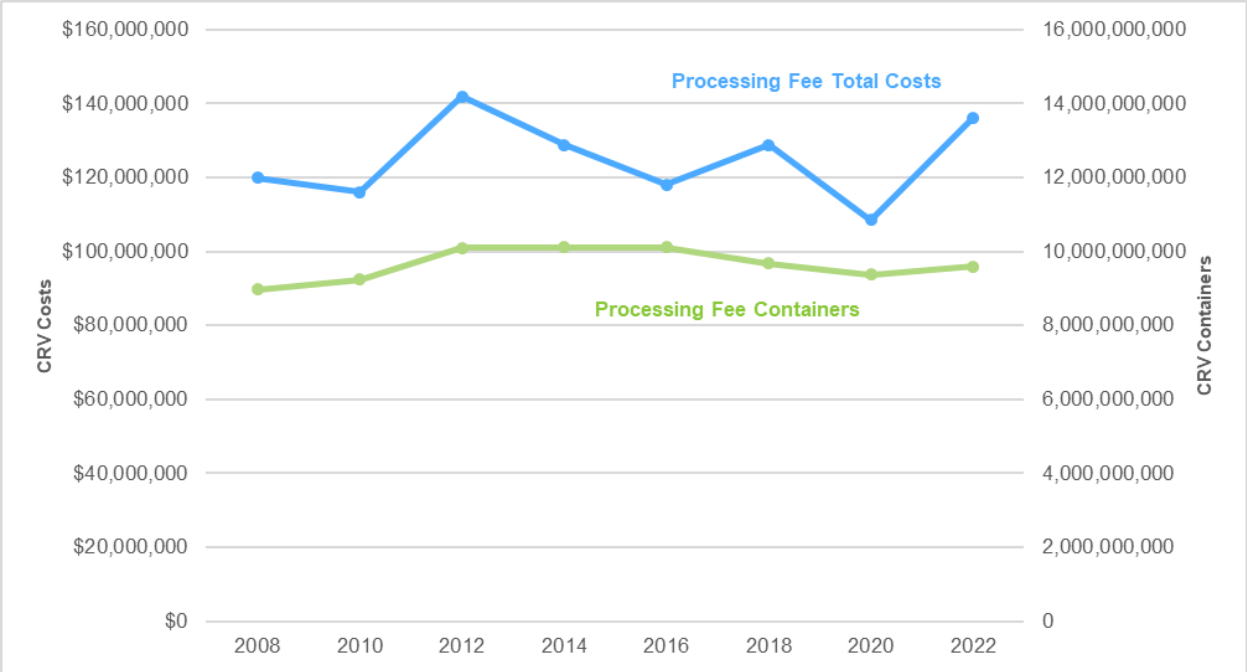


Exhibit 24
Population CRV Costs and Containers of Processing Fee Recyclers
(2008 through 2022)



B. Changes in Recycling Center Productivity and Costs

Introduction

The increase in cost per container for 2022 is due to the interrelationship between recycling center productivity and costs. From 2020 to 2022, productivity levels, measured as containers recycled per recycling center, increased, and labor hours per 1,000 containers recycled increased for PF recyclers and decreased for HF recyclers. By comparison, average cost per recycling center increased significantly in 2022. The increased cost per recycling center was significant enough to result in increased cost per container.

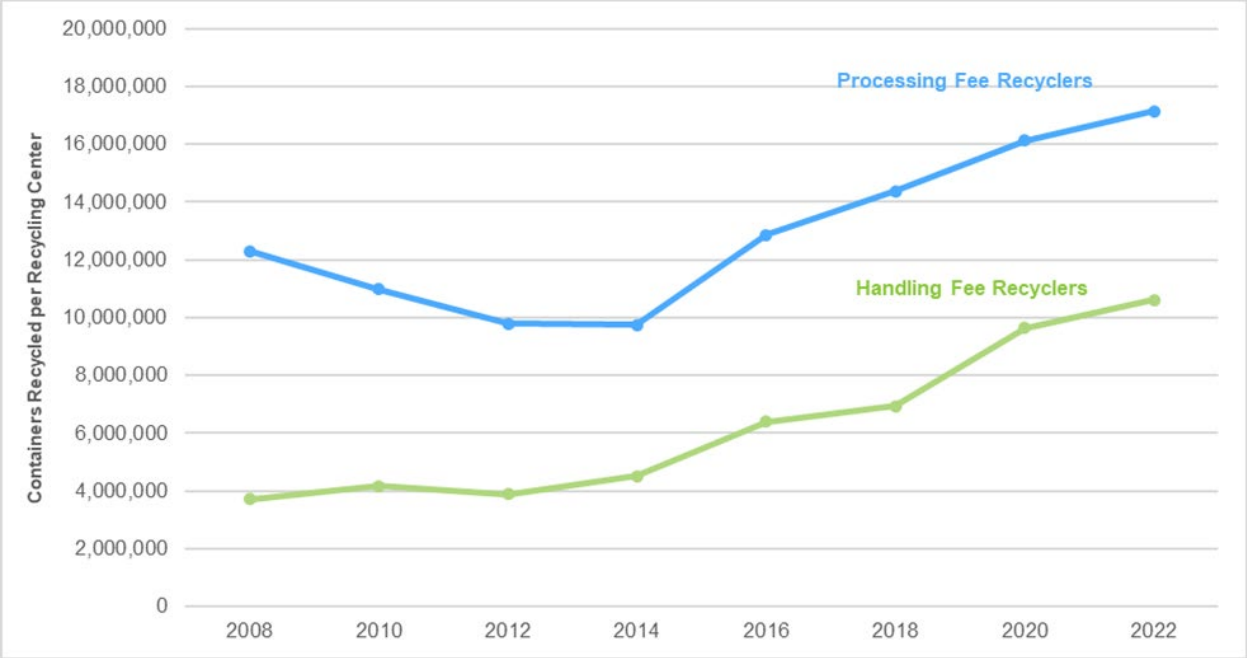
Average Containers Recycled per Recycling Center

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

Exhibit 25 provides the average number of containers recycled per recycling center, for the cost survey years 2008 through 2022. Each cost survey year's data point is the quotient determined by dividing population containers recycled by the number of recycling centers in the population. The 2022 productivity increased from 2020. Productivity between HF and PF recyclers increased to similar extents, with a 6% increase and 10% increase, respectively. This difference of 4 percentage points between HF and PF recyclers is among the smallest difference observed in the past seven surveys (average difference is 12 percentage points).

More productive recycling centers, those recycling more containers, generally have lower costs per container than less productive recycling centers, those handling less containers). However, minor increases in productivity do not significantly contribute to an increase or decrease in costs.

Exhibit 25
Average Containers Recycled per Handling Fee Recycler and Processing Fee Recycler (2008 through 2022)



Change in Containers per Recycling Center, Costs per Recycling Center, and Cost per Container

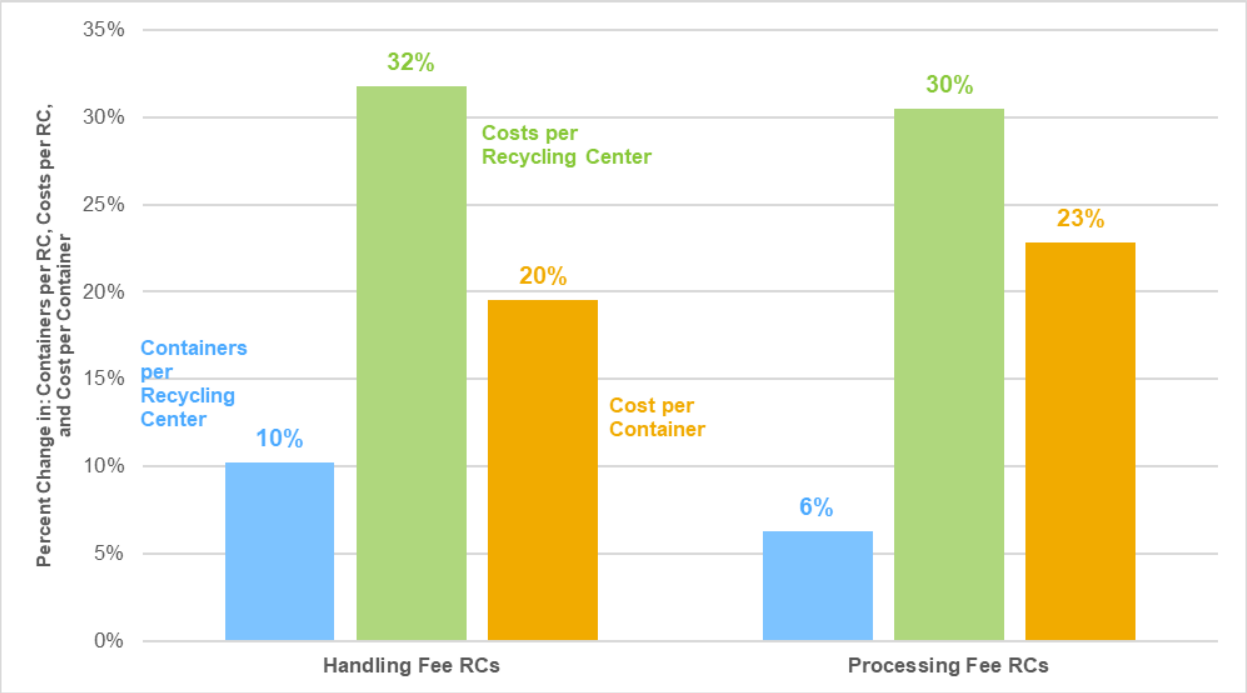
Exhibit 26 summarizes how cost per container is impacted by key recycler metrics (containers per recycler, costs per recycler) on cost per container. This shows that higher containers per recycler contribute to lower cost per container (inverse relationship), and higher costs per recycler contribute to higher costs per container (direct relationship).

Exhibit 26
Impact of Key Recycler Metrics to Cost per Container

Key Metric	Relative Value	Cost per Container
Containers per Recycler	Higher	Lower
Costs per Recycler	Higher	Higher

Exhibit 27 summarizes the relationship between RC productivity, costs, number of containers, and cost per container. The chart shows the percent change of these key metrics between 2020 and 2022. For HF recyclers, productivity, measured as containers recycled per RC, increased at a significantly lower rate than costs per RC, resulting in an increase in cost per container. Processing fee recyclers experienced a similar trend to a slightly greater extent. The spread between the change in containers and costs per recycler for HF recyclers is 22 percentage points (32% increased recycler costs vs 10% increased containers). In comparison, the spread was 24 percentage points (30% vs 6%) for PF recyclers. The slightly higher spread for PF recyclers resulted in a slightly higher percent increase in cost per container than for HF recyclers.

