2018 Handling Fee Cost Survey: Final Report

June 1, 2020

Produced Under Contract by Crowe

CalRecycle

California Department of Resources Recycling and Recovery

2018 Handling Fee Cost Survey

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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, we acknowledge and appreciate the cooperation and time commitment of the many recycling centers that were selected to participate in the processing fee and handling fee cost survey.

Executive Summary

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

This executive summary is organized as follows:

A. Handling Fee Cost Survey Background
B. Handling Fee Cost Survey Objectives
C. Handling Fee Cost Survey Results
D. Handling Fee Cost Survey Tasks
E. Handling Fee Cost Analyses.

A. Handling Fee Cost Survey Background and History

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

A major subprogram within AB 2020 is the convenience zone system. The law established specific goals for convenient recycling in order to allow consumers to redeem their containers and receive back their refund value. A traditional deposit system requires beverage retailers (dealers) to accept and sort returned empty containers. However, as the legislation was being created, part of the compromise behind AB 2020 was to develop a mechanism to avoid, or minimize, dealer take-back requirements, which were viewed as costly and unwieldy. While California had about 500 pre-existing recycling centers in 1986, these were not deemed adequate to ensure convenient recycling opportunities, as many of these sites did not accept all materials or were in non-convenient industrial locations.

As part of the initial negotiations on the bill, rather than requiring all dealers to accept empty containers as was the case with “traditional bottle bills”, AB 2020 established redemption centers close to where people shopped. Thus the “convenience zone” was born, which was defined as the area within a one-half mile circular radius surrounding each supermarket in California with annual sales exceeding $2 million.[1] Each convenience zone (CZ) was to contain at least one recycling center that redeemed all

[1] This definition is still in place today.

types of beverage containers and was to be open at least 30 hours per week, including at least 5 off-business hours. If a recycling center was not established within a zone, then all dealers within the zone would be required to take back containers. Through this mechanism, the law created incentives for dealers to ensure that a recycling center was located in their zone.

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

The convenience zone system is significantly more efficient and cost effective than in-store dealer take-back. However, conventional wisdom at that time (and proven today by recent handling fee cost surveys) was that recycling in convenience zones on average costs more than recycling at pre-existing recycling centers.

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

Initially, AB 2020 included a "safety net," Convenience Incentive Payments (CIPs), to help pay the cost of recycling centers located in convenience zones. CIPs were paid from unredeemed funds. Only sites that were the sole redemption location in a zone, and that realized a net average monthly financial loss, were eligible. However, in the early program years up to two-thirds of new convenience zone redemption centers received CIPs. Realizing that CIPs were becoming the norm, rather than the exception, the legislature adopted restrictions on CIP amounts and how they were allocated. The biggest concern with the CIP system was that it was "needs based" and discouraged improvements in operating efficiency.

In 1992, AB 87 (Sher, Chapter 1266, Statutes of 1992) enacted a number of major changes to the still-young AB 2020 program. One of the most significant changes was the elimination of the CIP and the establishment of a "performance-based" 1.7-cent per container handling fee to pay for the cost of convenience at convenience zone sites. AB 87 provided for handling fee payments of up to $2,300 per month, per site, with priority going to those sites with the highest eligible monthly containers. To be eligible, sites had to be: (1) the only recycling center in a convenience zone, (2) be located at or in the parking lot of the supermarket, and (3) meet specified total monthly redemption containers (initially 45,000 containers per month, increasing to 60,000 containers per month in January 1994). Furthermore, to ensure that sites receiving handling fees were recycling adequate glass and plastic, AB 87 required that glass and plastic must be at least 30 percent of a site's eligible containers. The total amount allocated for handling fees was set at $18.5 million per year.

With the exception of changes to the amount of total funding, this basic handling fee system was in place between 1993 and 2008 as a means to help pay for the cost of convenient recycling, with only relatively modest modifications. Until July 1, 2008, handling fee eligibility requirements were as follows:

- Eligible sites included: recycling centers at supermarket sites, non-profit convenience zone recyclers, or rural regional recyclers[2]
- Recycling centers must have recycled at least 60,000 containers in the calendar month for which they were paid, or at least an average of 60,000 containers per month during the previous 12 months (a container 24 ounces, or more, counted as two containers).
- The number of containers eligible for handling fees was determined by dividing the site's monthly glass and plastic containers by the monthly total containers recycled. If this quotient was at least equal to 10 percent, the total monthly containers of the site were eligible for handling fees. If the quotient was less than ten percent, then the maximum eligible containers were determined by dividing the glass and plastic containers by 10 percent. Given high rates of plastic recycling, essentially all recyclers met this eligibility requirement.
- The per container handling fee was 1.8 cents, and the monthly handling fee payment per site did not exceed $2,300,
- If there were not adequate total monthly funds allocated to pay all eligible handling fee sites, then sites with higher monthly eligible containers receive priority for payments.
- Handling fee payments were made to only one certified recycling center in a convenience zone. If a dealer was in two zones, only one payment would be made to a recycler located at that dealer. If another recycler was operating in a

[2] These categories of recycler are defined in statute: a supermarket site means any certified recycling center that redeems all types of beverage containers in accordance with Section 14572, and which is located within, or outside and immediately adjacent to the entrance of, or at, or within a parking lot or loading area surrounding, a supermarket which is the focal point of a convenience zone, or a dealer that is located within that zone, and which is accessible to motor traffic (Section 14526.5). A nonprofit convenience zone recycler means a recycling center that is operated by an organization established as a 501(c) or 501(d) entity in U.S. Code, is certified by the department, and is located within a convenience zone, but is not necessarily a supermarket site (Section 14514.7). A rural regional recycler means an operator that is certified by the department as being in a nonurban area identified using Farmers Home Loan Administration criteria, or is within an area designated by the department as a rural region with a population of between 10,000 and 50,000 persons (Sections 14525.5.1 and 14571).

zone without receiving handling fee payments, the department did not pay handling fees to a convenience zone recycler in that zone or to another recycler.

- There were separate eligibility criteria for rural region recyclers, related to hours of operation, operation in more than one zone, and location of other recyclers.
- Total annual handling fee payments in fiscal year 2006/2007 were capped at $33 million and for fiscal year 2007/2008 were capped at $35 million.

AB 3056 (Committee on Natural Resources, Chapter 907, Statutes of 2006), implemented the most significant changes to the handling fee system since 1993. These changes started with the 2006 handling fee cost survey, and the new approach to handling fee calculations and payments that started July 1, 2008. On July 1, 2008, the following changes were made:

- The maximum annual funding cap was removed (funds are now constrained only by available unredeemed funds)
- The 60,000 minimum containers per month requirement was removed
- The $2,300 maximum per month requirement was removed
- 1.8 cents per container requirement was removed
- Counting containers 24 ounces and above as two containers was removed

AB 3056 requires CalRecycle to conduct a handling fee cost survey every two years in conjunction with the processing fee cost survey. Section 14585, subdivision (f), was added to the Beverage Container Recycling and Litter Reduction Act on September 30, 2006, as follows:

"(f)(1) On or before January 1, 2008, and every two years thereafter, the department shall conduct a survey of a statistically significant sample of certified recycling centers that receive handling fee payments to determine the actual cost incurred for the redemption of empty beverage containers by those certified recycling centers. The department shall conduct these cost surveys in conjunction with the cost surveys performed by the department pursuant to subdivision (b) of Section 14575 to determine processing payments and processing fees. The department shall include, in determining the actual costs, only those allowable costs contained in regulations adopted pursuant to this division that are used by the department to conduct cost surveys pursuant to subdivision (b) of Section 14575.

(2) Using the information obtained pursuant to paragraph (1), the department shall then determine the statewide weighted-average cost incurred for the redemption of empty beverage containers, per empty beverage container, at recycling centers that receive handling fees.

(3) On and after July 1, 2008, the department shall determine the amount of the handling fee to be paid for each empty beverage container by subtracting the amount of the statewide weighted-average cost per container to redeem empty

beverage containers by recycling centers that do not receive handling fees from the amount of the statewide weighted-average cost per container determined pursuant to paragraph (2).

(4) The department shall adjust the statewide average cost determined pursuant to paragraph (2) for each beverage container annually to reflect changes in the cost of living, as measured by the Bureau of Labor Statistics of the United States Department of Labor or a successor agency of the United States government.

(5) The cost information collected pursuant to this section at recycling centers that receive handling fees shall not be used in the calculation of the processing payments determined pursuant to Section 14575."

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

Together, the processing fee and handling fee cost surveys performed in 2019 represented the largest cost survey effort undertaken by CalRecycle. In total, the Crowe team completed 343 randomly selected recycler cost surveys, comprised of surveys of 233 processing fee recyclers, and surveys of 110 handling fee recyclers. In addition, Crowe conducted a census of all remaining rural recyclers (190 sites), for a total of 533 recycling centers surveyed. The cost surveys are also similar in detail and complexity to prior cost surveys in terms of quantitative information obtained.

B. Handling Fee Cost Survey Objectives

The objective of the handling fee cost survey was to estimate the California statewide, weighted-average, 2018 certified recycler cost per container to recycle for handling fee recyclers and processing fee recyclers. Recycler center costs were surveyed in 2019 using recycler center calendar year 2018 financial statements. Based on the current approach, beginning July 1, 2020, the per container handling fee payment for eligible supermarket sites, non-profit convenience zone recyclers, and rural recyclers, will be based on the calculated measured difference between the cost per container for these two populations (i.e., handling fee recycler cost per container minus processing fee recycler cost per container).

The recycler costs per container in this report present the culmination of 11 months (April 2019 through February 2020) of research, development, and implementation efforts for a primary data economic cost survey of California certified recycling centers. The actual handling fee cost survey field work was performed over a seven-month period from May 2019 through November 2019.

C. Handling Fee Cost Survey Results

The statewide, weighted-average, recycler cost per container for handling fee recyclers and processing fee recyclers are presented in **Exhibit ES-1.** The statewide, weighted-average, cost to recycle for handling fee recyclers in 2018 was 2.224 cents per container, 67 percent higher than the statewide, weighted-average, cost to recycle for processing fee recyclers in 2018, at 1.330 cents per container.

Exhibit ES-1
Statewide Recycler Costs per Container (2018)

Recycler Type	2018 Statewide, Weighted-Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90 % Confidence Interval
1. Handling Fee Recycler	2.224 Cents	+67%	4.94%
2. Processing Fee Recycler	1.330 Cents	n/a	6.70%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.894 Cents	n/a	n/a

Exhibit ES-1 includes the new handling fee payment calculation, 0.894 cents per recycled container, equal to the difference between the handling fee recycler statewide, weighted-average cost per container to recycle, and the processing fee recycler statewide, weighted-average cost per container to recycle, as specified in Section 14585 (f)(3), of the Beverage Container Recycling and Litter Reduction Act. The department is scheduled to implement this new handling fee payment starting July 1, 2020. CalRecycle may add a cost of living adjustment (COLA) to the handling fee.

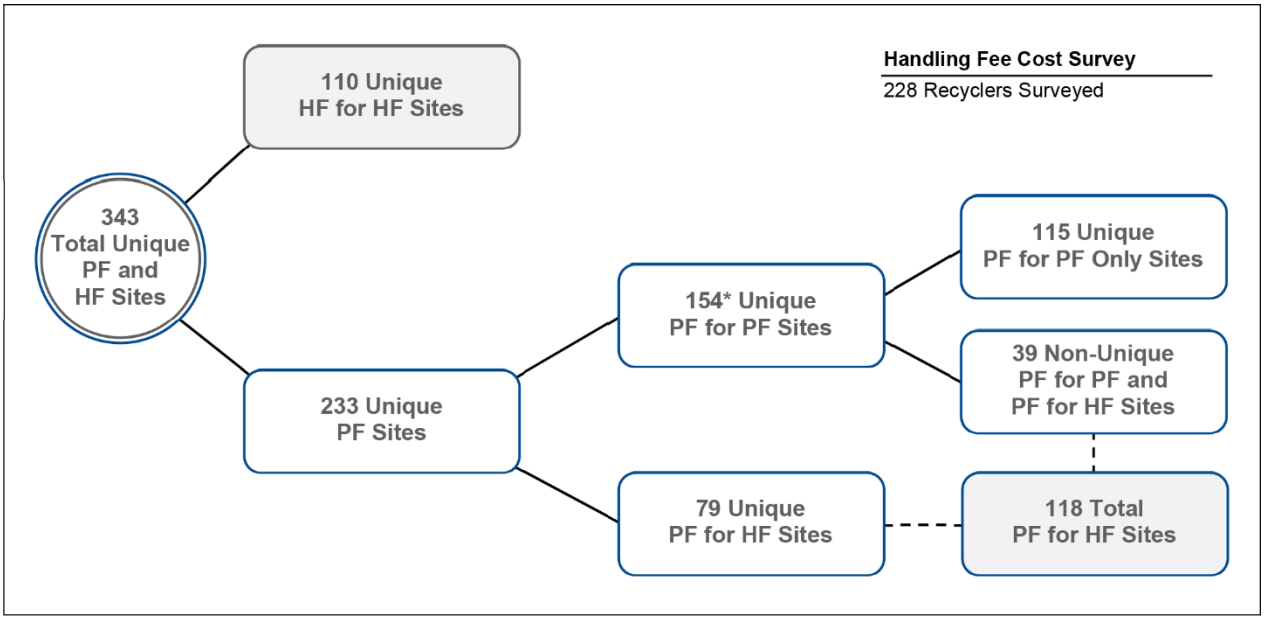
The sample sizes used to determine the costs per container were estimated to achieve a 90 percent confidence interval. This standard was higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85 percent confidence interval. The cost-per-container results for both handling fee recyclers and processing fee recyclers presented in this report exceeded this target, with low error rates at the 90 percent confidence level of 4.94 percent, and 6.70 percent, respectively.

D. Handling Fee Cost Survey Tasks

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

1. **Developed and documented a sample survey design framework and selected recycling centers for the cost survey.** We determined the number of recycling centers to be selected for the stratified random sample used to measure costs per container for handling fee and processing fee sites. Following the sample design, Crowe randomly identified certified recycling centers selected to participate in the cost survey.
2. **Monitored site completion characteristics to sample design for both handling fee recyclers and processing fee recyclers.** In total, Crowe surveyed 233 processing fee recyclers and 110 handling fee recyclers to calculate recycler costs for specific components of the processing fee and handling fee cost surveys. **Exhibit ES-2** illustrates the total number of processing fee and handling fee recyclers surveyed and the number of recyclers in the handling fee survey.