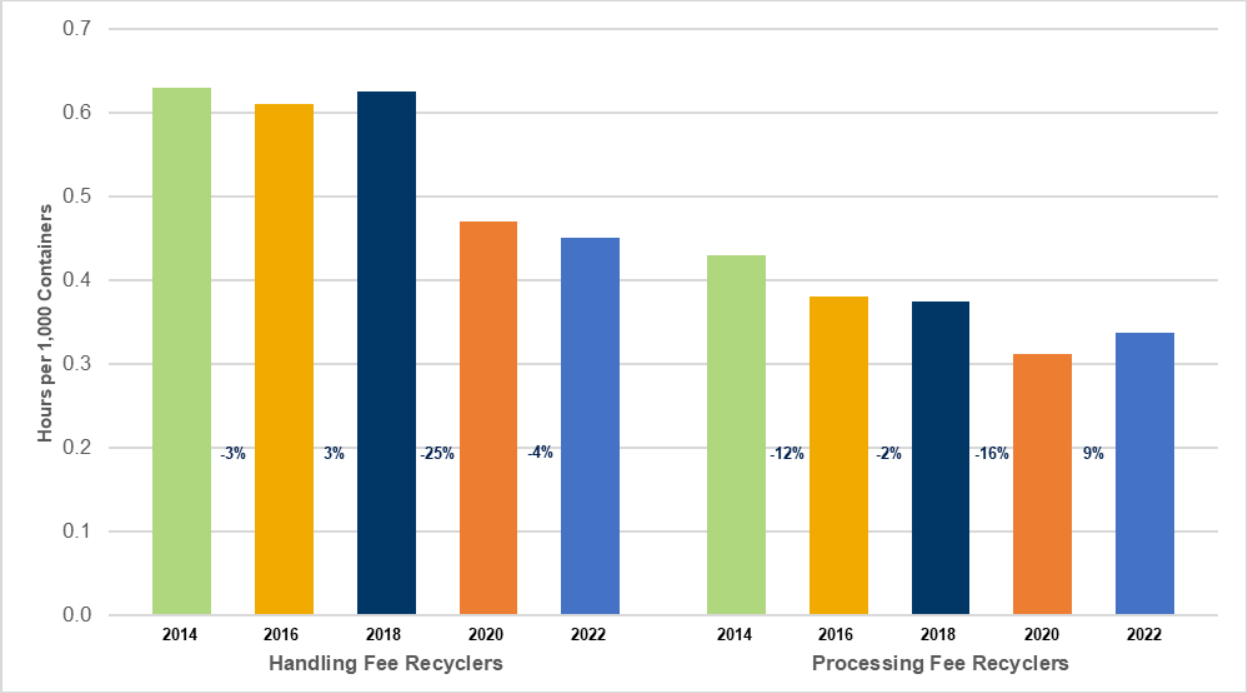
Exhibit 27
2020 and 2022 Sampled Handling Fee and Processing Fee Recyclers
Percent Change in Key Recycler Metrics



Labor Hours per 1,000 Containers Recycled

The labor hours required to handle 1,000 CRV beverage containers is another measure of recycling center productivity and is a factor that directly impacts cost per container. Crowe calculated and compared the average HF and PF recycler labor hours allocated per 1,000 containers recycled between the 2014 to 2022 surveys. **Exhibit 28** shows the labor hours allocated per 1,000 CRV containers recycled. Across the survey years, the labor input required per 1,000 containers shows a decreasing trend. Between 2020 and 2022, recyclers' labor hours per 1,000 containers went down by 4% for HF recyclers and up by 9% for PF recyclers. This opposite result among HF and PF recyclers is likely due to the differences in the spread between the change in the number of containers and the number of recyclers between the two years, as discussed in the previous subsection. Specifically, HF recyclers showed a positive 30 percentage point spread versus PF recyclers that showed a positive 16 percentage point spread. The higher spread for HF recyclers contributes to higher productivity or lower labor hours per 1,000 containers. These record decreases in labor hours per 1,000 containers indicates a significant increase in productivity between years.

Exhibit 28
2014 to 2022 Sampled Handling Fee Recyclers and Processing Fee Recyclers
Average Labor Hours per 1,000 Containers Recycled



Any increases in 2022 HF recycler productivity were counterbalanced by the increase in wages. The decrease in PF recycler productivity contributes to higher overall costs, especially as labor represents over half of a recycler's costs. It's important to note that productivity for HF recyclers increased to a greater extent while productivity for PF recyclers decreased, contributing to a smaller difference between overall costs per volume between the two populations.

Cost Category Comparison

In conducting the cost surveys, Crowe assigns each of a recycler's cost line items to one of 13 categories. To help evaluate potential reasons for the cost-per-ton increases between 2020 and 2022, Crowe 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 recycling centers. It does not account for costs by strata or recycling tons per site; it simply reflects an average category cost per recycling center for the 115 HF recyclers and 134 PF recyclers surveyed as part of the 2022 Handling Fee cost survey.

Exhibit 29 provides a comparison of the 2022 and 2020 average category costs and percentage of costs per sampled HF recycler. This comparison illustrates several key points:

- Average CRV costs per recycling center increased by 33%.
- The percent of CRV costs by category were very similar between the two years. For example, direct labor represented 53% of CRV in both years.
- Consistent with prior cost surveys, the cost categories that make up the largest share of recycling center costs besides labor are:
  - Transportation (~12%)
  - Rent (~8%)
- All cost categories increased besides rent, depreciation, property tax, and fuel (yard).
- The cost categories with the greatest dollar increase between 2022 and 2020, accounting for 90% of the increase, were (ordered from greatest to least):
  - Direct Labor
  - Transportation
  - GBO
  - Indirect Labor
- Direct labor was the largest single factor, accounting for more than 50% of the increase.

- Transportation and GBO had the next greatest dollar increase, accounting for 19% and 12% of the increase, respectively.

Exhibit 29
Comparison of Average Handling Fee Recycler Category Costs (2020 and 2022)

Cost Category	2022 (n=115)	% of CRV Costs	2020 (n=113)	% of CRV Costs	% Change 2020 (adj.) to 2022
Direct Labor	$132,967	52.5%	$101,303	53.3%	31%
Indirect Labor	15,349	6.1%	9,672	5.1%	59%
General Business Overhead	19,912	7.9%	12,488	6.6%	59%
Transportation	29,830	11.8%	18,103	9.5%	65%
Rent	20,757	8.2%	21,194	11.1%	-2%
Depreciation	3,587	1.4%	5,194	2.7%	-31%
Property Tax	86	0.0%	261	0.1%	-67%
Utilities	6,504	2.6%	4,790	2.5%	36%
Supplies	12,261	4.8%	8,865	4.7%	38%
Fuel	366	0.1%	461	0.2%	-21%
Insurance	5,796	2.3%	3,475	1.8%	67%
Interest	574	0.2%	286	0.2%	101%
Maintenance	5,191	2.1%	4,096	2.2%	27%
Total CRV Costs per Site	**$253,180**	**100.0%**	**$190,189**	**100.0%**	**33%**

Exhibit 30 provides a similar comparison for sampled PF recyclers, which illustrates several key points:

- Average CRV costs per recycling center increased by 33%, the same increase as HF recyclers.
- The percent of CRV costs, by category, is very similar between the two years. For example, direct labor represented 53% of CRV costs in 2022 and 51% in 2020.
- Consistent with prior cost surveys, the cost categories that make up the largest share of recycling center costs besides labor are:
  - Rent (~11%)
  - Transportation (~9%)
- All cost categories increased besides insurance and interest.
- The cost categories with the greatest dollar increase between 2022 and 2020, accounting for 85% of the increase, were (ordered from greatest to least):
  - Direct labor
  - Transportation
  - Indirect labor
  - GBO
- The increase in labor was the largest single factor, accounting for 57% of the increase.
- Transportation and indirect labor had the next greatest dollar increase, each accounting for 13% and 9%, respectively.

Overall, changes by cost category among HF and PF recyclers were similar, with both increasing by 33%. Category by category, larger percent changes were related to smaller cost categories.

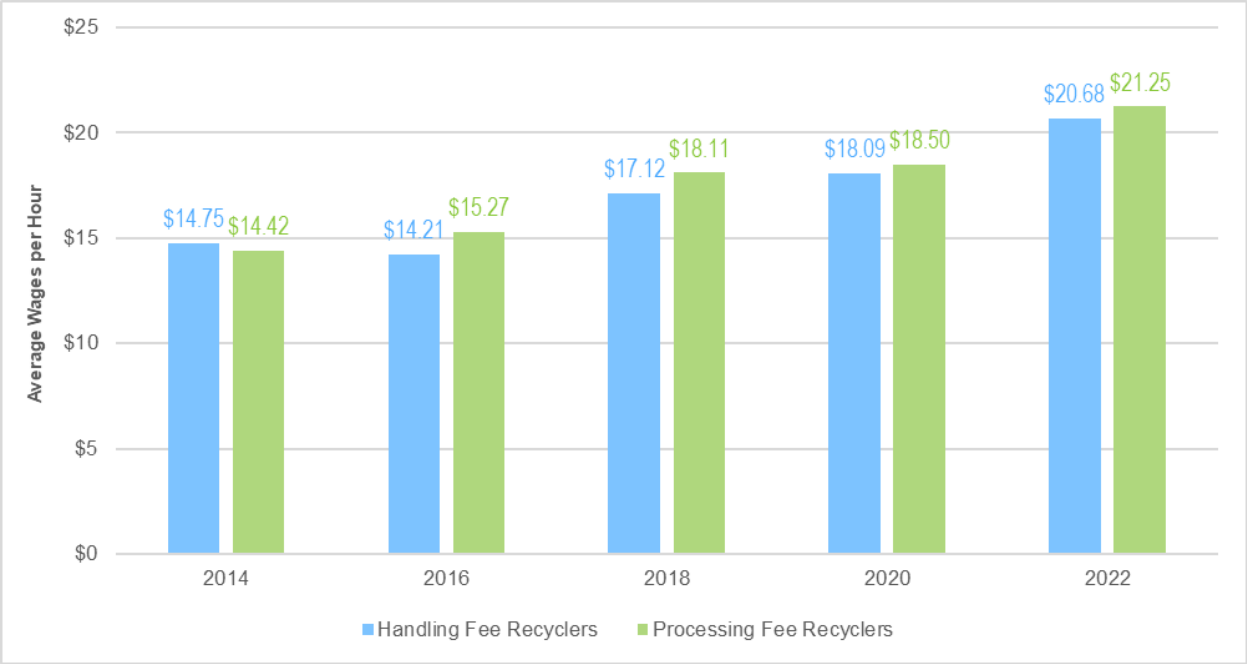
Exhibit 30
Comparison of Average Processing Fee Recycler Category Costs (2020 and 2022)

Cost Category	2022 (n=134)	% of CRV Costs	2020 (n=127)	% of CRV Costs	% Change 2020 (adj.) to 2022
Direct Labor	$157,737	52.6%	$115,806	51.2%	36%
Indirect Labor	22,812	7.6%	15,893	7.0%	44%
General Business Overhead	17,462	5.8%	13,065	5.8%	34%
Transportation	27,433	9.1%	18,115	8.0%	51%
Rent	31,904	10.6%	28,328	12.5%	13%
Depreciation	6,873	2.3%	3,926	1.7%	75%
Property Tax	1,503	0.5%	1,076	0.5%	40%
Utilities	9,191	3.1%	6,684	3.0%	38%
Supplies	9,974	3.3%	8,408	3.7%	19%
Fuel	1,454	0.5%	1,252	0.6%	16%
Insurance	5,046	1.7%	5,756	2.5%	-12%
Interest	1,005	0.3%	1,363	0.6%	-26%
Maintenance	7,573	2.5%	6,698	3.0%	13%
Total CRV Costs per Site	**$299,967**	**100.0%**	**$226,370**	**100.0%**	**33%**

Labor and Non-Labor Costs

The average HF and PF recyclers' hourly wage increased from 2020 to 2022. **Exhibit 31** illustrates the average hourly wage for the last five handling fee surveys. For HF sites, the average hourly wage increased by $2.58 (14%) to a level higher than prior years. The average wage per hour for PF sites increased by $2.76 (15%). Additionally, while recycling centers may be able to reduce labor hours to some extent, recycling centers still must employ at least one employee on-site during all hours of operation. Our cost survey does not capture the time spent waiting for CRV customers. All time is allocated to CRV materials, non-CRV materials, or other business. These 14% to 15% increases in wages contribute to higher costs.