Exhibit ES-2
Processing Fee and Handling Fee Cost Survey Sample (2018)



* 39 PF sites within the 154 also were within the handling fee cost survey PF for HF sites, for a total 118 (79+39) PF sites used for the cost per container calculation.

3. **Updated and calibrated the Labor Allocation Cost Survey Model.** The cost survey model is a 14-worksheet, Microsoft Excel-based computer 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 2018 container per pound and CRV payment information, as well as procedural changes to the cost survey.
4. **Revised and updated the Cost Survey Training Manual.** Crowe evaluated the training manual used in prior years, removing outdated and duplicative information, adding graphics, and increasing readability and relevance. The streamlined manual consists of ten chapters, each emphasizing actions for survey team members to take in the field and when completing site files. The new training manual focuses on key areas of learning necessary to successfully conduct cost surveys. Crowe developed new PowerPoint presentations covering topics in the training manual. The presentations include videos of a cost survey site visit, quizzes, and activities specific to each training module.
5. **Revised and conducted cost survey training.** Training consisted of three days of interactive training sessions, training site visits, and a follow-up classroom session. Activities during the first three days included conducting cost survey interview role playing activities, mentoring from experienced survey team members, and completing a site visit cost model and associated documentation. Following the three days of classroom training, each new survey team member conducted at least two cost survey site visits with a highly experienced team member to provide “real-world” experience. The experienced survey team member guided the new team member, with increasing levels of responsibility for the on-site and post-site visit procedures over the course of the visits. Following the field visits, new survey members spent two days working together to complete the site files. The entire survey team reconvened after the training site visits to present and discuss the site visits and review the remainder of the training materials.
6. **Scheduled, conducted, and completed 228 recycling center on-site visits during seven months between May 2019 and November 2019.** Throughout the scheduling and site visits, the Crowe team built upon the field working relationships 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 of the cost surveys were conducted by a team of one or two auditors, including accountants and/or recycling experts. It typically took between one to three hours to complete the on-site survey. In addition to the on-site time, usually over eight hours of additional time was required after each site visit to analyze data, and to follow up with each recycler to obtain complete financial and labor information.
7. **Created a secure SharePoint site for electronic file reviews.** Crowe developed a secure online file review system for team members to upload and review survey files. The survey files maintain the functional components

of former hard copy documentation (site procedure checklist, site memorandum, site equipment sheet, Excel cost model, signed affidavit, and supporting site labor and financial information), but eliminate the paper-intensive file development and review process of prior cost surveys.

8. **Developed and implemented an intensive quality control procedure.** The quality control procedure included thirteen hours, and five different levels of review (site team review, independent first level review, manager review, CPA partner review, and project director review), for each site file. This review took place before the site files were released for data processing and data analysis. These quality assurance steps ensured that each site file was complete and accurate, and ensured that all results from the labor allocation model and the indirect cost allocation sub-models were accurate. In total, over 30 hours generally were spent for each completed recycler site, including the site team and quality control hours.
9. **Determined the final cost per container for processing fee and handling fee recyclers.** Using an automated process, Crowe extracted results from each of the 228 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 percent confidence interval.

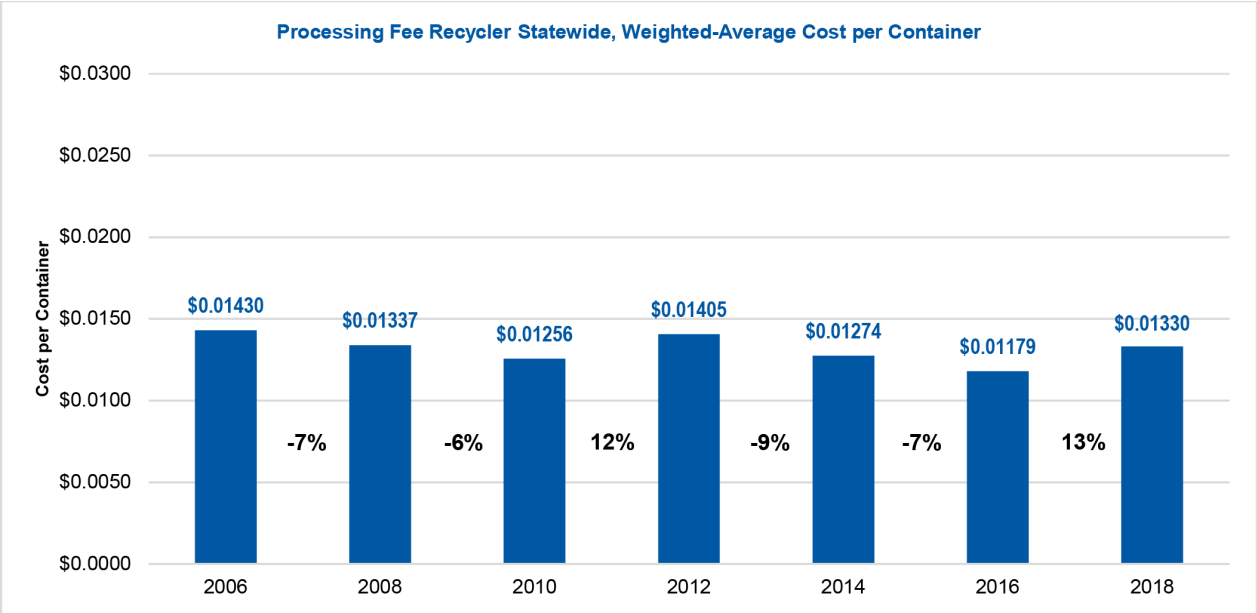
E. Handling Fee Cost Survey Analyses

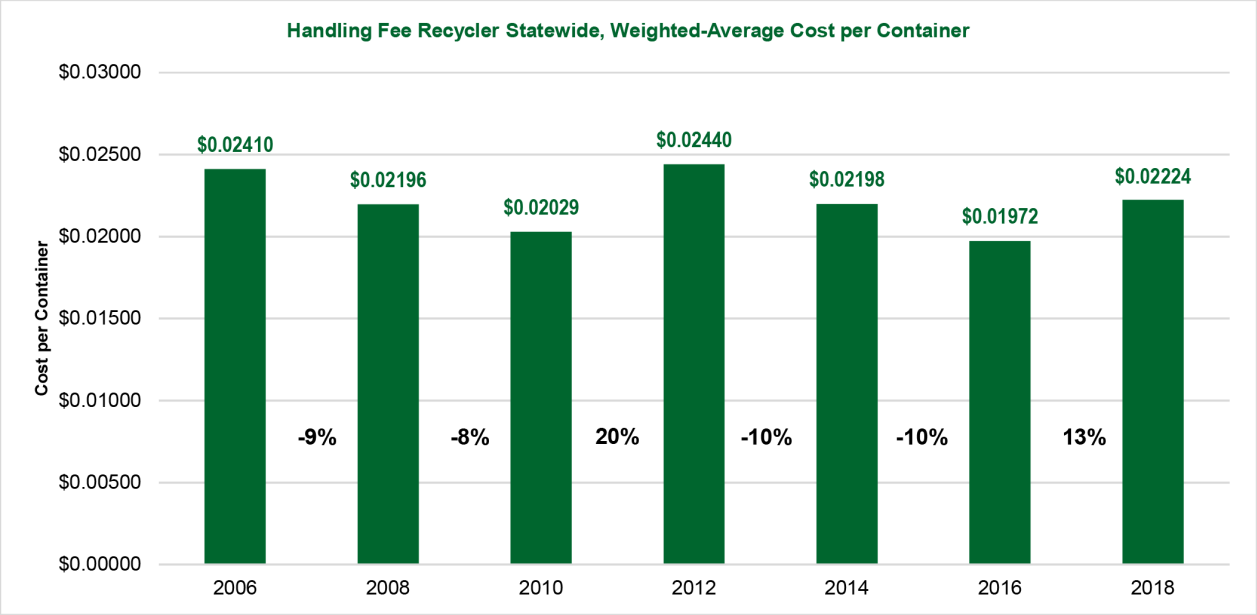
During the course of the handling fee cost survey, Crowe conducted a series of analyses for CalRecycle. Below, we briefly describe these analyses:

- **Compared historical cost-per-container results.** Crowe compared the statewide, weighted-average cost per container for processing fee recyclers and handling fee recyclers from the 2006 to 2018 handling fee cost surveys. Cost per container increased for both types of recyclers in in 2018, following decreases in 2014 and 2016. **Exhibit ES-3** provides handling fee and processing fee cost-per-container results since 2006. **Exhibit ES-4** illustrates the calculated handling fee resulting from each cost survey.
- **Analyzed likely reasons behind the recycler cost per container increase.** Crowe evaluated several possible reasons for the 13 percent increase in handling fee and processing fee recycler costs per container. The increase in average CRV hourly wages for both types of recyclers was a significant factor in the increased cost per container. CRV hourly wages for sampled handling fees increased 20 percent, and increased 18 percent for sampled processing fees between 2016 and 2018. Increased transportation costs between 2016 and 2018 were also a contributing factor.

- **Evaluated changes in number of recyclers, costs, and recycled containers.** Crowe evaluated historical trends in population number of recyclers and the relative population CRV costs and containers recycled by processing fee and handling fee recyclers.
- **Evaluated changes in recycling center productivity and costs.** Crowe evaluated changes in number of recyclers and containers recycled between 2016 and 2018. The average containers handled per recycling center increased in 2018. More productive recycling centers that recycle more material generally have lower costs than less productive recycling centers that recycle less material. However, other factors, such as higher wages and transportation, led to higher costs to recycle.
- **Analyzed annual handling fee payments.** Crowe compared the total handling fee payments over the last several years and estimated future handling fee payments overall.
- **Compared recyclers, containers recycled, and cost per container by strata.** Crowe analyzed the distribution of recyclers, costs, and recycling by strata. We also compared the average cost per container by stratum and the statewide average cost per container for both handling fee and processing fee recyclers. We also analyzed the total number of recyclers and containers recycled by stratum.
- **Compared population characteristics of handling fee and processing fee recyclers.** Crowe compared the total population CRV costs, total population containers, and total population size (number of sites) between handling fee and processing fee recyclers for 2006 to 2018 survey years. In all seven years, handling fee recyclers recycled about one-third of the containers but accounted for just over 40 percent of total costs. Handling fee recyclers accounted for between 48 to 62 percent of the total number of recyclers, with the percentage declining in recent years.

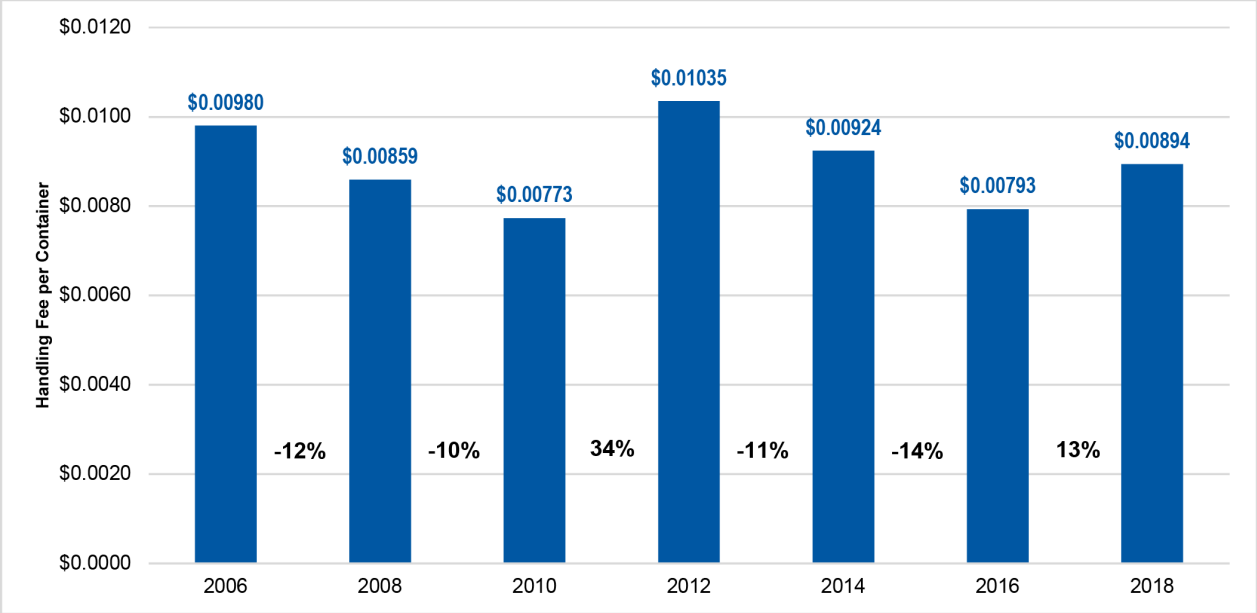
Exhibit ES-3
Processing Fee and Handling Fee Recycler Cost per Container[a] (2006–2018)





[a] Statewide, weighted-average cost per container recycled.

Exhibit ES-4
Handling Fee Cost Survey Calculated Handling Fee Payments (2006 to 2018 Cost Years)



1. Handling Fee Cost Survey Methodologies

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

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

A. Survey Design

This 2018 survey was the seventh time that CalRecycle conducted a handling fee survey to determine the cost per container of recycling beverage containers. Crowe also developed the survey design for the first six handling fee cost surveys. We utilized the same handling fee cost survey design methodology that we developed for the previous handling fee cost surveys.

The purpose of the survey design was to identify the specific recycling centers surveyed to estimate California statewide, weighted-average, 2018 certified recycling center cost per container to recycle for handling fee (HF) recyclers, and processing fee (PF) recyclers. Recycling center costs were surveyed in 2019 using recycling center calendar year 2018 financial statements. Recycling center costs measured by the cost survey will be used for the handling fee payment calculation, effective July 1, 2020.

The population of handling fee recycling centers eligible for the handling fee cost survey was defined as all recyclers:

1. Receiving at least one handling fee payment for any of the months between January 2018 and December 2018,
2. Certified operational on or before March 1, 2018,
3. Reporting redemption value between January 2018 and December 2018,
4. Not subsidized by the Department of Rehabilitation, and
5. Not subject to major investigation by CalRecycle (19 sites were removed for this reason).

There were 669 recycling centers in this total handling fee recycling center survey population.

The population of processing fee recycling centers eligible for the handling fee cost survey was defined as all recyclers:

- Certified operational on or before March 1, 2018
- Reporting redemption value between January 2018 and December 2018
- Not subsidized by the Department of Rehabilitation
- Not subject to major investigation by CalRecycle (31 sites were removed for this reason)

There were 674 recycling centers in this total processing fee recycling center survey population. This is the same population of recyclers used for the processing fee cost survey

This overall 2018 handling fee cost survey had a slightly larger sample size as compared to previous handling fee cost surveys. The Crowe team completed 118 processing fee and 110 handling fee recycler cost surveys between May 2019 through November 2019 to obtain these cost survey results. This handling fee cost survey was consistent with prior cost surveys in terms of quantitative information obtained for each recycling site.

To measure calendar year 2018 costs, the survey design consisted of two stratified random samples:

- A statistically defensible, stratified random sample of 110 sites, drawn from the 669 qualifying handling fee recycling centers. Three strata were defined by the total annual containers handled by a site. This stratified random sample was used to measure the costs of recycling CRV containers for handling fee recycling centers. Handling fee recycler strata definitions are provided in **Exhibit 1-1.**
- A statistically defensible, stratified random sample of 118 sites, drawn from the 674 qualifying processing fee recycling centers. Three strata were defined by the total annual containers handled by a site. This stratified random sample was used to measure the costs of recycling California Redemption Value (CRV) containers for processing fee recycling centers. Processing fee recycler strata definitions are provided in **Exhibit 1-2.**

Exhibit 1-1
Handling Fee Recycler Container Stratum Definitions (2018)

Stratum	2018 Number of Containers Recycled
1	Greater than, or equal to, 11.6 million containers
2	Greater than, or equal to, 6.7 million containers, up to less than 11.6 million containers
3	Less than 6.7 million containers

Exhibit 1-2
Processing Fee Recycler Container Stratum Definitions (2018)

Stratum	2018 Number of Containers Recycled
1	Greater than, or equal to, 31 million containers
2	Greater than, or equal to, 15 million containers, up to less than 31 million containers
3	Less than 15 million containers

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 these parallel strata definitions for handling fee and processing fee recyclers, we were able to directly compare cost-per-container results for the two populations. Furthermore, as a result of this survey design, the cost survey conducted for 2018 costs per container treated the two recycler populations with equal statistical rigor.

CalRecycle regulations require that the cost per container be estimated at an 85 percent confidence interval, and CalRecycle policy further specifies a 10 percent error rate. Similar to the processing fee cost survey, the sampling plan (for the two stratified random samples) was based on a more accurate and statistically conventional and accepted, 90 percent confidence interval. Department policy specifies a 10 percent error rate. The cost-per-container results for both handling fee recyclers, and processing fee recyclers, presented in this report meet this target, with low error rates at the 90 percent confidence level of only 4.94 percent, and 6.70 percent, respectively.

Sample Design Results

Exhibit 1-3 provides a summary of the completed handling fee recycler survey sites. Crowe scheduled, conducted, and completed 110 handling fee recycler site visits and cost analyses for the handling fee cost survey.

Exhibit 1-4 provides a summary of the completed processing fee recycler survey sites. Crowe scheduled, conducted, and completed 118 processing fee recycler site visits and cost analyses for the handling fee cost survey. Crowe surveyed a total of 39 sites, shown in Exhibit 1-4, for both the handling fee and processing fee cost surveys.

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

Exhibit 1-3
Handling Fee (HF) Recycler Site Visits (2018)

Handling Fee Recycler Site Category	Number of HF Site Visits
HF Container Stratum 1	30
HF Container Stratum 2	30
HF Container Stratum 3	50
Total HF Completed Sites	**110**

Exhibit 1-4
Processing Fee (PF) Recycler Site Visits (2018)

Processing Fee Recycler Site Category	Total Number of PF Site Visits for HF Survey	Number Visited for HF Survey Only[a]	Number Visited for Both PF and HF Surveys[b]
PF Container Stratum 1	23	10	13
PF Container Stratum 2	40	28	12
PF Container Stratum 3	55	41	14
Total PF completed sites	**118**	**79**	**39**

[a] These 79 of 118 sites were selected only for the cost per container calculation for processing fee sites for the handling fee cost survey.

[b] These 39 of 118 sites were selected for the cost per container calculation for the handling fee cost survey, and for the cost per ton calculation for the processing fee cost survey.

Exhibit 1-5
Error Rates, Population Sizes, Sample Sizes and Method by Recycler Type (2018)

Recycler Type	Error Rate (90% CI)	Population Size	Sample Size	Sample Method
1. Handling Fee Recyclers	4.94	669	110	Container Stratified Random Sample
2. Processing Fee Recyclers	6.70	674	118	Container Stratified Random Sample

Sample Selection

For this 2018 (as well as the 2016 and 2014) cost surveys, we followed our recommendation from prior cost surveys in regards to the removal of investigated recycling centers. For this 2018 cost survey, CalRecycle provided a list of recycling centers that were under investigation for significant violations (including areas such as monetary violations, fraud detection reviews, claims violations, and Department of Justice referrals). We excluded these investigated recycling centers from the population for three primary reasons:

1. During an active investigation, recycling centers may not provide accurate financial information to our survey teams
2. Safety concerns related to sending our survey teams to recycling centers in the midst of an investigation
3. Recycling volumes of recycling centers that operate illegally may be larger due to illegal containers, and thus result in non-representative costs

Thirty-one PF recyclers and nineteen HF recyclers were removed from the population due to investigation, significantly more than for the 2016 cost survey.

In the original sample, there were 233 unique processing fee sites selected among the random PET stratified sample and the processing fee container strata sample. When the cost survey was underway, several issues arose that required a site to be dropped, and an alternate site appropriately and randomly chosen to replace it. Reasons for dropped sites included:

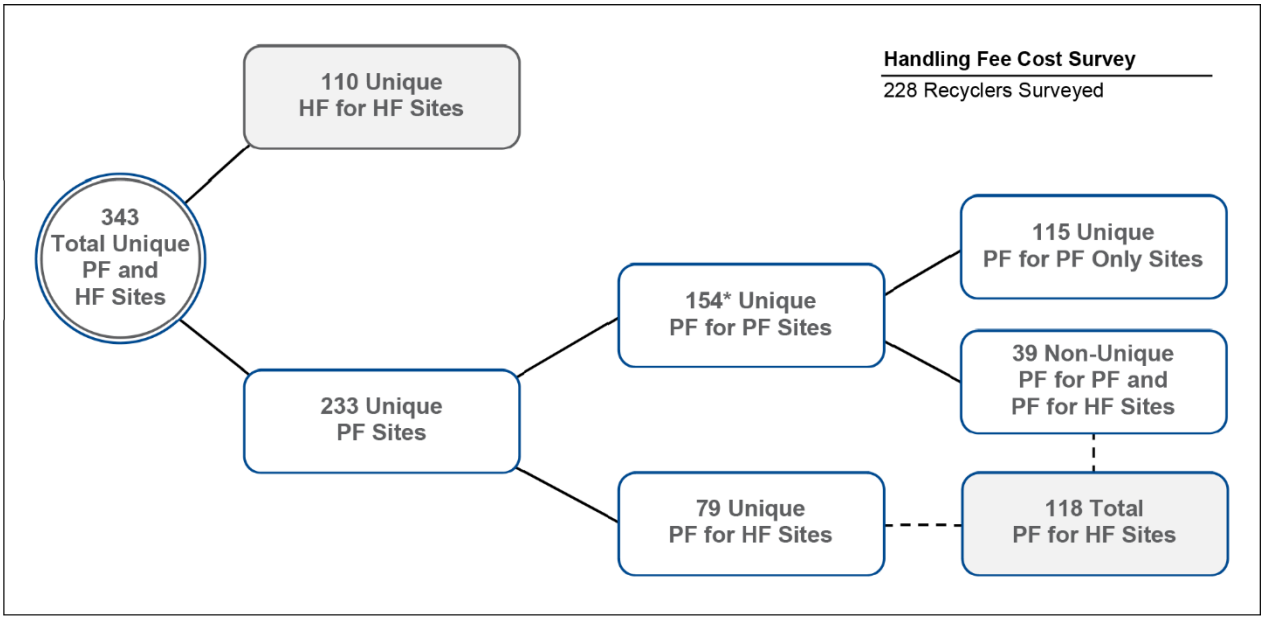
1. CalRecycle may have initiated a new site investigation or CalRecycle may have subsequently decertified a site
2. Sites were closed or sold, and/or the 2018 financial information was not available
3. Sites were subsidized by the Department of Rehabilitation
4. The site owners were non-cooperative

Crowe selected alternative sites for these dropped sites. The alternative sites were carefully chosen from the respective appropriate lists of available sites by strata. The lists of available sites to choose from were randomly generated and there was a strict sequential protocol ordering established in order to ensure survey randomness integrity. While the number of unique sites increased and decreased during the course of the survey, the final total unique PF sites was 233.

Sample Reconciliation

The final 233 processing fee recyclers included 118 sites for the handling fee cost survey. In additional there were 110 handling fee sites selected for the cost per container calculation. Together, the processing fee and handling fee cost surveys performed in 2019 represented one of the largest cost survey efforts undertaken by CalRecycle. **Exhibit 1-6** illustrates the total number of processing fee and handling fee recyclers surveyed, and the number of recyclers in the processing fee cost survey. Note, this exhibit excludes rural recyclers, which will be discussed in a separate report.

Exhibit 1-6
Processing Fee and Handling Fee Cost Survey Sample (2018)



* 39 PF sites within the 154 also were within the handling fee (HF) cost survey (PF for HF sites), for a total 118 (79 + 39) PF sites used for the cost per container calculation.

B. Survey Scheduling, Logistics, and Confidentiality

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

Because conducting a cost survey fundamentally entails the collection of proprietary financial information, sensitivity to stakeholder relations is highly important. Without willing and active cooperation from the selected recycling center operators, determining the real costs of beverage container recycling would be exceptionally difficult and the results would be hard to support. Our 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.

The first stage of recycler communication was a letter on CalRecycle letterhead informing the recycler that they were selected to participate in the processing fee and handling fee cost survey. The letter also identified the expectations of the recycler and introduced Crowe as CalRecycle's cost survey contractor. Introduction letters were sent to all selected recyclers starting in April 2019. In the second stage of communication, a Crowe scheduling coordinator established telephone contact with the recyclers to schedule site visits.

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

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

The coordinators also were tasked to optimize site visit efficiency by matching the varying schedules of over 20 site survey team personnel with the availability of the recycling centers across diverse geographic locations. During any given week, up to three different survey teams were simultaneously in the field. In most cases, one site visit, with some telephone follow-up, was sufficient to obtain all the information needed to complete the survey of each site. A few sites required repeated telephone follow-up or initial "drive-by" visits to confirm that the site was operating and make direct contact with the site owner or manager.

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

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

C. Training Manual Updates

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

For the 2015 cost survey, Crowe evaluated the entire 700-page training manual used in prior years and removed outdated and duplicative information. We identified 17 training modules for revision and developed learning objectives and interactive exercises for each. For the current cost survey, Crowe continued to update and revise the training manual and materials.

Crowe streamlined the manual to consist of ten chapters, each emphasizing actions for survey team members to take in the field and when completing site files. The new training manual focuses on key areas of learning necessary to successfully conduct cost surveys. In addition, Crowe developed new PowerPoint presentations covering topics in the training manual. The presentations include videos of a cost survey site visit, quizzes, and activities specific to each training module.

Crowe created new work assignments and interactive exercises as part of the training update. The updated training modules reflected the change to the file assembly and review process from a manual, paper-based process to a secure online, SharePoint-based process.

The updated training manual still consists of two volumes:

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

After completion of the training program, Crowe made further revisions to the training manual volumes, to reflect actual classroom experience, discussions, and questions. The training manuals, to be provided to CalRecycle as one of the project hard copy reports, will reflect these updates.

D. Surveyor Training

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

Over half of the individuals who conducted site visits for this survey had experience in the previous cost surveys (every other year beginning in 2002) and had completed one or more training sessions in prior years. These surveyors already had extensive experience in auditing and financial accounting procedures, as well as practical site-visit and recycling program experience. These returning team members still completed the full 32-hour in-house training course in 2019.The new survey team members completed the full 32-hour in-house training program and participated in field training.

Following the first three days of classroom training, each new survey team member conducted at least two cost survey site visits with a highly experienced team member in order to provide “real-world” experience. The experienced survey team member guided new team members with increasing levels of responsibility for the on-site and post-site visit procedures over the course of the visits. Following the field visits, new survey members spent two days working together to complete the site files. The entire survey team reconvened after the training site visits to present and discuss the site visits and review the remainder of the training materials. For this 2018 Cost Survey, Crowe also conducted a two-hour training for quality control reviewers.

For the classroom component of the training, Crowe prepared and presented PowerPoint presentations for each training module. A significant segment of the training sessions was spent on hands-on activities and preparing three site files (simple, moderate, complex) using data from the 2016 cost survey. The training allowed team members to better understand the many variations of financial information, and other complicating issues, they would likely face in the field. The training session included role-playing interviews and on-line quizzes. The Crowe team led the classroom training.

E. Cost Model Updates

The labor allocation cost model (cost model) is a Microsoft Excel workbook consisting of 14 worksheets. The model was first developed to improve the methodology of the 1995 cost surveys. Since that time, it has been updated and revised to accommodate legislative and regulatory changes, as well as upgrades of Excel. In 2000, the survey team and the DOR conducted a significant model revision to add plastic resins #2 to #7 to the model, and to upgrade to Excel *1997*, which replaced old Excel macros with visual basic programming.

The current version of the cost model represents several legacy generations (and layers) of modifications and updates, including a significant number of improvements that were made immediately following the 2002-2016 cost surveys. Prior to conducting the current cost survey, Crowe reviewed and updated the cost model to reflect 2018 container per pound and CRV payment information, as well as procedural changes to the cost survey. Crowe updated fields in the model’s review sheet for surveyors to enter information about site transportation.

F. Calibration of the Indirect Cost Allocation Sub-Models

As a result of the introduction of new containers to the Beverage Container Recycling Program in 2000, the 2002-2008 cost surveys included calculating cost per ton for ten different material types: six plastic resins, in addition to PET #1; glass; aluminum; and bi-metal. A key task of the 2002 cost survey project was to develop a costing methodology for plastics #2 to #7 and bi-metal. For this 2018 cost survey, we still applied the 2002 indirect cost allocation sub-model procedure to determine costs per ton for the minority material types that was used every two years from 2002-2016. In addition, we calibrated the indirect cost allocation sub-models for aluminum/bi-metal and all plastics with 2018 survey information. These sub-models, now incorporated into the Labor Allocation Cost Survey Model, ensure rational allocation of costs and labor to bi-metal and plastic resins HDPE #2, PVC #3, LDPE #4, PP #5, PS #6, and Other #7. While the survey no longer directly measures the cost per ton for bi-metal and plastics #3 to #7, the sub-model is still utilized to help determine aluminum, PET #1, and HDPE #2 costs per ton and cost per container for all ten beverage container material types.