Exhibit 31
2014 to 2022 Sampled Handling Fee and Processing Fee Recyclers
Average Hourly Wage



Crowe also determined the labor and non-labor portions of cost per container for the 2014, 2016, 2018, 2020, and 2022 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 32 for sampled HF recyclers shows the following:

- Labor accounted for approximately 53% of the HF recycler cost per container in 2022.
- The share of HF recycler labor cost per container has been generally consistent in the last three years. In 2020, labor costs per container was 55%.

Exhibit 32
2014 to 2022 Sampled Handling Fee Recyclers
Labor and Non-Labor Costs per Container

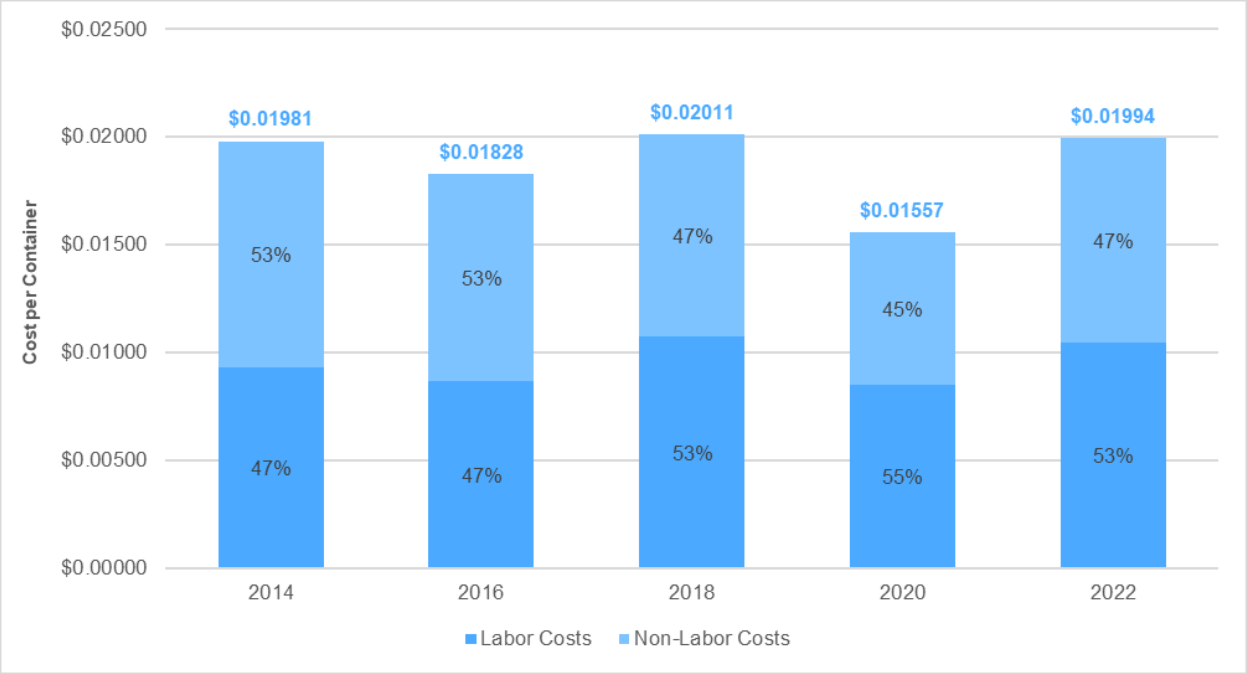
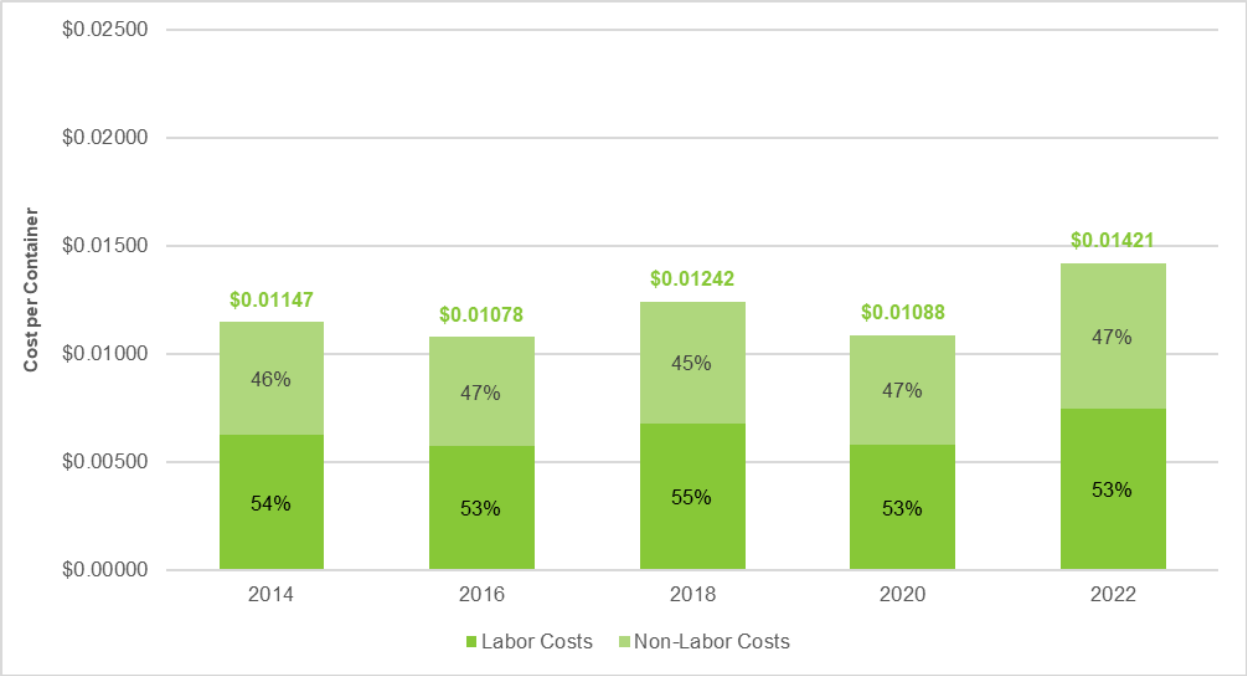


Exhibit 33 for sampled PF recyclers shows the following:

- Labor accounted for approximately 53% of the PF recycler cost per container in 2022.
- The shares of PF recycler labor and non-labor cost per container are generally consistent between the five survey years. In 2020, labor costs per container were also 53%.

Exhibit 33
2014 to 2022 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 2020 and 2022. In the analyses below, 2022 labor costs are not adjusted by CPI; rather, they are a straight dollar comparison across the two survey years. A CPI adjustment would increase 2020 costs by 12.9%.

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 activities, 3) direct yard labor (DYL) or all other labor (AOL), and 4) certain material types, i.e., aluminum/bi-metal, glass, and plastic. DYL labor includes yard employees who sort, weigh, handle, bale, or cashier. AOL labor includes administration, management, and driver time, which are typically higher-wage activities.

- Factors that did lead to higher labor costs:
    - Higher CRV hourly wages – Weighted-average CRV hourly wages increased overall and by strata between 2020 and 2022, driven by the 6.4% (LA County) to 15% (statewide) increases in minimum wage between 2020 and 2022.
- Factors that did not lead to higher labor costs:
    - Low wage sites – The proportion of low wage sites remained the same for HF recyclers (remained at 17% in 2020 and 2022), and only slightly decreased for PF recyclers (17% to 14%). This means that low wage sites did not contribute to the change in costs.
    - Labor hours per 1,000 CRV containers - Decreased slightly for HF recyclers (-4%) and increased for PF recyclers (9%). These slight changes do not contribute to higher or lower costs.
    - High wage sites – The proportion of high wage sites decreased for both HF and PF recyclers. Additionally, the average hourly rate among high wage sites is lower.

CRV Hourly Wages

Crowe calculated CRV hourly wages by summing CRV labor costs across all recycling centers in each survey sample and dividing by the sum of CRV labor hours. **Exhibit 34** and **Exhibit 35** summarizes sampled HF and sampled PF CRV hourly wages. 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% of the cost of CRV recycling.

CRV hourly wages for sampled HFs increased 14% while CRV hourly wages increased by 15% for sampled PFs between 2020 and 2022. Considering that California minimum wage increased 15%, these increases seem reasonable. Across strata for sampled HFs, stratum 1 increased the most, with a 31% increase. Across strata for sampled PFs, stratum 2 increased the most, with a 25% increase.

To provide context, at 2,080 hours annually, $20.00 per hour is equivalent to $41,600 gross annual income. Below provides additional annual wage comparisons for 2022:

- Median household income in California was $85,300. (Source: St. Louis FRED. https://fred.stlouisfed.org/series/MEHOINUSCAA646N)
- Per capita income in California was $45,591. (Source: U.S. Census, American Community Survey: https://www.census.gov/quickfacts/fact/table/CA/INC910222#INC910222)
- The California Poverty Measure for a family of four, slightly higher than the federal poverty level, was about $39,900 in early 2023 (Source: Public Policy Institute of California (https://www.ppic.org/publication/poverty-in-california/).

Exhibit 34
Comparison of HF CRV Hourly Wages Overall and by Strata (2020 and 2022)

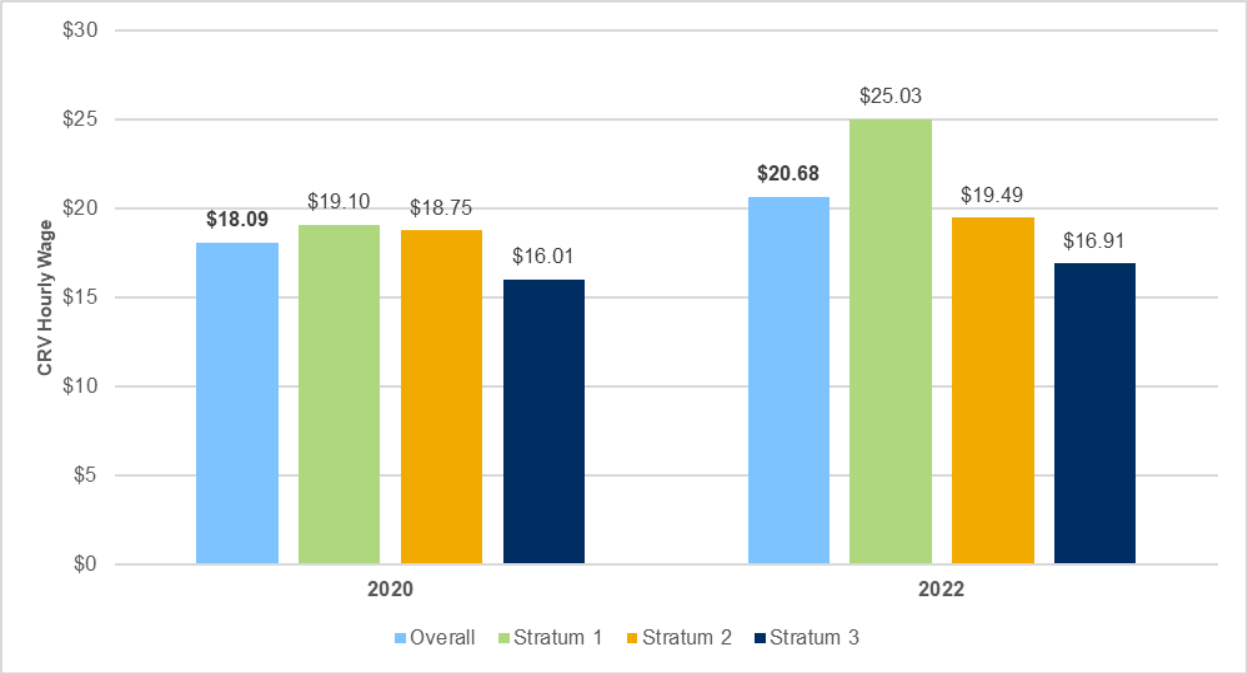
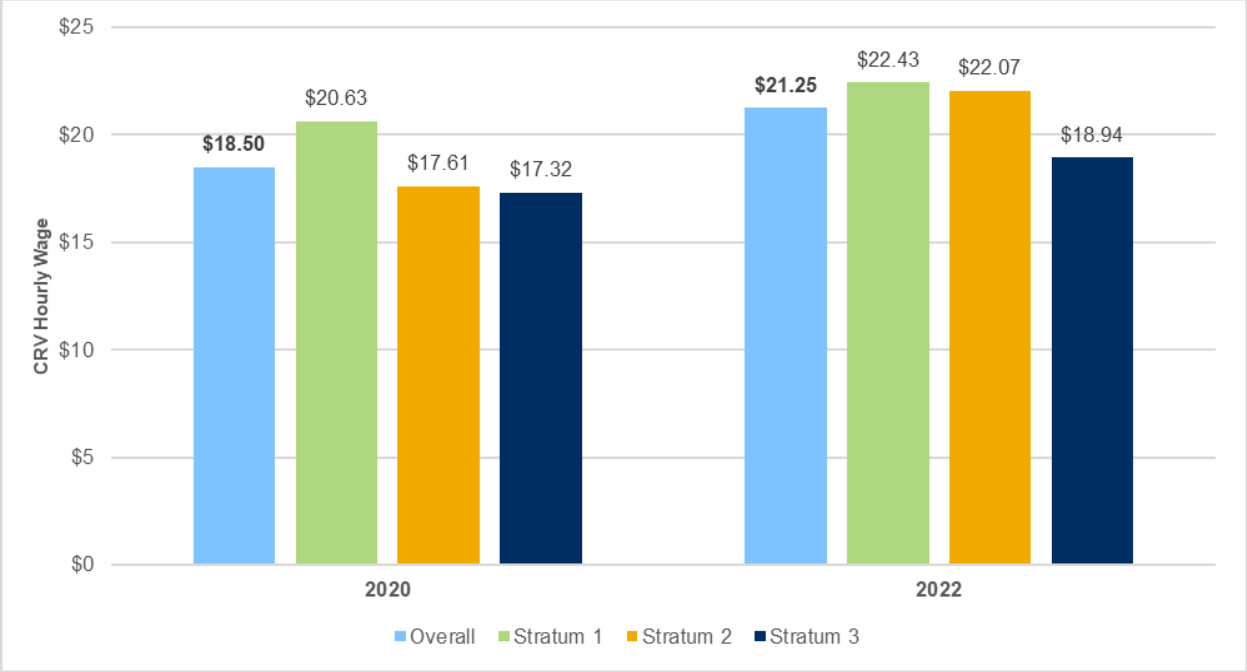


Exhibit 35
Comparison of PF CRV Hourly Wages Overall and by Strata (2020 and 2022)



Increases in DYL, AOL, and Overall Wage per Hour

Consistent with the weighted-average increase in CRV hourly wage, the simple average for DYL and overall hourly wages increased as did hourly wage per strata. Consistent with the PF cost survey, there was a decline in AOL hourly wage, with a significant decline for HF recyclers driven by stratum 1 and 2. These wages include all labor: other business, recycling center, non-CRV, and CRV. They do not reflect the number of hours per site, or volumes of material handled. **Exhibit 36** and **Exhibit 37** compare average hourly wages by strata and overall for sampled HF and PF recyclers, respectively.

Exhibit 36
Comparison of HF DYL, AOL, and Overall Wage per Hour (2020 and 2022)

Average DYL per hour

Strata	2020	2022	% Change
1	$16.37	$20.32	24%
2	$15.06	$18.47	23%
3	$14.85	$15.60	5%
Average	**$15.42**	**$18.52**	**20%**

Average AOL per hour

Strata	2020	2022	% Change
1	$100.80	$54.00	-46%
2	$48.91	$28.50	-42%
3	$23.41	$24.75	6%
Average	**$57.71**	**$32.43**	**-44%**

Average Overall Wage per Hour

Strata	2020	2022	% Change
1	$20.06	$24.50	22%
2	$19.05	$19.47	2%
3	$15.90	$16.57	4%
Average	**$18.34**	**$21.42**	**17%**

Exhibit 37
Comparison of PF DYL, AOL, and Overall Wage per Hour (2020 and 2022)

Average DYL per hour

Strata	2020	2022	% Change
1	$17.05	$19.58	15%
2	$16.72	$19.15	15%
3	$16.41	$17.72	8%
Average	**$16.72**	**$18.05**	**8%**

Average AOL per hour

Strata	2020	2022	% Change
1	$45.77	$39.69	-13%
2	39.67	$37.81	-5%
3	28.42	$26.42	-7%
Average	**$37.96**	**$32.25**	**-15%**

Average Overall Wage per Hour

Strata	2020	2022	% Change
1	$23.69	$23.14	-2%
2	$20.13	$23.38	16%
3	$18.38	$19.62	7%
Average	**$20.73**	**$20.36**	**-2%**

On average, CRV AOL hours comprise about 14% of HF and 18% of PF recyclers' total hours. Therefore, even significant changes in AOL hourly wage 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 2020 and 2022 is generally 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 hears that low-wage businesses such as recycling centers must respond to increases in the minimum wage, even if they provide wages that are slightly above it. Employers must provide competitive wages to compete for workers in a tight labor market. Furthermore, to attract workers to physically demanding work at recycling centers, employers tell us they need to provide a premium above minimum wage.

On the contrary, the average AOL hourly wage decreased significantly compared to DYL and overall hourly wage. The increase in DYL hourly wage was high enough to result in an overall increase.

Minimum Wage Increases

Changes in DYL are directly impacted by changes in minimum wage. Because DYL accounts for 82% to 86% of CRV labor hours, increases in DYL have a much greater impact on CRV recycling costs than increases in AOL. California minimum wage increased 15%, from $13 per hour in 2020 to $15 per hour in 2022. Los Angeles (LA) County's minimum wage increased 6.4% between 2020 and 2022. Approximately one-fifth of surveyed HF recyclers were located in LA County, while 39% of surveyed PF recyclers were located in LA County. The increases in hourly wages in LA County sites has a significant impact on processing fee costs and a lesser impact on handling fee costs.

Exhibit 38 shows that LA County DYL wages increased by 17% between 2020 and 2022, while non-LA County DYL increased by 13%. AOL wages decreased significantly, with a 49% decrease for LA County recyclers and a 30% decrease for non-LA County recyclers. Overall, both LA County and non-LA County recyclers increased by 6%. This indicates little difference among these regions.

Exhibit 38
Comparison of HF Los Angeles County and non-Los Angeles County Minimum Wage, DYL, AOL, and Overall Wage per Hour (2020 and 2022)

Wage Category	LA County 2020 (n=35)	LA County 2022 (n=24)	LA County % Change	Non-LA County 2020 (n=78)	Non-LA County 2022 (n=91)	Non-LA County % Change
Minimum Wage	$15.00	$15.96	6%	$13.00	$15.00	15%
Direct Yard Labor (DYL)	$15.06	$17.55	17%	$15.34	$17.29	13%
All Other Labor (AOL)	$63.03	$32.37	-49%	$43.83	$30.76	-30%
Overall Wage per Hour	**$18.10**	**$19.23**	**6%**	**$17.74**	**$18.76**	**6%**

Reductions in Low Wage Recycling Centers

One of the challenges inherent in the cost survey methodology is that for sole proprietors, S-corporations, and partnerships where the owner(s) work in the recycling centers, owner's income or profits are generally equivalent to owner wages. These business categories represent a large share of the survey population — 62% for sampled HF recyclers and 76% for sampled PF recyclers in 2022. Over the last several years, Crowe has seen a growing number of recycling centers where the owner(s) work a significant number of hours but earn little to no profits. This results in hourly wages below minimum wage, driving cost per container down.

Crowe evaluated the number and percentage of surveyed recyclers with overall hourly wages below minimum wage in 2020 and 2022. **Exhibit 39** shows the proportion of surveyed HF recyclers with overall average hourly wages that were less than minimum wage in 2020 and 2022. The proportion remained the same for the two years surveyed. **Exhibit 40** shows the same comparison and overall similar results for PF recyclers, with minimal differences in the proportion of recyclers under minimum wage. Due to minimal changes to the proportion of low-wage recyclers, low-wage recyclers are not contributing to higher recycler costs.

Exhibit 39
Comparison of Low Wage HF Recycling Centers (2020 and 2022)

Category	2020 (n=113)	2022 (n=115)
California Minimum Wage	$13.00	$15.00
Number of Surveyed HF Recyclers < Minimum Wage	19	19
Percent of Surveyed Sites < Minimum Wage	17%	17%
Range of Hourly Wages < Minimum Wage	$3.31 to $12.97	$2.47 to $14.99

Exhibit 40
Comparison of Low Wage PF Recycling Centers (2018 and 2020)

Category	2020 (n=127)	2022 (n=134)
California Minimum Wage	$13.00	$15.00
Number of Surveyed PF Recyclers < Minimum Wage	21	16
Percent of Surveyed Sites < Minimum Wage	17%	14%
Range of Hourly Wages < Minimum Wage	$0.73 to $12.90	$0.00 to $14.99

Transportation Costs

Crowe analyzed CRV transportation costs to better understand how transportation impacted the changes in cost per container between 2020 and 2022. Transportation costs increased in 2022 and were one of the larger contributors to overall CRV costs. To evaluate the impact of transportation on recycler costs, Crowe evaluated transportation and fuel costs for each material type by hauling method. Crowe combined transportation and fuel costs to evaluate the impact of transportation on recycler costs. These costs include non-labor costs that should generally reflect the cost to recyclers of hauling material to processors.[9] To analyze how transportation influenced the cost per container between the two years, Crowe analyzed the changes in transportation costs. Transportation (and fuel) costs represent 12% of total CRV costs for HF recyclers.

Exhibit 41 shows a comparison between 2020 and 2022 for transportation and fuel costs per container for sampled HF and PF recyclers as well as the price of retail diesel per gallon.[10] Transportation and fuel costs per container for sampled HF recyclers increased 38% and for PF recyclers increased 36%. In 2020, California averaged $3.38 per gallon of diesel; in 2022, the average price was $6.03 per gallon, or an increase of 79%.[11] These increases in transportation and fuel costs directly contribute to higher overall costs.