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

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

G. Site and Survey Tracking

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

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

H. Cost Survey Procedures

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

- **Pre-site visit:** model population, data review, and travel logistics
- **On-site visit:** site tour, cost survey, and labor interviews
- **Post-site visit:** data entry, analysis, and follow-up

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 2018 into the cost model Excel file for each site. The survey team evaluated the beverage container tons information to identify the approximate size and scope of the survey. Much of the pre-site visit time was spent on travel logistics and mapping.

Exhibit 1-7
Three Phases of the Cost Survey (2018)

Phases	1. Pre-Site Visit	2. On-Site Visit	3. Post-Site Visit
Activities	1. Scheduling team sends notification letter 2. Survey team confirms site visit 3. Survey team reviews information on the site, including prior site files and current cost model 4. Scheduling team sends follow-up notification letter, as necessary	• Survey team conducts site visit	1. Survey team completes site files and uploads files to SharePoint site 2. Reviewers begin reviewing site files 3. Survey team responds to comments 4. Review process ends in final approval
Participants	• Scheduling Team • Survey Team	• Survey Team	• Survey Team • Reviewers

On-Site Visit

Each on-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 on-site visit. Survey teams carefully followed procedures outlined in the training manual. The survey team first toured the site with site management to view and inquire about the site's operations, such as materials handled, equipment, recycling procedures, and material shipping.

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

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

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

Post-Site Visit

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

The survey team prepared the site memorandum using information gathered during the site tour. The site memorandum summarized important information about the site including:

1. A description of operations
2. A description of CRV materials handled
3. The source of financial information
4. Specific sources of payroll information
5. Direct costing or other special cost considerations
6. Problems encountered and how these problems were solved
7. Final review and comments
8. A contact person's name, title, email address, and telephone/fax numbers

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

I. Quality Control and Confidentiality Procedures

Data quality control (QC) was a primary focus of the cost survey project. Quality control procedures included five separate levels of review and totaled an average 13 hours per site**.** These data QC procedures were essential to ensure that the cost survey results were fair, equitable, accurate, reasonable, justifiable, and defensible.

The quality control process included reviews to:

- Determine that costs were verified to a documented source, allowable and reasonable, and reconciled to appropriate documentation
- Determine that site procedures were followed and documented by the appropriate site team members

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

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

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

2. Handling Fee Cost Calculations and Results

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

A. Cost Calculations
B. Cost Results

A. Cost Calculations

This handling fee cost survey was the seventh 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 pre-determined by sample design.[3] We utilized two stratified random samples for the handling fee cost survey.

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

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

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

Exhibit 2-1
Cost per Container Calculation (2018)

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

$$+$$

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

$$+$$

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

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

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

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

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

Next, we 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 2018 × 2,000 × CPP, where CPP was the 2018 statewide average containers per pound for each material type, as determined by CalRecycle. We determined the total CRV containers by calculating the number of CRV containers for each material type and summing across all ten material types. For example, for a recycler with 100 tons of aluminum redeemed, the number of aluminum containers was equal to:

(100 tons) × (2,000 pounds/ton) × (28.90 containers/pound) = 5,780,000 containers.

Once we had determined individual site CRV costs and CRV containers, we were able to determine 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. We then multiplied that stratum average cost per container by total containers in the stratum population. We then summed total CRV costs for the three strata and divided by total containers in the population. This calculation is illustrated in Exhibit 2-1. **Exhibit 2-2** provides the weighted-average by strata sample calculation for handling fee recycler cost per container.

Exhibit 2-2
Weighted-Average By Strata Calculation Example
Handling Fee Recycler Cost per Container (2018)

Stratum	Sample CRV Costs	Sample CRV Containers	Sample Cost per Container
Stratum 1	$8,718,132.32	521,426,430	$0.01672[a]
Stratum 2	5,639,394.19	283,939,016	0.01986[a]
Stratum 3	5,524,115.63	183,175,102	0.03016[a]

Stratum	Population CRV Costs	Population CRV Containers	Population Cost per Container
Stratum 1	$25,625,291.17[b]	1,532,633,780	–
Stratum 2	31,114,143.90[b]	1,566,572,421	–
Stratum 3	46,492,857.58[b]	1,541,664,675	–
Population Total	$103,232,292.65[b]	4,640,870,876	$0.02224[c]

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

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

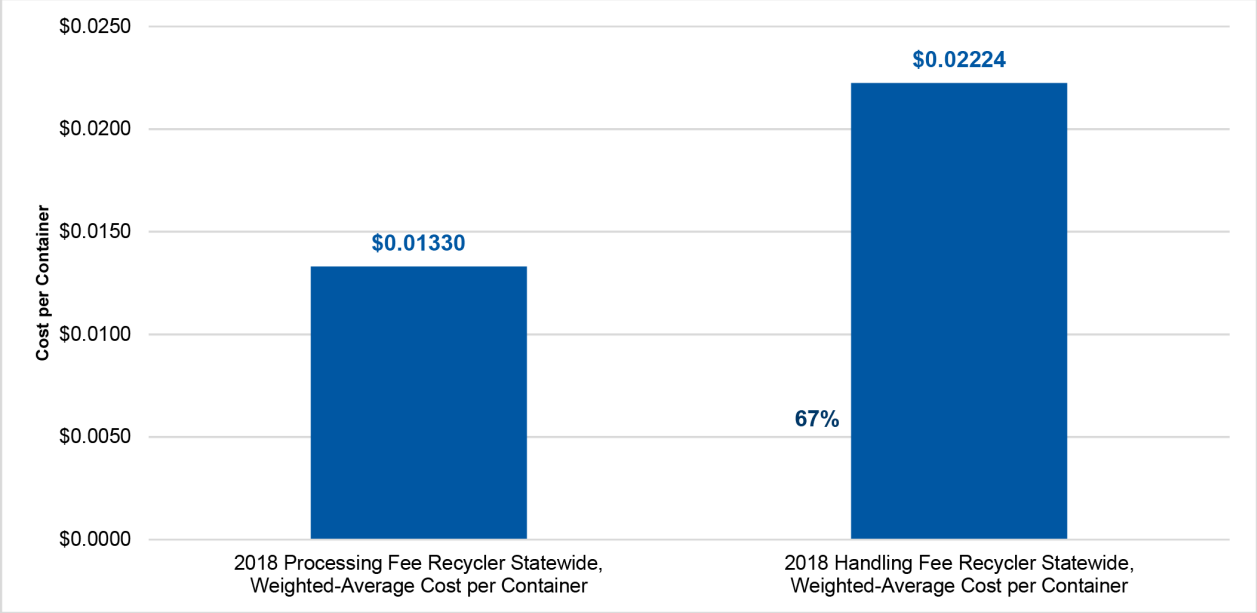
[c] A statewide, weighted-average result of $0.02224 calculated by dividing total population CRV costs by total population CRV containers

B. Cost Results

The statewide, weighted-average, recycler cost per container for handling fee recyclers and processing fee recyclers are presented in **Exhibit 2-3.** The cost to recycle for handling fee recyclers in 2018 was 2.224 cents per container, 67 percent higher than the cost to recycle for processing fee recyclers in 2018, at 1.330 cents per container.

Exhibit 2-4 includes the new handling fee payment calculation, 0.894 cents per recycled container, equal to the difference between the handling fee recycler cost per container to recycle, and the processing fee recycler cost per container to recycle, as specified in Section 14585 (f)(3). Under existing law, the department is scheduled to implement this new handling fee payment starting July 1, 2020.

Exhibit 2-3
Handling Fee and Processing Fee Recycler Cost per Container[a] – 2018



[a] Statewide, weighted-average cost per container recycled.

Exhibit 2-4
Statewide Recycler Costs per Container (2018)

Recycler Type	Statewide, Weighted-Average, Cost per Container	Percentage Change (PF to HF Cost per Container)	Error Rate at 90% Confidence Interval
1. Handling Fee Recycler	2.224 Cents	+67%	4.94%
2. Processing Fee Recycler	1.330 Cents	N/A	6.70%
3. Handling Fee Recycler Cost per Container minus Processing Fee Recycler Cost per Container	0.894 Cents	N/A	N/A

The sample sizes used to determine the costs per container were estimated to achieve a 90 percent confidence interval. This standard was higher than the statistical requirements in regulations for handling fee survey cost per container calculations, which specify an 85 percent confidence interval. The 2018 cost-per-container results for both handling fee recyclers and processing fee recyclers exceeded this target, with low error rates at the 90 percent confidence level of 4.94 percent, and 6.70 percent, respectively.

Exhibit 2-5 compares total number of containers recycled, sample population size, and sample size for handling fee and processing fee recyclers. **Exhibit 2-6** illustrates the cost per container calculations for the two populations of recyclers.

The new handling fee payment, as of July 1, 2020, will be paid on all containers recycled by eligible supermarket sites, nonprofit convenience zone recyclers, and rural region recyclers. The 2018 per container handling fee payment of 0.894 cents is 13 percent more than the handling fee payment determined in the 2016 handling fee cost survey, of 0.793 cents per container. This increase reverses the downward trend in handling fees between 2012 and 2016.

Exhibit 2-5
Handling Fee and Processing Fee Recyclers
Number of Containers Recycled, Population Sizes, and Sample Sizes (2018)

Recycler Type	Total Number of Containers Recycled	Sample Population Size (sites)	Sample Size (sites)
1. Handling Fee Recyclers	4.64 billion	669	110
2. Processing Fee Recyclers	9.68 billion	674	118

Exhibit 2-6
Strata and Population Costs and Volumes (2018)

Handling Fee Recyclers

Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$8,718,132.32	521,426,430	$0.01672	$25,625,291.17	1,532,633,780
2	$5,639,394.19	283,939,016	$0.01986	$31,114,143.90	1,566,572,421
3	$5,524,115.63	183,175,102	$0.03016	$46,492,857.58	1,541,664,675
Total				$103,232,292.65	4,640,870,876

Handling Fee Recycler Statewide, Weighted-Average Cost per Container: $0.02224

Processing Fee Recyclers

Container Stratum	Sample CRV Costs	Sample CRV Containers	Cost per Container	Population CRV Costs	Population CRV Containers
1	$10,315,472.80	1,042,545,322	$0.00989	$32,205,106.86	3,254,846,789
2	$11,123,911.57	835,018,135	$0.01332	$42,746,125.89	3,208,744,521
3	$7,303,745.27	436,740,831	$0.01672	$53,848,926.84	3,219,995,245
Total				$128,800,159.59	9,683,586,555

Processing Fee Recycler Statewide, Weighted-Average Cost per Container: $0.01330

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. Comparison Cost per Container from 2006 to 2018
B. Handling Fee Recycler Cost per Container Increase
C. Changes in Number of Recyclers, Costs, and Recycled Containers
D. Changes in Recycling Center Productivity and Costs
E. Distribution of Sample
F. Total Annual Handling Fee Payments
G. Comparison of Population Size, Containers Recycled, and Costs by Strata
H. Comparison of Population Characteristics of Processing Fee and Handling Fee Recyclers.
I. Summary of Handling Fee Cost Survey Analyses

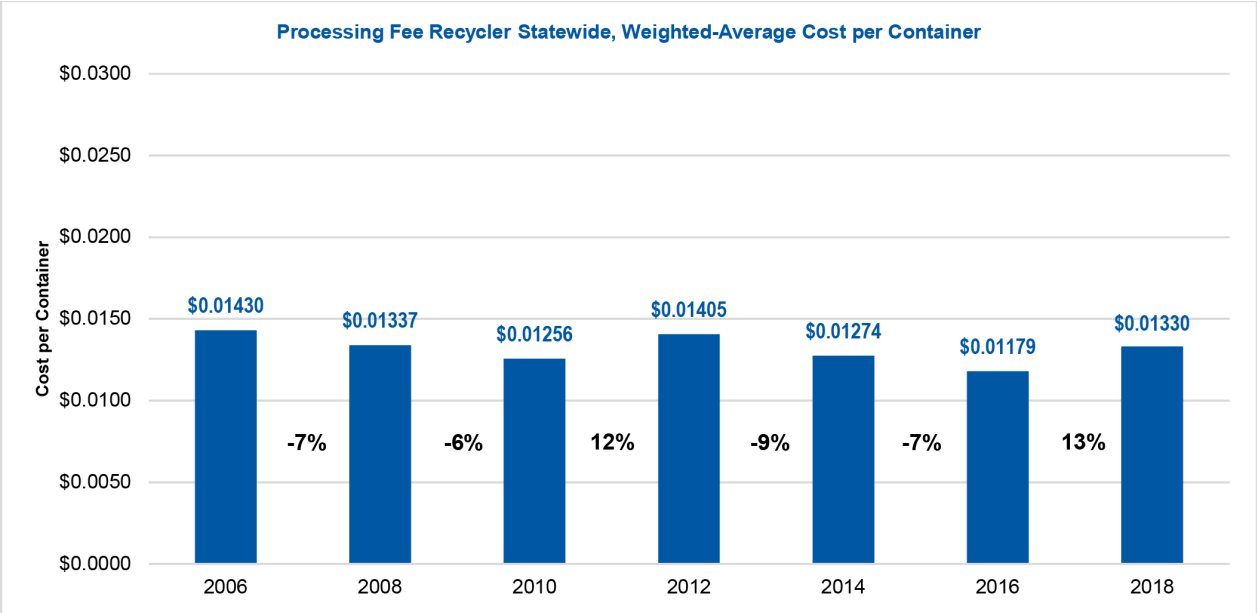
A. Comparison of Cost per Container, 2006 to 2018

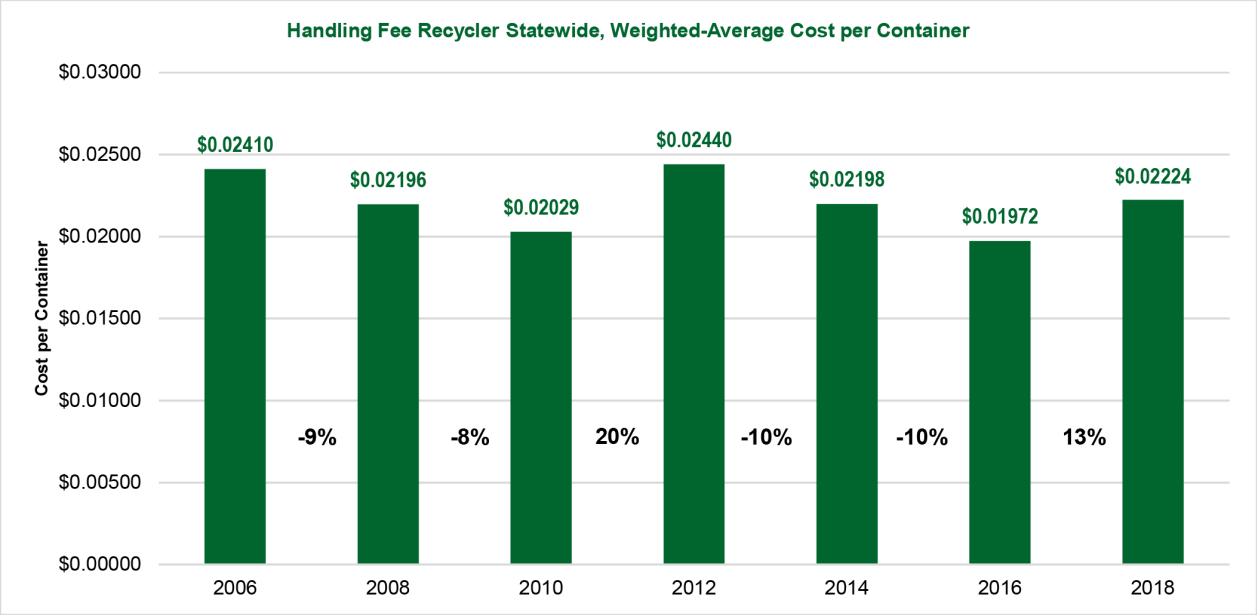
Exhibit 3-1 compares the statewide, weighted-average cost per container for processing fee and handling fee recyclers from the seven handling fee cost surveys (even years, 2006 to 2018). Costs per container increased by 13 percent in 2018 for both handling fee recyclers and processing fee recyclers, reversing the downward trend that started after 2012. The processing fee recycler increase in cost per container between 2016 and 2018 is consistent with the processing fee cost survey result, in which the 2018 costs per ton for aluminum, glass, PET #1, and HDPE #2 increased.

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

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

Exhibit 3-1
Processing Fee and Handling Fee Recycler Cost per Container[a] (2006–2018)





[a] Statewide, weighted-average cost per container recycled.

The increase in HF recycler cost per container between 2016 and 2018 is due to the interrelationship between several factors: recycler center productivity, labor hours, and costs. We examined several selected factors that may have caused the increase in cost per container for handling fee recyclers and processing fee recyclers in order to test the credibility of the full cost survey results. As a result of our analyses, we are confident that the cost-per-container results are a valid reflection of handling fee recyclers and processing fee recyclers during 2018.

A number of factors combine to influence fluctuations in recycling center costs, number of containers recycled, and cost per container. Consistent with the processing fee cost survey, recyclers incurred higher labor and transportation costs in 2018. Both of these factors were significant contributors to the higher cost per container.

Exhibit 3-2 and **Exhibit 3-3** provide comparisons of the results for the last seven handling fee cost surveys. The handling fee payment, as of July 1, 2020, will result in an increase of 13 percent in the per container handling fee payments. The error rates for the 2018 handling fee cost survey were consistent with prior years. Both error rates, calculated at the 90 percent confidence level, were well below 10 percent.

Exhibit 3-2
Statewide Handling Fee and Processing Fee Recycler Costs per Container and Handling Fee (2006–2018)

Statewide, Weighted-Average, Cost per Container

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

Percentage Change

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

Exhibit 3-3
Statewide Handling Fee and Processing Fee Recycler Cost Survey Error Rates (90% Confidence Interval) (2002–2018)

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

Exhibit 3-4
Handling Fee Cost Survey Calculated Handling Fee Payments (2008–2018)

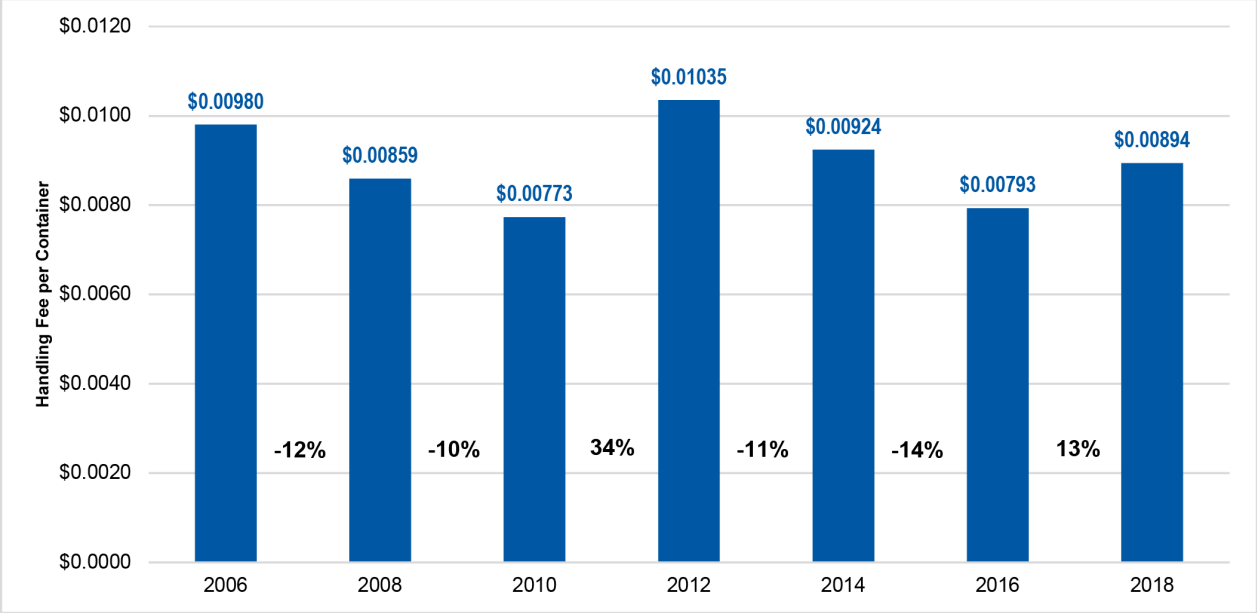


Exhibit 3-4 illustrates the seven per-container handling fees, as measured by the seven cost surveys. The measured handling fee for a given year becomes effective on July 1, two years after the survey cost year. For example, the costs calculated for 2018 determine the handling fee effective on July 1, 2020. Between the 2016 survey year and the 2018 survey year, the handling fee will increase 13 percent.

The measured handling fee per container dropped by 12 percent between 2006 and 2008 survey years, from 0.980 to 0.859 cents per container. The measured handling fee dropped another 10 percent between 2008 and 2010, to 0.773 cents. CalRecycle made an administrative decision to maintain the prior $0.0089 cent per container handling fee (the calculated rate plus a cost of living increase) for July 2012. The measured handling fee increased 34 percent between 2010 and 2012 survey years and the handling fee decreased 11 percent between 2012 and 2014 survey years. The handling fee decreased 14 percent between 2014 and 2016 survey years. Note that CalRecycle applies a cost of living adjustment (COLA) to handling fees, so actual per container payments are slightly higher than the calculated results.

B. Handling Fee Recycler Cost per Container Increase

The handling fee cost per container increased 13 percent between 2016 and 2018, reflecting the first increase in cost per container since 2012. To test the credibility of the full cost survey results, we examined several selected factors that may have caused the increase in cost per container for handling fee recyclers and processing fee recyclers. The higher cost-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 3-5** provides a comparison of the HF recycler cost per container and the number of containers recycled by the HF recycler population for the seven handling fee cost surveys. Exhibit 3-5 shows that in most years cost per container decreased between survey years when the number of containers recycled increased, and cost per container increased when containers recycled decreased. However, in 2018, cost per container increased, even with a slight increase in number of containers recycled. This indicates that non-volume factors contributed to the cost increase.

Exhibit 3-5
Cost per Container Results and Containers Recycled by the Survey Population
Handling Fee Recyclers (2006–2018)

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

[c] Containers recycled by the full population of 985 HF recyclers in 2012 and by the survey population of 920 HF recyclers in 2014, 706 recyclers in 2016, and 669 recyclers in 2018.

The importance of number of containers recycled applies to the overall results, but it starts at the individual recycling center level. In determining CRV costs at an individual recycling center, there is sometimes an opportunity to allocate costs between CRV and

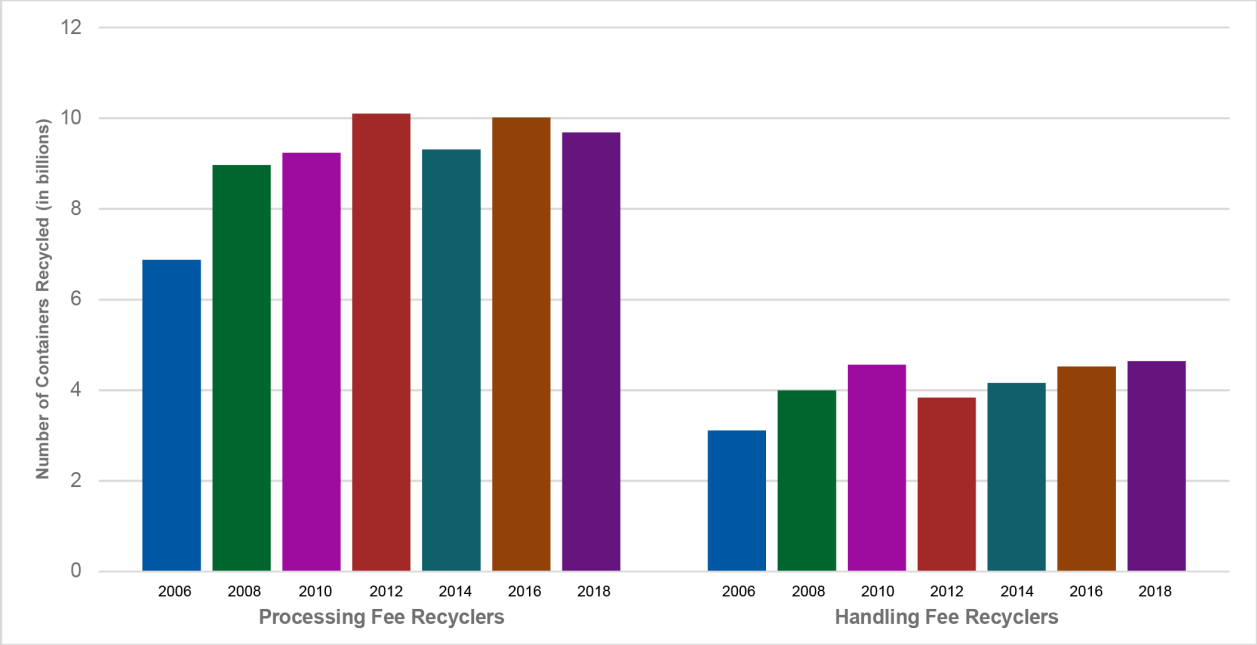
non-CRV (including other business) categories. However, the majority of handling fee recyclers only handle CRV material. For example, of the 110 HF recyclers surveyed, only 4 percent of total labor hours were associated with non-CRV recycling. Thus, the cost per HF container is primarily based on all of the recycling center's (recycling center's) costs, divided by all of the recycling centers containers. To the extent that many recycling center costs are essentially fixed, the number of containers has a great influence on cost per container. By comparison, of 118 PF for HF sites surveyed, 44 percent of total labor hours were allocated to non-CRV activities. For PF recyclers, costs (and labor) are more often distributed across CRV and non-CRV categories, so cost per container is less dependent on number of containers recycled.

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

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

Exhibit 3-6 provides a comparison of containers recycled by the PF and HF cost survey populations over the seven handling fee cost surveys. Comparing the equivalent full population data, PF containers recycled increased each year from 2006 to 2012, decreased in 2014, increased in 2016, and decreased again in 2018. HF containers recycled increased between 2006 and 2010, decreased in 2012 to levels below that of 2008, and increased in 2014, 2016, and 2018.

Exhibit 3-6
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2006–2018 Populations)



Cost Differential between Handling Fee Recyclers and Processing Fee Recyclers

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

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

To determine the handling fee, we compare 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 we utilize parallel sample designs, we can be assured that we are making an appropriate comparison, to the extent possible.

PF recycler cost per container to recycle increased 13 percent between 2016 and 2018, from 1.179 cents per container to 1.330 cents per container. The 13 percent increase in PF recycler cost per container is reasonably consistent with the increases seen in the PF recycler cost per ton results (where glass, aluminum, and PET cost per ton increased). The calculated $0.00894 handling fee payment from this cost survey represents a 13 percent (12.74%) increase from the $0.00793 per container calculated in the 2016 HF cost survey.

The impact of the differential can move in both directions. For example, in the 2012 cost survey, the HF recycler cost per container increased 20 percent as compared to 2010, and the PF recycler cost per container increased 12 percent as compared to 2010. The calculated 2012 handling fee payment increased 34 percent as compared to 2010. The 2018 survey is the first survey where the PF and HF costs changed essentially equally. The current survey is a shift from the prior six HF cost surveys where handling fee recycler costs and, more than ever, processing fee recycler costs changed in the same direction. In those cases, there were greater changes in handling fee payments, as compared to the changes for either HF or PF recycler costs per container.

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

Introduction

The statewide, weighted-average cost per container for the HF for HF recycling centers, and for the PF for HF recycling centers, is the quotient determined by dividing the estimated statewide weighted cost of recycling the CRV material, calculated from the handling fee cost survey (numerator), by the number of containers recycled, determined from CalRecycle reporting systems (denominator). Changes in the HF, and PF for HF, cost per container from survey to survey result from increases or decreases in CRV costs and in CRV containers recycled. There is not a direct linear relationship between costs of recycling and containers recycled. In addition, the relative increase or decrease in costs and containers between any two given cost surveys are not necessarily the same. Below, we present 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 subsection that follows we examine the impact of these changes on cost-per-container results.