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[9] These costs 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 costs.

[10] Source: U.S. Energy Information Administration, Annual Retail Gasoline and Diesel Prices (as of Feb 2024): https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_sca_a.htm.

[11] As reference, regular gasoline increased by 74% ($3.05/gal to $5.31/gal) from 2020 to 2022.

Exhibit 41
Transportation and Fuel Costs Per Container (2020 and 2022)

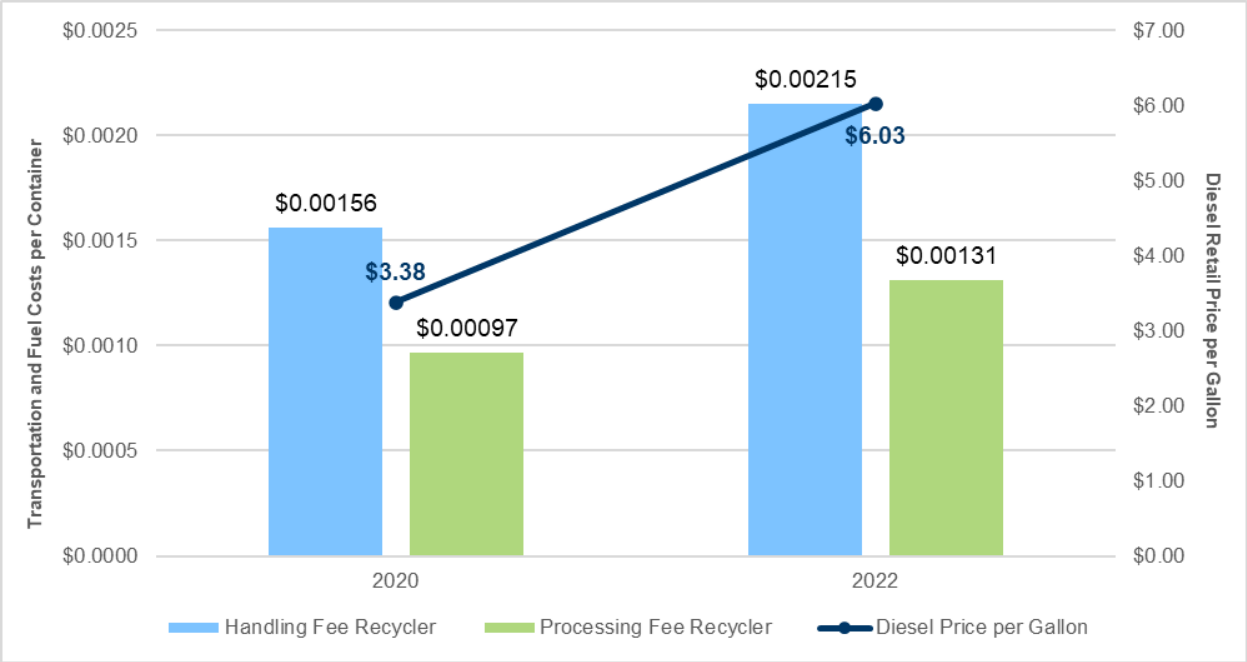


Exhibit 42 and **Exhibit 43** compare 2020 and 2022 for transportation cost per container for sampled HF and PF recyclers. The charts examine differences among small, medium, and large recyclers for sampled HF and PF recyclers. For 2022 HF and PF recyclers, the results show that the larger the recycler, the lower the transportation cost per container. Transportation cost per container increased significantly across almost all recyclers. Transportation cost per container increased from 34% (stratum 1) to 49% (stratum 2 and 3) for HF recyclers and 10% (stratum 2) to 101% (stratum 1) for PF recyclers.

Exhibit 42
Handling Fee Recycler Transportation Cost Per Container by Strata (2020 and 2022)

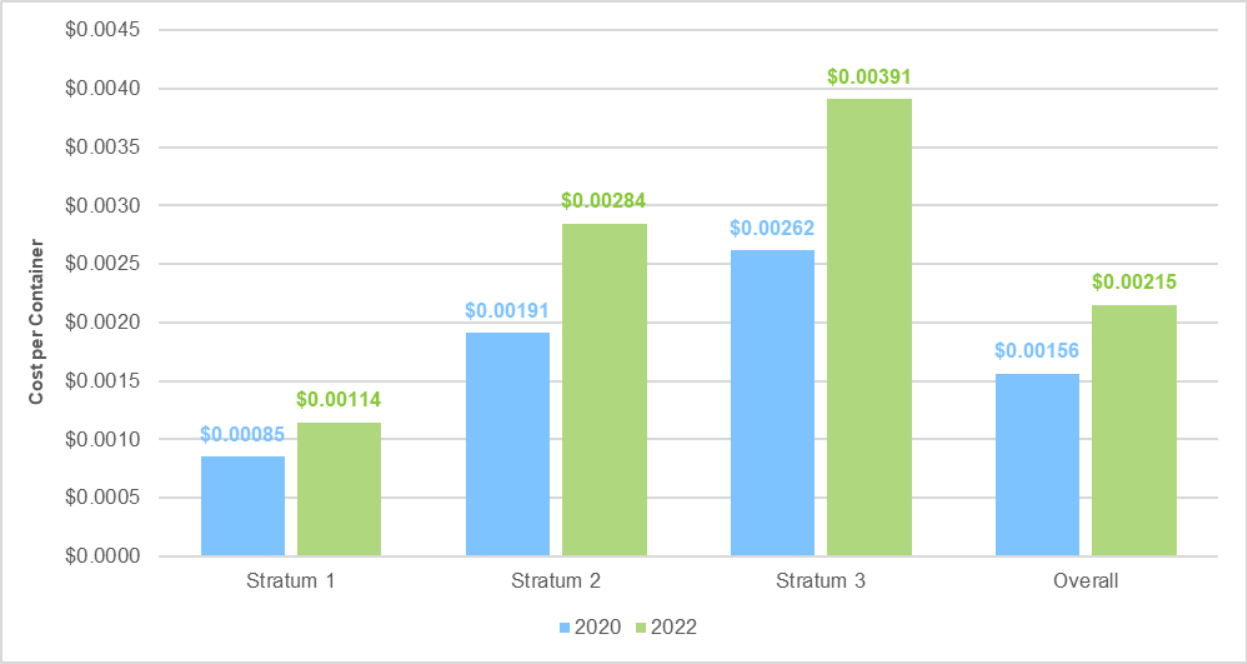
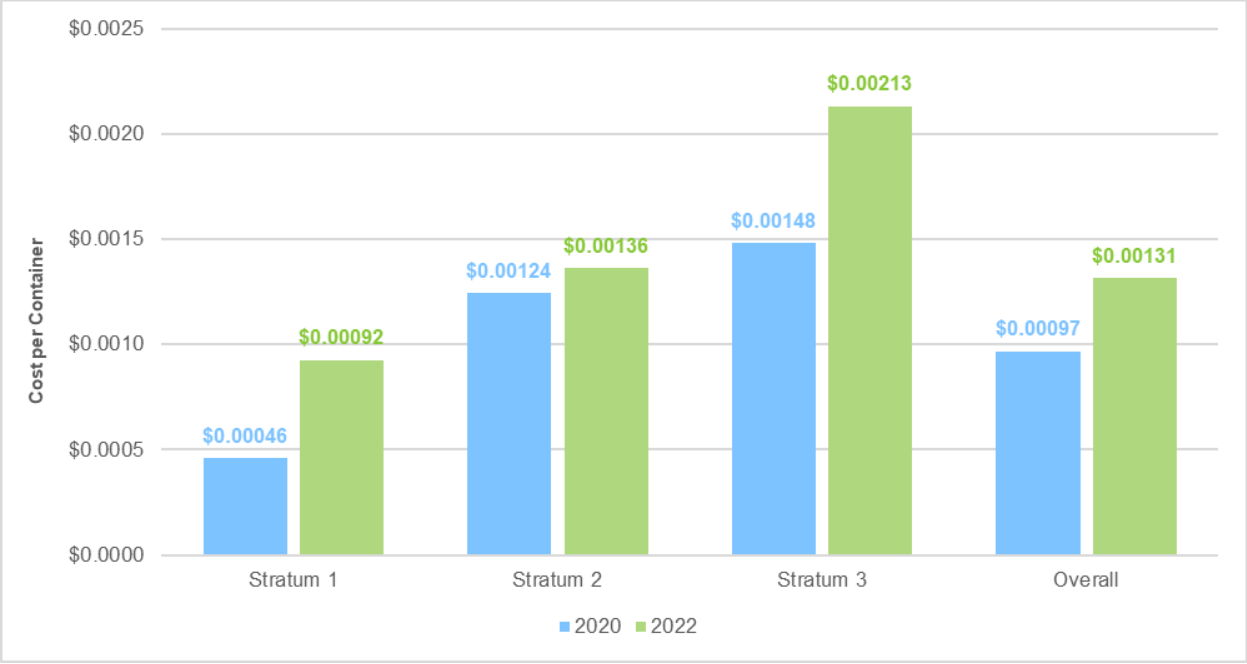


Exhibit 43
Processing Fee Recycler Transportation Cost Per Container by Strata (2020 and 2022)



C. Total Annual Handling Fee Payments

Since completing the 2010 handling fee cost survey in early 2012, CalRecycle, stakeholders, and the Legislature have been evaluating alternatives to the existing handling fee payment system. Many recyclers believed the determined cost of $0.00773 per container was too low. AB 1933 (Gordon, 2012), allows CalRecycle to revise the methodology and scrap values used for calculating handling fees if the most recent survey does not accurately reflect the actual costs for recycling centers redeeming empty beverage containers.