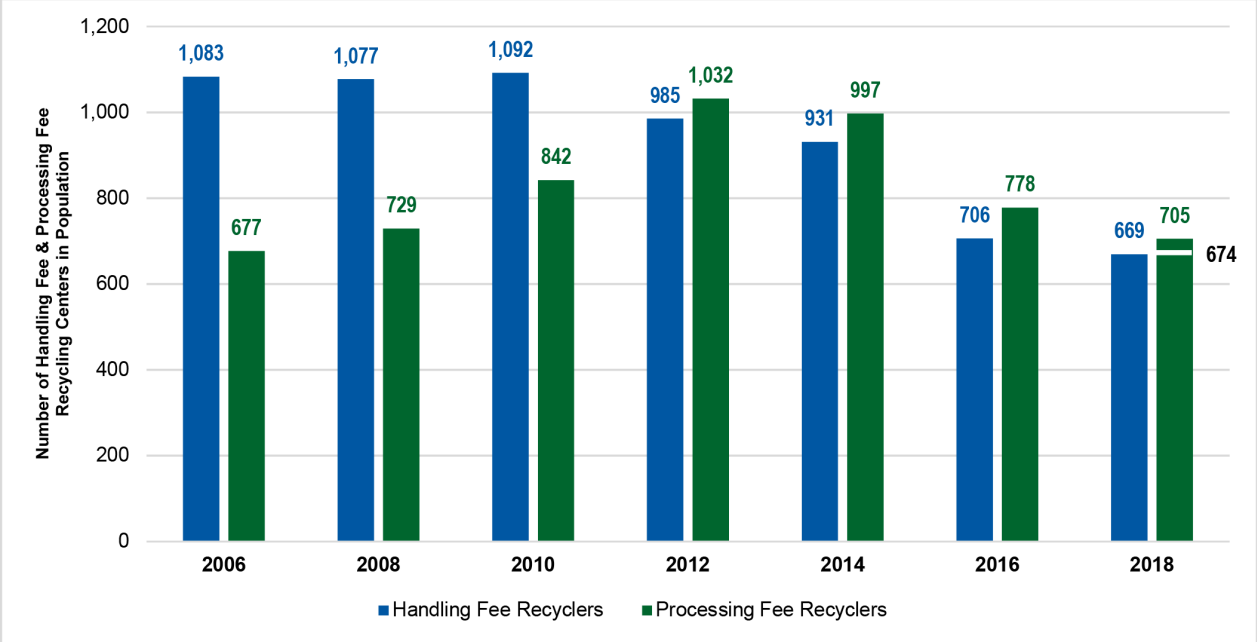
Historical Trends in Population Number of Recyclers

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

Exhibit 3-7 provides the number of HF and PF recyclers for the seven handling fee cost survey years. The number of HF recycling centers decreased 5 percent between 2016 and 2018. However, the volume of containers recycled by HF recycling centers increased by 3 percent during the same period. When the number of HF recycling centers declines, and the number of containers recycled increases, the amount of recycled material available to each HF recycling center, on average, increases.

The number PF recycling centers peaked in 2012 with 1,032. The PF recycling center population decreased from 2012 to 2014 by 3 percent, another 19 percent between 2014 and 2016, and 9 percent between 2016 and 2018. Note that the 674 PF recyclers in 2018 refers to the total survey population once investigated sites were removed. However, in contrast to HF recyclers, the total number of containers recycled decreased by 3 percent. The PF recycler population size in 2018 was similar to the population size in 2006 and 2008.

Exhibit 3-7
Number of Population Handling Fee Recycling Centers and Processing Fee Recycling Centers (2006–2018)



Historical Trends in Population Costs and Population Containers Recycled

As shown earlier in Exhibit 3-9, containers recycled by processing fee recycling centers increased each cost survey year since 2006 through 2012, decreased in 2014, increased in 2016, and decreased again in 2018. Containers recycled by handling fee recycling centers increased between 2006 and 2010, declined between 2010 and 2012, and increased in 2014, 2016, and 2018. **Exhibits 3-8** and **3-9** provide historical trends in total population costs and total population containers, beginning with the 2006 handling fee cost survey and extending to the current 2018 handling fee cost survey. Population cost data are estimated from the handling fee cost survey. Population container data are based on CalRecycle reports.

Exhibit 3-8
Population CRV Costs and Containers of Handling Fee Recyclers (2006–2018)

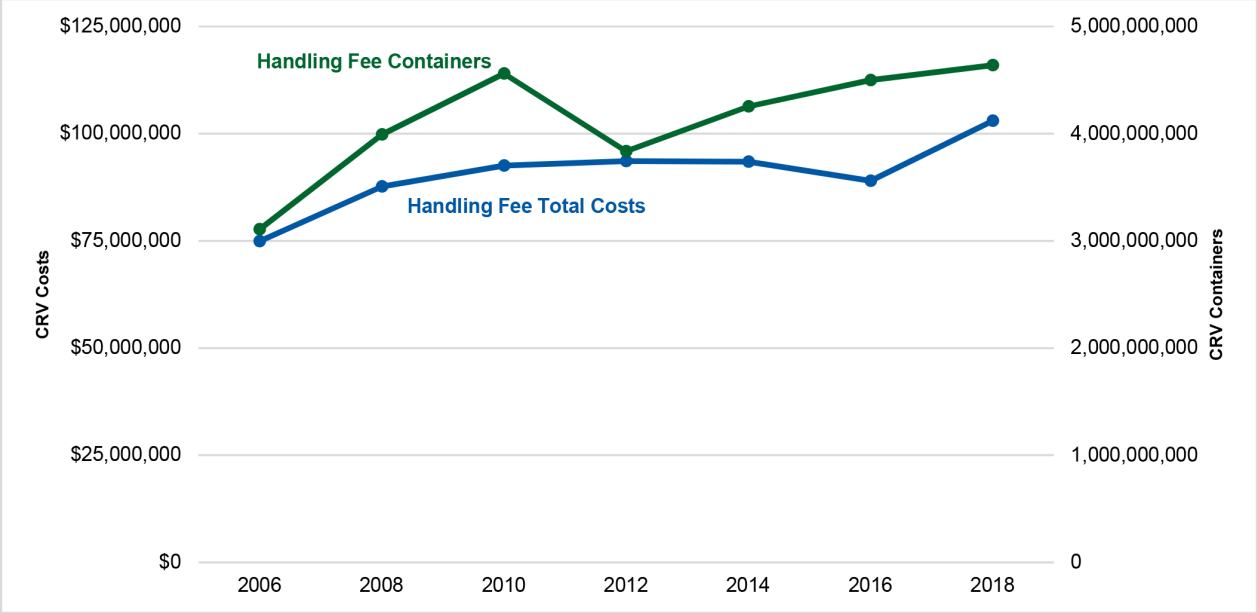
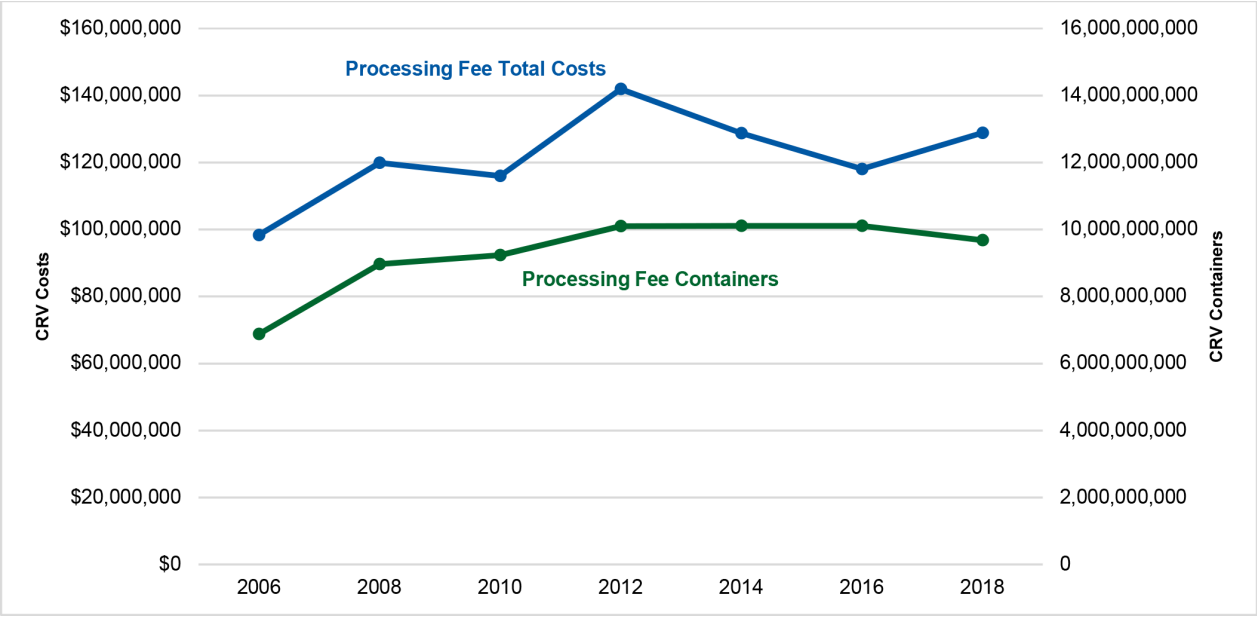


Exhibit 3-9
Population CRV Costs and Containers of Processing Fee Recyclers (2006–2018)



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

- When the containers line is below the costs line, an increasing distance between the two lines is reflected as an increase in cost per container. In this case, the denominator (containers) is declining relative to the numerator (costs), resulting in a larger quotient. For example, in Exhibit 3-8, the widening of the distance between 2010 and 2012 HF data points represents a 20 percent increase in HF cost per container. Similarly, the increase in total cost in 2018 relative to the smaller increase in total containers resulted in a 13 percent increase in cost per container
- When the containers line is below the costs line, a decreasing distance between the two lines is reflected as a decrease in cost per container. In this case, the denominator (containers) is increasing relative to the numerator (costs), resulting in a smaller quotient. For example, in Exhibit 3-9, the narrowing of the distance between 2012 and 2014 PF data points represents a nine percent decrease in PF cost per container. Similarly, the closing of the distance between the 2014 and 2016 data points reflects the continued decrease in cost per container.

D. Changes in Recycling Center Productivity and Costs

Introduction

The increase in cost per container for 2018 is due to the interrelationship between several factors: recycling center productivity, labor hours, and costs. From 2016 to 2018, productivity levels, measured as containers recycled per recycling center, increased and labor hours per 1,000 containers recycled decreased for PF recyclers and increased for HF recyclers. For PF recyclers, less labor time was being spent on more containers. For HF recyclers, more labor time was being spent on more containers. In addition, the average hourly wage increased. Average costs per recycling center increased in 2018 at a more significant rate than would be proportionate to the rise in containers recycled. Recycling center productivity (measured in containers per recycling center) increased less than did average costs per recycling center, resulting in an increase in cost per container.

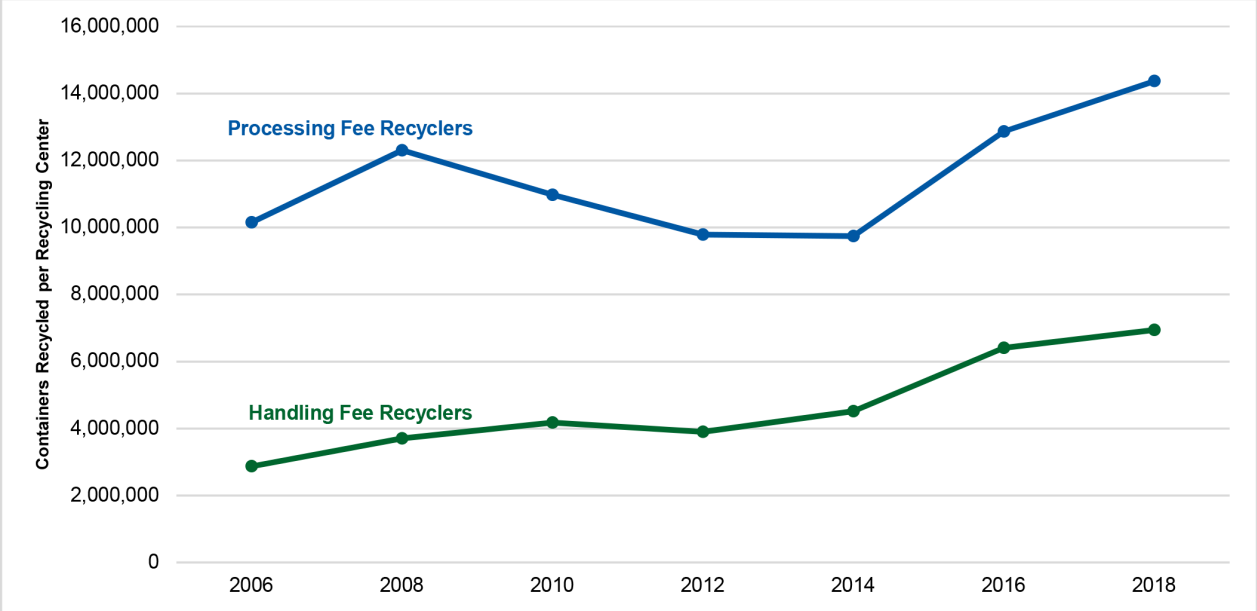
Average Containers Recycled per Recycling Center

The productivity of HF recycling centers (i.e., the average number of containers recycled per recycling center) had been increasing between 2006 and 2010 and then declined between 2010 and 2012. There has been a longer-term decline in PF recycling

center productivity since 2008. However, from 2012 to 2018 productivity significantly increased for both HF for HF and PF for HF recycling centers.

Exhibit 3-10 provides the average number of containers recycled per recycling center for the cost survey years 2006 through 2018. 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 2018 productivity levels for both HF and PF recycling centers increased as compared to 2016.