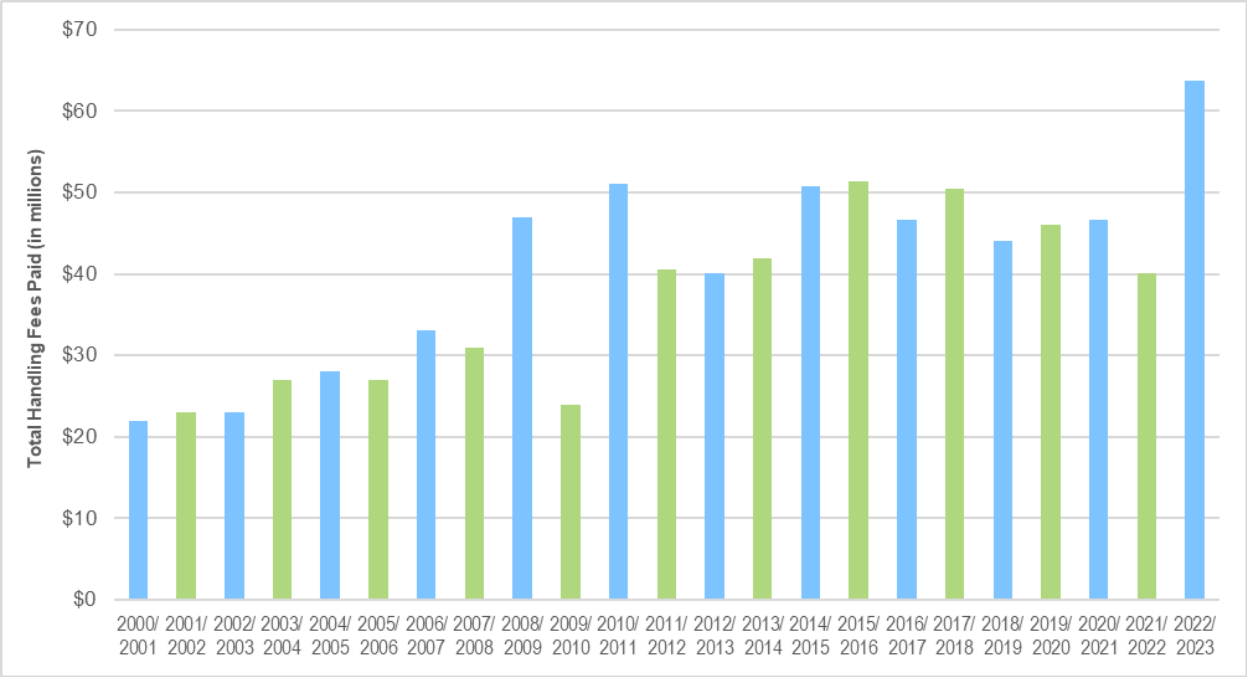
Program stakeholders have a consensus that there are problems with the current handling fee approach. The fact that handling fees are paid on all containers recycled by eligible HF recyclers results in very high monthly payments to large recyclers and very low monthly payments to small recyclers. The closure of the remaining rePlanet sites in 2019 also resulted in a substantial disruption to the population of HF recyclers and the costs of recycling that continues today. There have been ongoing discussions and a number of different legislative fixes proposed in the past several years, with one enacted assembly bill in 2022.

Through the passage of AB 203 (Committee on Budget, 2022), CalRecycle was able to issue a revised handling fee rate. Based on a cost-of-living adjustment to prior handling fees, this rate has been used for fiscal year (FY) 2022/2023 and FY 2023/2024.

Exhibit 44 provides total annual handling fee payments between FY 2000/2001 and FY 2022/2023. CalRecycle revised the handling fee rate, increasing the prior 2020 calculated handling fee rate of 0.00557 per beverage container redeemed to a revised $0.01036 or 88% rate adjustment. Since the passing of AB 203, CalRecycle increased the handling fee rate from the revised $0.01036 in FY2022/2023 to $0.01092 for FY2023/2024, applying a COLA adjustment.

If CalRecycle chooses to apply the current 2022 handling fee cost survey calculated rate at 0.00573, the handling fee payment would drop by 48% from the July 2023 rate. Even with additional containers entering the program due to SB 1013 (Atkins, 2022) and SB 353 (Dodd, 2023), the total annual handling fee payments would significantly drop. If applying a COLA adjustment to the current handling fee rate per AB 203, total handling fees paid would be expected to increase.

Exhibit 44
Total Annual Handling Fee Payments (FY 2000/2001 through FY 2022/2023)



Note: FY2022/2023 total handling fee payments is an estimate.

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

Exhibit 45 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 1.994 cents. For HF recyclers, the average cost per container increases as the size (i.e., volume handled) of the recycling center decreases.

While the handling fee is not intended to cover the full cost of recycling for HF recyclers, the per container handling fee payment will provide less coverage for stratum 3 recyclers than for strata 1 or 2 recyclers. The 0.573 cent handling fee covers 42% of the average cost of recycling for stratum 1 recyclers, 31% of the average cost of recycling for stratum 2 recyclers, and only 21% of the average cost of recycling for stratum 3 recyclers.

Exhibit 45
Handling Fee Recycler Costs per Container and Population Size, by Strata (2022)

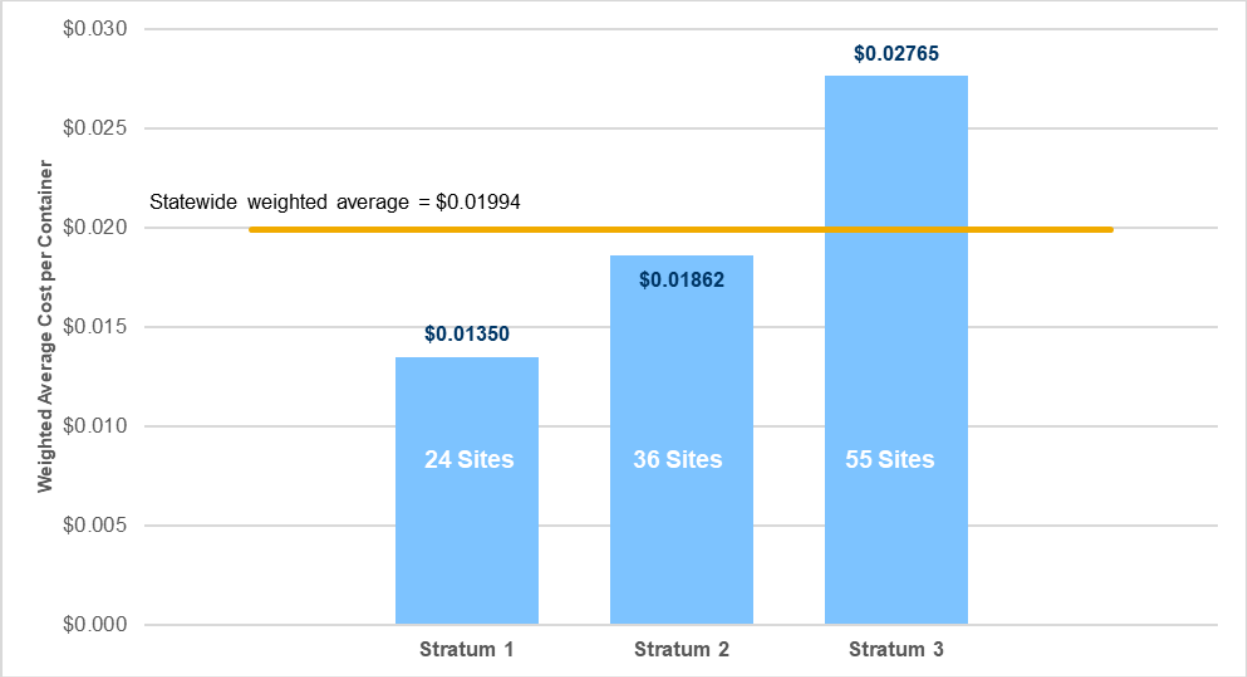


Exhibit 46 compares the average cost per container for each of the three processing fee recycler container strata and the statewide weighted-average cost per container of 1.421 cents. Similar to HF recyclers, stratum 1 recyclers had the lowest average cost per container to recycle and stratum 3 recyclers had the highest average cost per container to recycle. For PF recyclers, cost per container for strata 1 and 2 are within 5% of each other, which is the closest that these two strata have been in the past.

Exhibit 46
Processing Fee Recycler Costs per Container and Population Size, by Strata (2022)

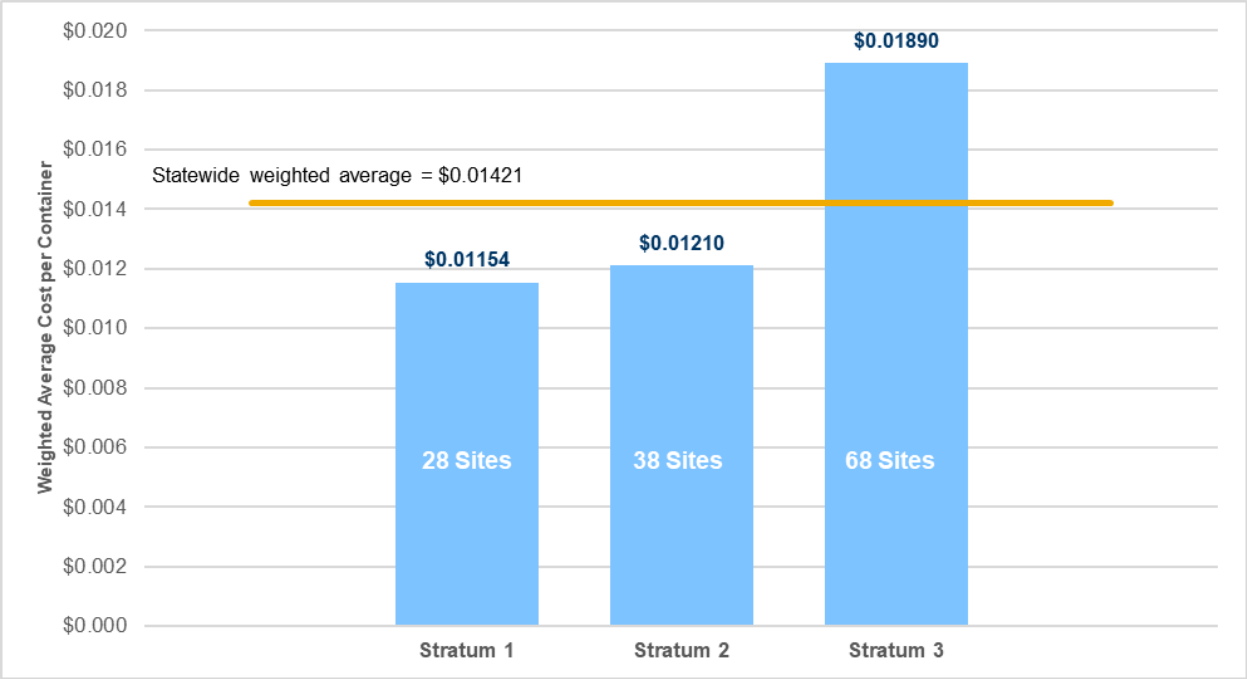


Exhibit 47 compares population and total containers recycled by strata for HF recyclers over the eight handling fee cost surveys. The full population of HF recyclers remained relatively stable between 2008 and 2010, then declined by 10% in 2012, and declined another 5% in 2014, a substantial 24% in 2016, and another 5% in 2018. The most significant drop of 34% was between 2018 and 2020 due to the loss of rePlanet in 2019. After years of decline, in 2022, the population of HF recyclers increased by 20%. This increase indicates a trend reversal and a potential stabilization of the number of HF recyclers. There's a chance that the implementation of SB 1013 will impact the number of recyclers, but it's unclear whether it would be an upward or downward shift. These impacts will be analyzed during the next survey.

Exhibit 47
Population and Container Detail, by Strata, for Handling Fee Recyclers (2008-2022)

Population

Year	Stratum 1	Stratum 2	Stratum 3	Total Population
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
2022	**61**	**140**	**328**	**529**

Containers Recycled

Year	Stratum 1	Stratum 2	Stratum 3	Total Containers
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
2022	**1,864,495,942**	**1,876,077,663**	**1,878,779,641**	**5,619,353,246**

The number of containers recycled by HF recycling centers statewide increased significantly through 2010, declined by 16% between 2010 and 2012, increased by 11% between 2012 and 2014, increased 9% between 2014 and 2016, and increased by a smaller 3% between 2016 and 2018. From 2018 to 2020, the number of containers recycled by HF recycling centers dropped 8%. In 2022, there was a 32% increase in the number of containers, the most significant increase among past surveys.