Exhibit 3-10
Average Containers Recycled per Population Handling Fee Recycler and Processing Fee Recycler (2006–2018)

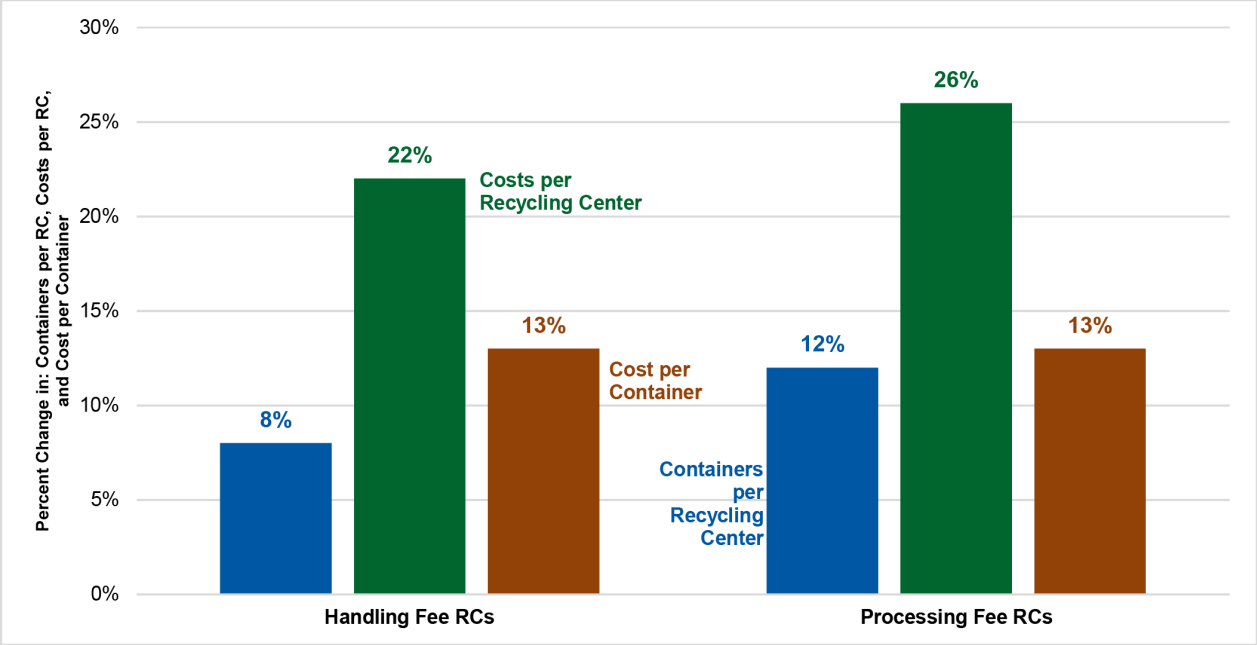


More productive recycling centers that recycle more containers generally have lower costs per container than less productive recycling centers that recycle less material. As a result, larger overall increases in the productivity of recycling centers likely contributed to the lower cost-per-container results, as observed in 2016, as compared to 2014. The 2018 results do not follow this trend. Though the 2018 productivity increased from 2016 levels, cost per container results increased. This indicates that there were other significant factors impacting recycler cost results in 2018.

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

Exhibit 3-11 summarizes the relationship between recycling center productivity, costs, and cost per container. The figure shows the percent change in containers per recycling center, costs per recycling center, and statewide, weighted-average cost per container, between the 2016 and 2018 HF for HF and PF for HF recycler samples. Recycling center productivity, measured as containers recycled per recycling center, increased at a lesser rate than did average costs per recycling center, resulting in an increase in cost per container. This trend in overall average recycling center operations is a significant cause for the increase in 2018 cost per container for both HF for HF recyclers and for PF for HF recyclers.

Exhibit 3-11
2016 and 2018 Sampled Handling Fee and Processing Fee Recyclers Percent Change in Containers per Recycler, Percent Change in Costs per Recycler, and Percent Change in Statewide, Weighted-Average Handling Fee Recycler and Processing Fee Recycler Cost per Container

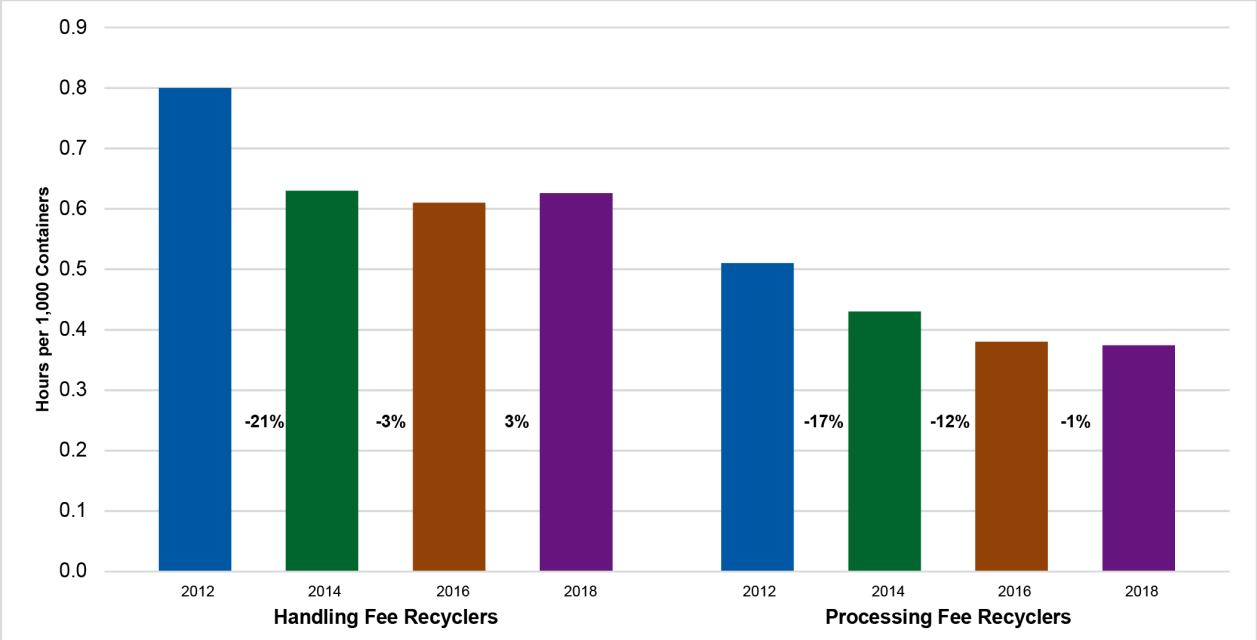


Labor Hours per 1,000 Containers Recycled

The labor hours required to handle 1,000 CRV beverage containers is another measure of recycling center productivity, and is a factor that has a direct impact on cost per container. We calculated, and compared, the average HF for HF and PF for HF recycler labor hours allocated per 1,000 containers recycled for the 2012, 2014, 2016, and 2018 surveys. **Exhibit 3-12** shows the labor hours allocated per 1,000 CRV containers recycled. The labor input required, on average, to handle 1,000 containers decreased for HF for HF and PF for HF recyclers from 2012 to 2016. Between 2016 and 2018, the labor hours per 1,000 containers increased for HF recyclers, indicating decreased productivity. The labor hours per 1,000 containers slightly decreased for PF recyclers, indicating increased productivity.

The 3 percent increase in the average hours that HF recycling centers required to handle 1,000 containers could logically contribute to an increase in cost per container. In addition, the average hourly wage for HF recyclers increased between 2016 and 2018 by approximately 20 percent. The 1 percent decrease in the average hours that PF recycling centers required to handle 1,000 containers was not a factor leading to the 13 percent increase in 2018 PF cost per container.

Exhibit 3-12
2012, 2014, 2016, and 2018 Sampled Handling Fee Recyclers and Processing Fee Recyclers Average Labor Hours per 1,000 Containers Recycled



Cost Category Comparison

In conducting the cost surveys, Crowe assigns each recycler cost line item to one of thirteen categories. To help evaluate potential reasons for the cost per container increase between 2016 and 2018, we compared the average CRV category costs among HF for HF and PF for HF recyclers for the two survey years. These data reflect the total costs in a particular category, divided by the number of recycling centers in the survey population. They do not consider costs by strata or containers recycled per site. They simply reflect an average category cost per recycling center for the 106 HF for HF and the 108 PF for HF recycling centers sampled for the 2016 cost survey and the 110 HF for HF and the 118 PF for HF recycling centers sampled for the 2018 cost survey. As illustrated below, the per-site average costs increased more than the weighted-average cost per container, which consider recycling volumes and are weighted across the population.

Exhibit 3-13 provides a comparison of the 2018 average category costs per sampled HF recycling center, the percent of CRV costs by category for 2018, the 2016 average category costs per HF recycling center, the percent of CRV costs by category for 2016, and CPI adjusted 2016 category costs per HF recycling center, and the percent change between the 2018 and CPI adjusted 2018 category costs. The CPI adjustment between 2016 and 2018 was 6.7 percent.[4] Exhibit 3-13 illustrates several key points:

- Average CRV costs per HF recycling center increased by one-fifth (20 percent) between 2016 and 2018
- The percent of CRV costs, by category, did not change significantly between 2016 and 2018. For example, the largest change was direct labor, which represented 52.2 percent of CRV costs in 2018 and 46.3 percent in 2016, even though direct labor itself increased by 36 percent
- Consistent with prior cost surveys, the cost categories that make up the largest share of HF recycling center costs are:
  - Direct labor (~50 percent)
  - Rent (~10 to 12 percent)
  - Indirect labor (~8 to 11 percent)
  - Transportation (~5 to 7 percent)
  - General business overhead (GBO; administrative costs, fees, etc.; ~5 to 7 percent)
- The cost categories with the largest dollar increase between 2016 (adjusted) and 2018, accounting for 75 percent of the increase, were:
  - Direct labor

[4] U.S. Department of Labor, Bureau of Labor Statistics, West Urban Consumer Price Index: https://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/

  - Transportation
  - Rent
  - Maintenance
- The increase in direct labor was the largest single factor, accounting for 56 percent of per-site cost increases between 2016 and 2018
- Transportation had the next largest dollar increase, accounting for roughly 12 percent of the per-site cost increases between 2016 and 2018.

Exhibit 3-13
Comparison of Average Handling Fee Recycler Category Costs (2016 and 2018)

Cost Category	2018 (n=110)	% of CRV Costs	2016 (n=106)	% of CRV Costs	CPI Adjusted 2016	% Change 2016 (adj.) to 2018
Direct Labor	$96,368	52.2%	$66,577	46.3%	$71,065	36%
Indirect Labor	$14,998	8.1%	$13,170	9.2%	$14,058	7%
General Business Overhead	$13,303	7.2%	$17,074	11.9%	$18,225	-27%
Transportation	$15,840	8.6%	$9,822	6.8%	$10,484	51%
Rent	$16,555	9.0%	$14,060	9.8%	$15,007	10%
Depreciation	$5,855	3.2%	$4,706	3.3%	$5,023	17%
Property Tax	$246	0.1%	$155	0.1%	$165	49%
Utilities	$3,583	1.9%	$2,430	1.7%	$2,594	38%
Supplies	$7,157	3.9%	$5,623	3.9%	$6,002	19%
Fuel	$280	0.2%	$1,848	1.3%	$1,973	-86%
Insurance	$3,839	2.1%	$3,987	2.8%	$4,256	-10%
Interest	$1,390	0.8%	$972	0.7%	$1,037	34%
Maintenance	$5,070	2.7%	$3,432	2.4%	$3,663	38%
Total CRV Costs per Site	**$184,484**	**100%**	**$143,857**	**100%**	**$153,552**	**20%**

Exhibit 3-14 provides a similar comparison for sampled PF recycling centers, which illustrates several key points:

- Average CRV costs per PF recycling center increased by roughly one-tenth (9 percent) between 2016 and 2018, which is about half the increase compared to sampled HF recyclers.
- Percent of CRV costs, by category, did not change significantly between 2016 and 2018. For example, direct labor represented 52.8 percent of CRV costs in 2018 and 51.3 percent in 2016, even though direct labor itself increased by 12 percent. This was similar, but remained slightly more consistent than sampled HF recyclers.
- Consistent with prior cost surveys, and the sampled HF recyclers, the cost categories that make up the largest share of recycling center costs are:
  - Direct labor (~50 percent)
  - Rent (~10 to 12 percent)
  - Indirect labor (~8 to 11 percent)
  - Transportation (~5 to 7 percent)
  - General business overhead (GBO; administrative costs, fees, etc.; ~5 to 7 percent)
- Mostly similar to sampled HF recyclers, the cost categories with the largest dollar increase between 2016 (adjusted) and 2018, accounting for 78 percent of the increases, were:
  - Direct labor
  - Rent
  - Insurance
  - Depreciation
- The increase in direct labor was the largest single factor, accounting for 48 percent of per-site increases between 2016 and 2018, which is similar to sampled HF recyclers.

Exhibit 3-14
Comparison of Average Processing Fee Recycler Category Costs (2016 and 2018)

Cost Category	2018 (n=118)	% of CRV Costs	2016 (n=108)	% of CRV Costs	CPI Adjusted 2016	% Change 2016 (adj.) to 2018
Direct Labor	$132,801	52.8%	$110,915	51.3%	$118,391	12%
Indirect Labor	$20,739	8.2%	$23,009	10.6%	$24,559	-16%
General Business Overhead	$15,873	6.3%	$14,445	6.7%	$15,419	3%
Transportation	$13,871	5.5%	$11,943	5.5%	$12,748	9%
Rent	$27,582	11.0%	$20,908	9.7%	$22,318	24%
Depreciation	$5,862	2.3%	$3,941	1.8%	$4,206	39%
Property Tax	$1,296	0.5%	$1,500	0.7%	$1,601	-19%
Utilities	$8,539	3.4%	$7,900	3.7%	$8,433	1%
Supplies	$7,253	2.9%	$6,807	3.1%	$7,265	0%
Fuel	$2,365	0.9%	$2,286	1.1%	$2,440	-3%
Insurance	$6,766	2.7%	$4,295	2.0%	$4,584	48%
Interest	$860	0.3%	$470	0.2%	$501	71%
Maintenance	$7,934	3.2%	$7,838	3.6%	$8,366	-5%
Total CRV Costs per Site	**$251,741**	**100%**	**$216,256**	**100%**	**$230,831**	**9%**

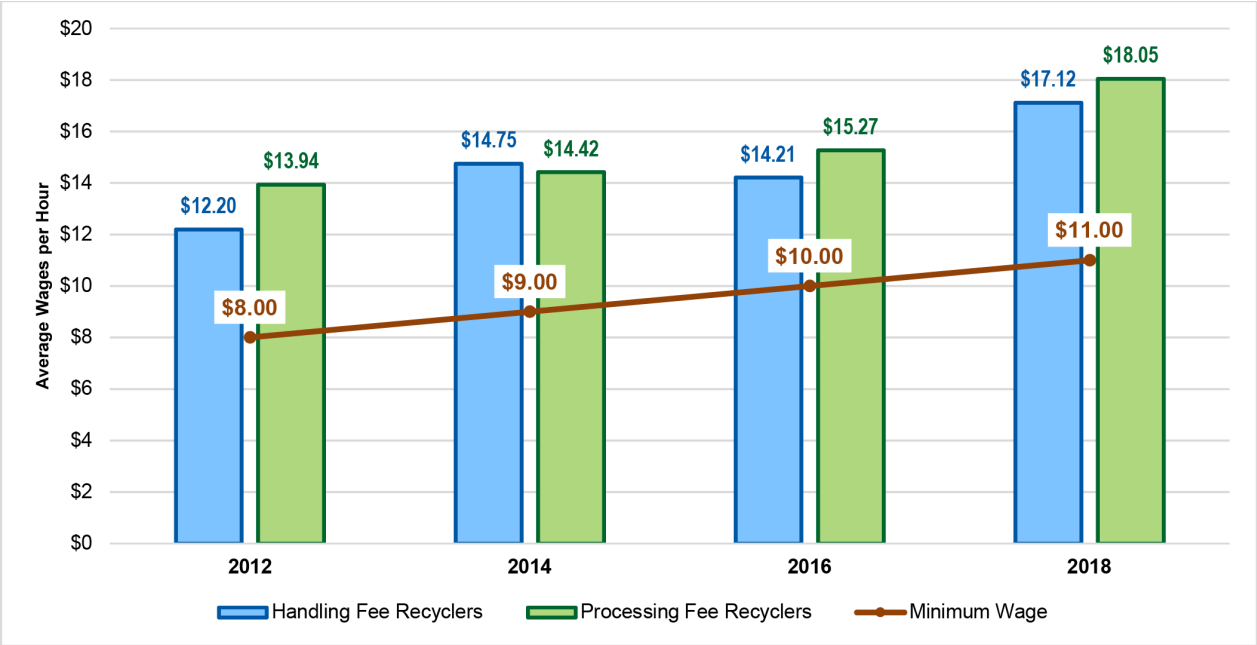
Labor and Non-Labor Costs

The average HF and PF recyclers wages per hour increased from 2016 to 2018. **Exhibit 3-15** illustrates average wages per hour for the last four handling fee surveys, along with minimum wage. For HF sites, the average wages per hour increased by $2.91 (20 percent), to a level higher than prior years. For PF sites[5], the average wage per hour increased by $2.78 (18 percent). Additionally, while recycling centers may be able to reduce labor hours to some extent, recycling centers still must employ one, or more, employee on site during all hours of operation. Our cost survey does not capture time spent waiting for CRV customers. All time is allocated to CRV materials, non-CRV

[5] The PF recycler CRV wage in Exhibit 3-15 represents the average wage (CRV wages divided by CRV hours) for the 118 processing fee recyclers in the handling fee cost survey. This hourly wage is slightly higher than the $17.65 average hourly wage of the 154 processing fee recyclers in the processing fee cost survey.

materials, or other business. These 18 to 20 percent increases in wages are a significant factor in the cost per container increases, consistent with the Processing Fee Cost Survey results. Exhibit 3-15 also illustrates the increases in California minimum wage during this time period.