Exhibit 48 compares the full population and total containers recycled by strata for PF recyclers over the eight handling fee cost surveys. Similar to HF recyclers, the number of recyclers decreased significantly between 2016 and 2018 and again between 2018 and 2020, with reductions across all three strata. Generally, through 2012, the number of recyclers in each stratum had increased between each survey until 2014, when the downward trend started. The number of containers recycled by strata increased through 2010, then dropped in 2012, then subsequently increased each year until 2020, where it dropped again. In 2022, the number of containers recycled increased significantly. 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. Between 2020 and 2022, the decline slowed to a decrease of 4%, indicating a potential trend reversal for the stabilization in the number of PF recyclers.

Through 2020, the percentage of containers collected by HF recyclers hovered between 28% to 33% of total recycling center volumes. In 2022, HF recyclers' share of combined containers increased to 37% from 31% in 2020. If this trend continues, the economics among HF and PF recyclers will gradually diminish.

Exhibit 48
Population and Container Detail, by Strata, for Processing Fee Recyclers (2008-2022)

Population

Year	Stratum 1	Stratum 2	Stratum 3	Total Population
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
2022	**60**	**132**	**367**	**559**

Containers Recycled

Year	Stratum 1	Stratum 2	Stratum 3	Total Containers
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
2022	**3,145,094,654**	**3,214,577,785**	**3,229,877,077**	**9,589,549,516**

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, PF recyclers are: (1) larger, (2) more likely to accept scrap metal, paper and other non-CRV materials, and (3) not necessarily located near supermarkets. In contrast, HF recyclers tend to: (1) be smaller, (2) accept only CRV containers, and (3) be located at or near supermarkets.[12]

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

[12] There are some exceptions to these generalizations. For example, some HF 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 49 compares the percentage of containers of CRV material recycled by PF recyclers, HF recyclers, and curbside programs between 2002 and 2022. 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. Between 2008 and 2018, there have been no significant shifts in the proportions. In 2020, curbside programs took a higher share of containers, which shows some of the impact of the pandemic on recyclers during that time. In 2022, PF recyclers' share of containers decreased by percentage points, while HF recyclers' share of containers increased by 5%. This supports the significant increase in the number of containers recycled by HF recyclers compared to PF recyclers.

Exhibit 49
Comparison of Percent of CRV Containers Recycled by Major Recycler Type (2002 to 2022)

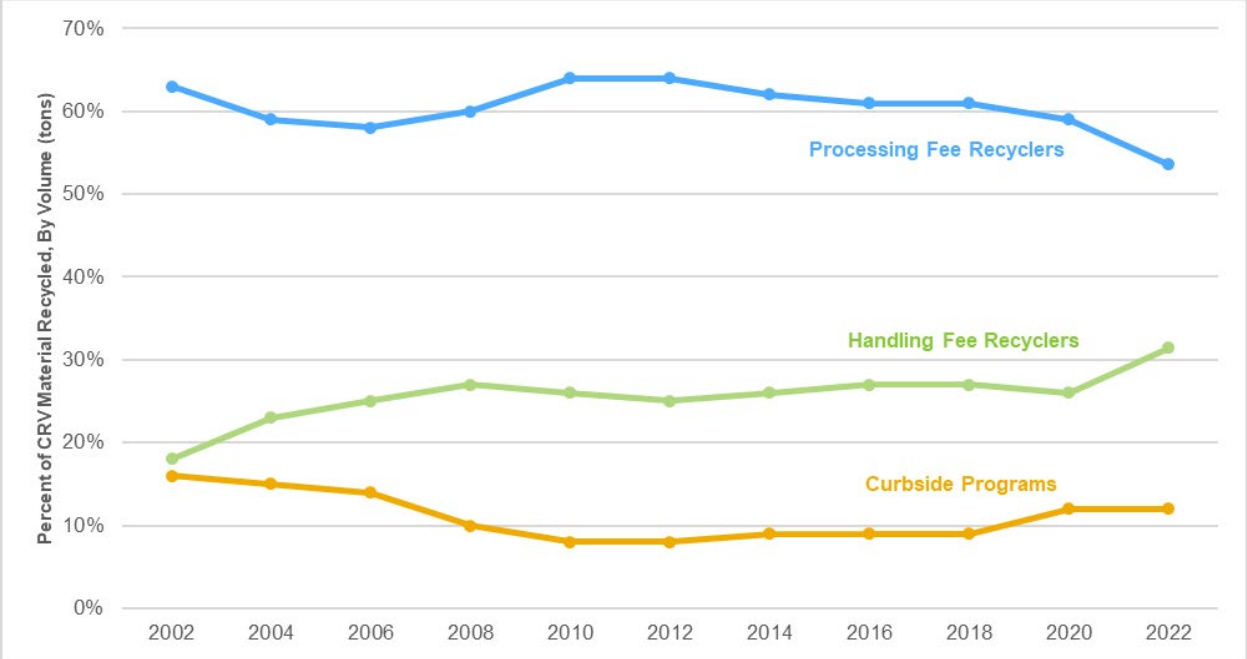


Exhibit 50 illustrates the total number of containers recycled by processing fee and HF recyclers from 2008 to 2022, and the number of processing fee and HF recyclers during the same period. This chart shows that the number of recyclers does not contribute to higher or lower volumes. In fact, as the number of recyclers decreased over time, the volume of containers remained relatively stable over time with a notable uptick from 2020 volumes to 2022 volumes, as 2020 represents a pandemic disruption and volumes closer to those of 2014.

Exhibit 50
Total Number of Containers Recycled by Handling Fee and Processing Fee Recyclers (2008 to 2022)

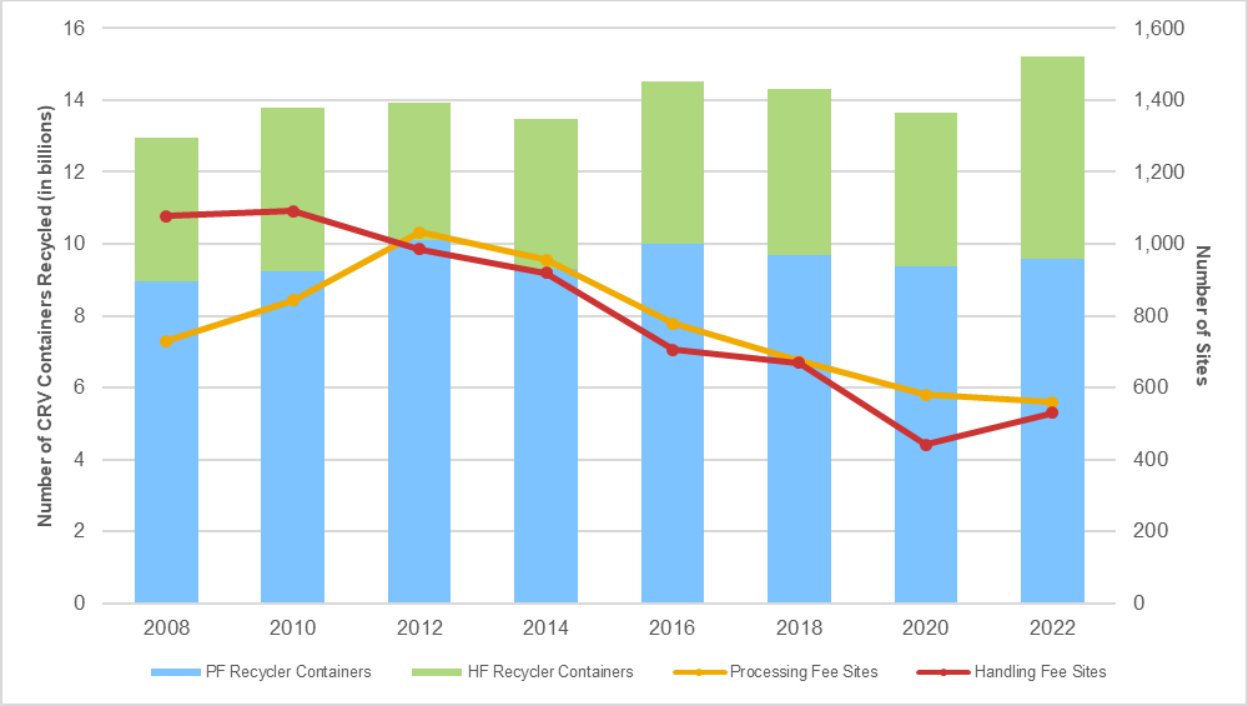
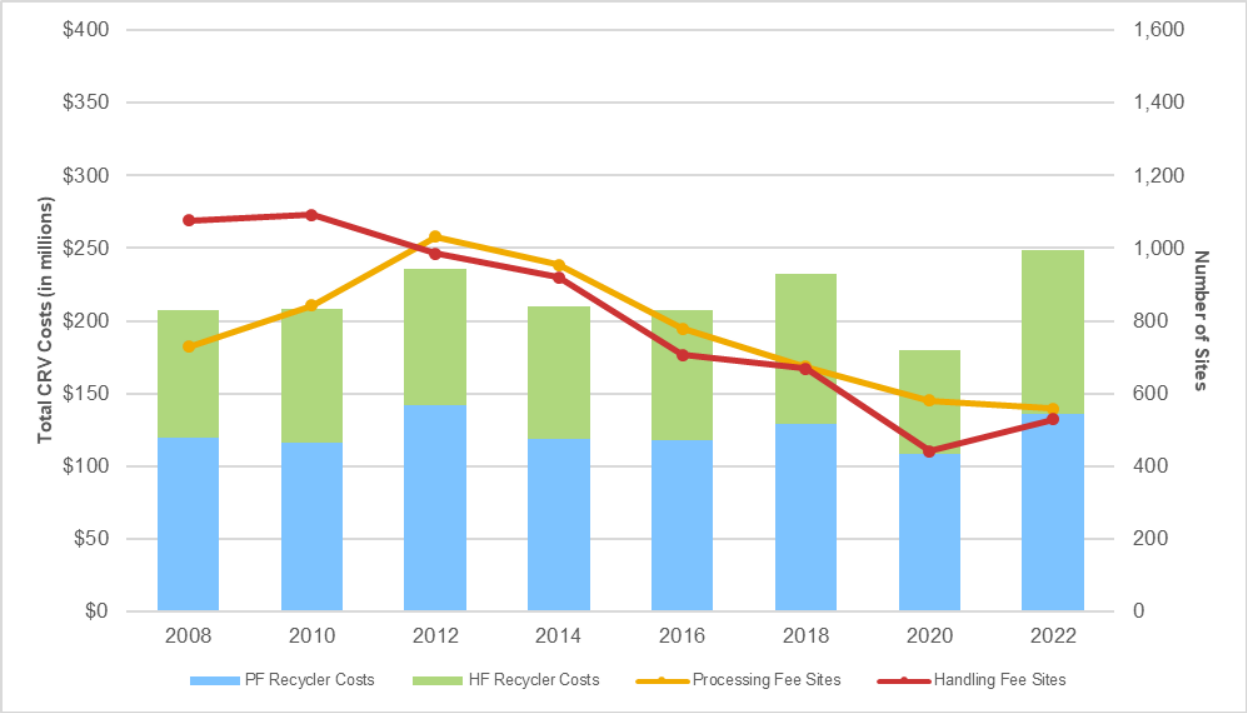


Exhibit 51 illustrates the total CRV recycling cost by PF and HF recyclers from 2008 to 2022, and the number of PF and HF recyclers during the same period. This chart shows that the number of recyclers does not contribute to higher or lower total CRV costs. In fact, as the number of recyclers decreased over time, total CRV costs either remained stable or increased over time.

Exhibit 51
Total Cost of CRV Recycling for Handling Fee and Processing Fee Recyclers (2008 to 2022)



F. Summary of Handling Fee Cost Survey Analyses

Overall, cost per container increased between 2020 and 2022, but to a somewhat lesser extent compared to the Processing Fee Cost Survey results. Our analyses identify a combination of factors that may be impacting recycling costs. Between 2020 and 2022, there was an increase in the overall survey population of HF recycling centers and a slight decrease of PF recycling centers. The increase in HF recycler cost per container between 2020 and 2022 is due to overall increases in operating expenses rather than recycler dynamics. In fact, despite increased volumes per recycler, the cost per container increased. This indicates that increase to operating expenses were significant enough to overcome the increases in recycler productivity. The following are factors that led to increased costs:

- **Higher labor costs** – Driven by the 15% increase in minimum wage, average hourly wage increased by 14% for HF recyclers and 15% for PF recyclers. Labor and indirect labor account for about 60% of recycler costs; therefore, an increase of 14% would result in an 8% increase in overall costs if everything else is held equal. Higher labor costs contribute to higher overall costs.
- **Higher transportation costs** – Driven by a 79% increase in diesel gasoline prices, transportation costs per ton increased by 38% for HF recyclers and 36% for PF recyclers. Transportation accounts for about 10% to 12% of recycler costs, therefore an increase of 38% would result in a 4% to 5% increase in overall costs if everything else is held equal. Higher transportation costs contribute to higher overall costs.
- **High inflation and cost of living** – Driven by the 12.9% increase in the consumer price index (CPI), the overall cost of living is higher in 2022 compared to 2020. The CPI increased nearly three times higher over a two-year period compared to an average increase of 4.5%. If everything else stayed the same, a CPI increase of 12.9% would generally result in a 12.9% increase to recycler costs.
    - Nearly all cost categories among HF and PF recyclers increased with direct labor, indirect labor, general business overhead, and transportation, accounting for roughly 90% of the increase in costs per recycler.

The handling fee cost survey is a complex, primary data-gathering exercise. We drew from 249 diverse recycling centers (115 HF, 134 PF) across the state to determine a single cost-per-container result. The cost-per-container results must make sense in the historical context of prior cost surveys, and within the context of current recycling operations and market dynamics. The HF recycler cost-per-container results presented in this Handling Fee Report are both reasonable in a historical context and reflect a recovery period after the peak of the pandemic.

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 2
Handling Fee Cost Survey Calculated Handling Fee Payments (without COLA) (2008 to 2022)

Year	Cost per Container	Percent Change
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%
2022	$0.00573	12%

Exhibit 3
Statewide Processing Fee and Handling Fee Recycler Cost per Container (2008 to 2022)

Processing Fee Recycler

Year	Cost per Container	Percent Change
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%
2022	$0.01421	23%

Handling Fee Recycler

Year	Cost per Container	Percent Change
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%
2022	$0.01994	20%

Exhibit 8
2022 Sampled Handling Fee Recyclers, Distribution of Cost per Container

Cents per Container	Frequency
<.50	3
.50 to .75	1
.75 to 1.00	7
1.00 to 1.25	9
1.25 to 1.50	13
1.50 to 1.75	9
1.75 to 2.00	13
2.00 to 2.25	8
2.25 to 2.50	12
2.50 to 2.75	7
2.75 to 3.00	5
3.00 to 3.25	2
3.25 to 3.50	5
3.50 to 3.75	2
3.75 to 4.00	3
4.00 to 4.25	3
4.25 to 4.50	2
4.50 to 4.75	3
4.75 to 5.00	2
>5.00	6

Exhibit 9
2022 Sampled Processing Fee Recyclers, Distribution of Cost per Container

Cents per Container	Frequency
<.50	2
.50 to .75	9
.75 to 1.00	15
1.00 to 1.25	18
1.25 to 1.50	17
1.50 to 1.75	33
1.75 to 2.00	13
2.00 to 2.25	7
2.25 to 2.50	5
2.50 to 2.75	2
2.75 to 3.00	3
3.00 to 3.25	1
3.25 to 3.50	3
3.50 to 3.75	0
3.75 to 4.00	1
4.00 to 4.25	0
4.25 to 4.50	0
4.50 to 4.75	0
4.75 to 5.00	1
>5.00	4

Exhibit 10
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 12
Handling Fee and Processing Fee Recycler Cost per Container (2022)

Year	Cost per Container	Percent Change
2022 Processing Fee Recycler Statewide, Weighted-Average Cost per Container	$0.01421	n/a
2022 Handling Fee Recycler Statewide, Weighted-Average Cost per Container	$0.01994	40%

Exhibit 16
Processing Fee and Handling Fee Recycler Cost per Container (2008–2022)

Processing Fee Recycler

Year	Cost per Container	Percent Change
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%
2022	$0.01421	23%

Handling Fee Recycler

Year	Cost per Container	Percent Change
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%
2022	$0.01994	20%

Exhibit 19
Handling Fee Cost Survey Calculated Handling Fee Payments (without COLA) (2008 to 2022)

Year	Cost per Container	Percent Change
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%
2022	$0.00573	12%

Exhibit 21
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2008 to 2022 Populations)

Year	Processing Fee Recyclers	Handling Fee Recyclers
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
2022	9,589,549,516	5,619,353,246

Exhibit 22
2008 through 2022 Populations, Number of Handling Fee Recycling Centers and Processing Fee Recycling Centers

Year	Handling Fee Recyclers	Processing Fee Recyclers
2008	1,077	729
2010	1,092	842
2012	985	1,032
2014	931	997
2016	706	778
2018	669	705
2020	459	611
2022	540	577

Exhibit 23
Population CRV Costs and Containers of Handling Fee Recyclers (2008 through 2022)

Year	Handling Fee Total Costs	Handling Fee Containers
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
2022	$112,051,518	5,619,353,246

Exhibit 24
Population CRV Costs and Containers of Processing Fee Recyclers (2008 through 2022)

Year	Processing Fee Total Costs	Processing Fee Containers
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
2022	$136,235,460	9,589,549,516

Exhibit 25
Average Containers Recycled per Handling Fee Recycler and Processing Fee Recycler (2008 through 2022)

Year	Processing Fee Recyclers	Handling Fee Recyclers
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
2022	17,154,829	10,622,596

Exhibit 27
2020 and 2022 Sampled Handling Fee and Processing Fee Recyclers
Percent Change in Key Recycler Metrics

Measure	Handling Fee RCs Percent Change	Processing Fee RCs Percent Change
Containers per Recycling Center	10%	6%
Cost per Recycling Center	32%	30%
Cost per Container	20%	23%

Exhibit 28
2014 to 2022 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
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%
2022	0.45	-4%	0.34	8%

Exhibit 31
2014 to 2022 Sampled Handling Fee and Processing Fee Recyclers
Average Hourly Wage

Year	Handling Fee Recyclers	Processing Fee Recyclers
2014	$14.75	$14.42
2016	$14.21	$15.27
2018	$17.12	$18.11
2020	$18.09	$18.50
2022	$20.68	$21.25

Exhibit 32
2014 to 2022 Sampled Handling Fee Recyclers
Labor and Non-Labor Costs per Container

Year	Labor Costs	Non-Labor Costs
2014	$0.00932	$0.01049
2016	$0.00865	$0.00963
2018	$0.01072	$0.00939
2020	$0.00852	$0.00706
2022	$0.01047	$0.00947

Exhibit 33
2014 to 2022 Sampled Processing Fee Recyclers
Labor and Non-Labor Costs per Container

Year	Labor Costs	Non-Labor Costs
2014	$0.00625	$0.00522
2016	$0.00574	$0.00504
2018	$0.00677	$0.00565
2020	$0.00578	$0.00510
2022	$0.00747	$0.00674

Exhibit 34
Comparison of HF CRV Hourly Wages Overall and by Strata (2020 and 2022)

Stratum	2020	2022
Overall	$18.09	$20.68
Stratum 1	$19.10	$25.03
Stratum 2	$18.75	$19.49
Stratum 3	$16.01	$16.91

Exhibit 35
Comparison of PF CRV Hourly Wages Overall and by Strata (2020 and 2022)

Stratum	2020	2022
Overall	$18.50	$21.25
Stratum 1	$20.63	$22.43
Stratum 2	$17.61	$22.07
Stratum 3	$17.32	$18.94

Exhibit 41
Transportation and Fuel Costs Per Container (2020 and 2022)

Year	Handling Fee Recycler	Processing Fee Recycler	Diesel Price per Gallon
2020	$0.00156	$0.00097	$3.38
2022	$0.00215	$0.00131	$6.03

Exhibit 42
Handling Fee Recycler Transportation Cost Per Container by Strata (2020 and 2022)

Year	Stratum 1	Stratum 2	Stratum 3	Overall
2020	$0.00085	$0.00191	$0.00262	$0.00156
2022	$0.00114	$0.00284	$0.00391	$0.00215

Exhibit 43
Processing Fee Recycler Transportation Cost Per Container by Strata (2020 and 2022)

Year	Stratum 1	Stratum 2	Stratum 3	Overall
2020	$0.00046	$0.00124	$0.00148	$0.00097
2022	$0.00092	$0.00136	$0.00213	$0.00131

Exhibit 44
Total Annual Handling Fee Payments (FY 2000/2001 through FY 2022/2023)

Year	Total Handling Fees Paid
2000/2001	$22,000,000
2001/2002	$23,000,000
2002/2003	$23,000,000
2003/2004	$27,000,000
2004/2005	$28,000,000
2005/2006	$27,000,000
2006/2007	$33,000,000
2007/2008	$31,000,000
2008/2009	$47,000,000
2009/2010	$24,000,000
2010/2011	$51,000,000
2011/2012	$40,500,000
2012/2013	$40,140,000
2013/2014	$41,900,000
2014/2015	$50,800,000
2015/2016	$51,300,000
2016/2017	$46,600,000
2017/2018	$50,500,000
2018/2019	$44,000,000
2019/2020	$46,000,000
2020/2021	$46,700,000
2021/2022	$46,906,318
2022/2023	$63,715,510

Exhibit 45
Handling Fee Recycler Costs per Container and Population Size, by Strata (2022)

Stratum	Costs per Container	Benchmark	Sites
Stratum 1	$0.01350	$0.01994	24
Stratum 2	$0.01862	$0.01994	36
Stratum 3	$0.02765	$0.01994	55

Exhibit 46
Processing Fee Recycler Costs per Container and Population Size, by Strata (2022)

Stratum	Costs per Container	Benchmark	Sites
Stratum 1	$0.01154	$0.01421	28
Stratum 2	$0.01210	$0.01421	38
Stratum 3	$0.01890	$0.01421	68

Exhibit 49
Comparison of Percent of CRV Containers Recycled by Major Recycler Type (2002 to 2022)

Year	Processing Fee Recyclers	Handling Fee Recyclers	Curbside Programs
2002	63%	18%	16%
2004	59%	23%	15%
2006	58%	25%	14%
2008	60%	27%	10%
2010	64%	26%	8%
2012	64%	25%	8%
2014	62%	26%	9%
2016	61%	27%	9%
2018	61%	27%	9%
2020	59%	26%	12%
2022	54%	31%	12%