Exhibit 3-15
2012, 2014, 2016, and 2018 Sampled Handling Fee and Processing Fee Recyclers Average Wages per Hour

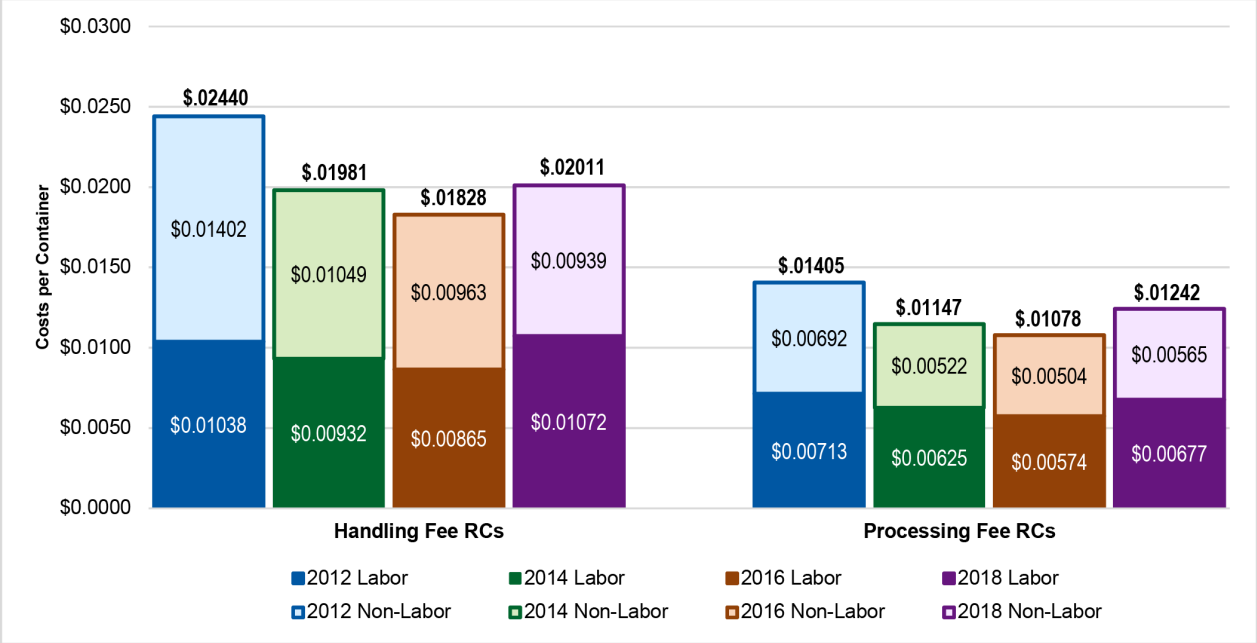


We also determined the labor and non-labor portions of cost per container for the 2012, 2014, 2016, and 2018 cost surveys, and compared how the two cost components changed between surveys. **Exhibit 3-16** shows the following:

- Labor accounts for approximately 52 percent of HF for HF cost per container in 2018
- The share of HF for HF labor cost per container rose from 43 percent in the 2012 cost survey to 47 percent in the 2014 and 2016 cost surveys, and 52 percent in 2018
- Labor accounts for approximately 53 percent of PF for HF cost per container in 2018
- The shares of PF for HF labor and non-labor cost per container are generally consistent between the four survey years.

Changes to productivity and wages are significant as labor makes up approximately half of all recycler costs. The analyses presented above provide considerable confidence in our sample design and cost survey labor allocation methodologies that were the basis of the 2018 cost-per-container results. The results also demonstrate a consistency in the cost survey labor allocation methodology between cost surveys.

Exhibit 3-16
2012, 2014, 2016, 2018 Sampled Handling Fee and 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 2016 and 2018. In the analyses below, 2016 labor costs are not adjusted by CPI, rather they are a straight dollar comparison across the two survey years. A CPI adjustment would increase 2016 costs by 6.7 percent.

To evaluate the potential influence and impact of labor costs on costs per container, as well as the potential influence of high-wage sites or labor allocations, we conducted evaluations of several potential factors related to labor hours, labor allocations, hourly yard wages, hourly administrative wages, and minimum wage. The cost survey labor allocation methodology assigns labor hours for each employee or owner at the site based on whether the time was associated with: 1) the recycler or other business, 2) CRV or non-CRV, 3) Direct yard labor (DYL) or all other labor (AOL), and 4) by aluminum/bi-

metal, glass, and plastic. DYL labor includes yard employees that sort, weigh, handle, bale, or cashier. AOL labor includes administration, management, and driver time, all of which are typically higher-wage activities.

- Factors that did lead to higher labor costs:
  - Higher CRV hourly wages. Weighted-average CRV hourly wages increased overall and by strata between 2016 and 2018
  - Higher simple average overall wages per hour, DYL wages per hour, and AOL wages per hour
  - Significant increases in hourly wages for Los Angeles County recycling centers as compared to the remainder of the state, likely driven by the 26 percent increase in LA county minimum wage between 2016 and 2018
  - There were fewer low wage PF recyclers surveyed between 2016 and 2018. This is consistent with our anecdotal observation that more small PF recyclers closed over the last two surveys, as compared to small HF recyclers
- Factors that did not lead to higher labor costs:
  - Labor allocations for surveyed PF recyclers. There were not significant changes in the allocation of CRV versus non-CRV hours. In fact, there was a slight decrease of one percent between 2016 and 2018.
  - Increased hours handling CRV materials. There were no significant changes in percent of CRV hours and CRV hours per 1,000 containers recycled. There was a 4 percent increase in percent of AOL hours as a percent of recycling center hours between 2016 and 2018 for surveyed HF recyclers, while there was a 17 percent increase for surveyed PF recyclers. However, because AOL hours represent 20 percent of HF recycler hours, and 10 percent of PF recycler hours, these increases do not have a significant impact.
  - High wage sites. There were a small number of sites with relatively high owner wages (profits) that showed an increase between 2016 and 2018 in AOL wages per hour; however, this would not significantly contribute to the overall increase in costs.
  - There was no change in the number of low wage HF recyclers surveyed between 2016 and 2018. Thus, the loss of low wage HF recyclers did not lead to increased HF recycler costs.

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 3-17 and 3-18** provides a summary of sampled HF and sampled PF CRV hourly wages by strata. This calculation reflects a weighted average hourly wage across the survey samples. It does not consider number of CRV containers. As seen above, labor reflects approximately 50 percent of the cost of CRV recycling.

Across strata for sampled HF recyclers, the greatest increase in CRV hourly wages was in strata 1, with a 32 percent increase, while across strata for sampled PF recyclers, the greatest increase was in strata 3, with a 39 percent increase. For PF recyclers, this is consistent with the reduction in strata 3 low-wage sites, discussed below. The increase in hourly wages likely explains a significant portion of the increased cost per container.

To provide context, at 2,080 hours annually, $17.12 per hour is equivalent to $35,610 gross annual income. In 2017, the median household income in California was $71,805. The 2017 per capita income was $35,046.[6] The California Poverty Measure for a family of four, slightly higher than the federal poverty level, was about $32,500 in 2017.[7]

[6] U.S. Census, American Community Survey: https://www.census.gov/programs-surveys/acs/.

[7] Public Policy Institute of California: https://www.ppic.org/publication/poverty-in-california/.

Exhibit 3-17
Comparison of HF CRV Hourly Wages Overall and by Strata (2016 and 2018)

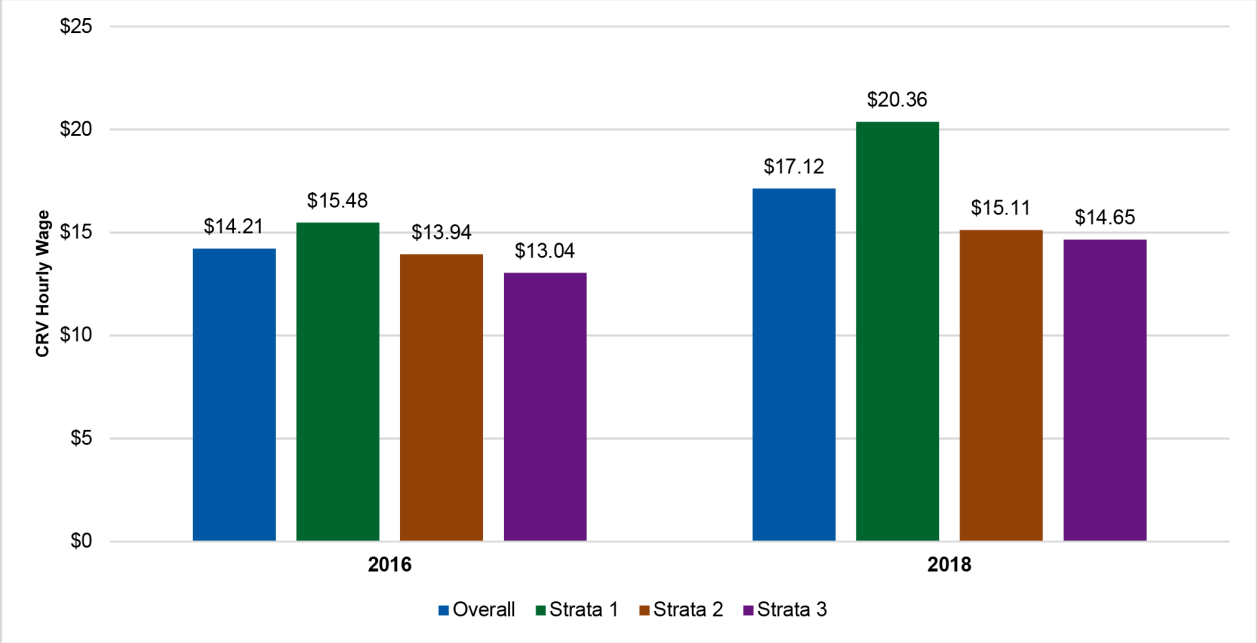
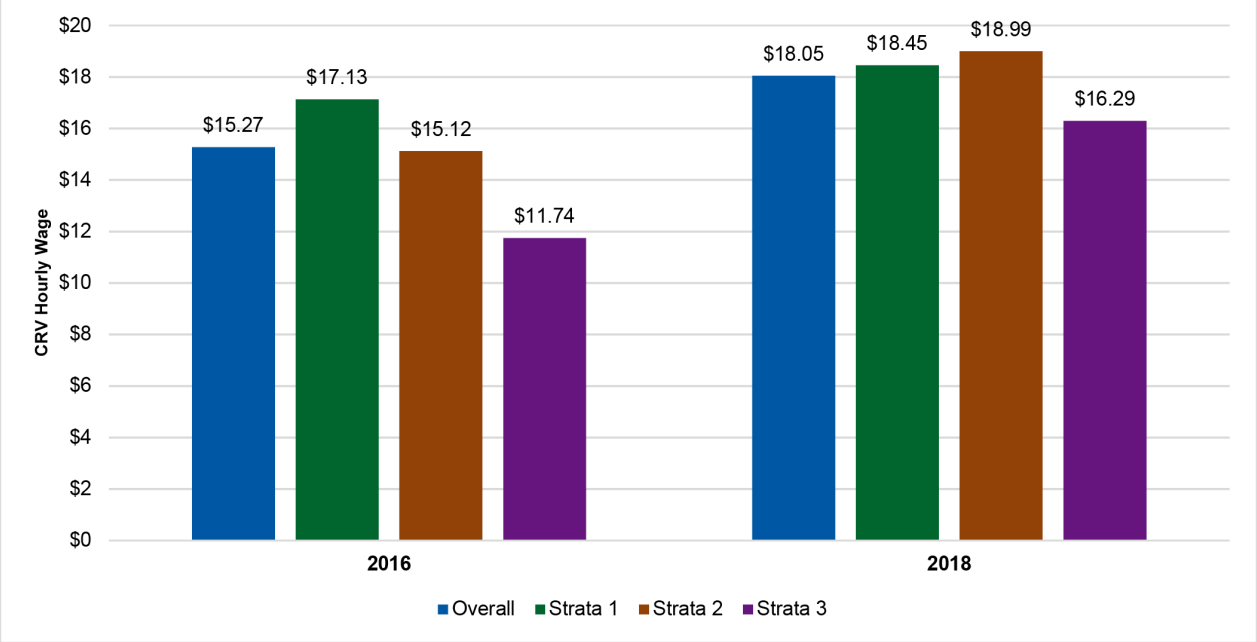


Exhibit 3-18
Comparison of PF CRV Hourly Wages Overall and by Strata (2016 and 2018)

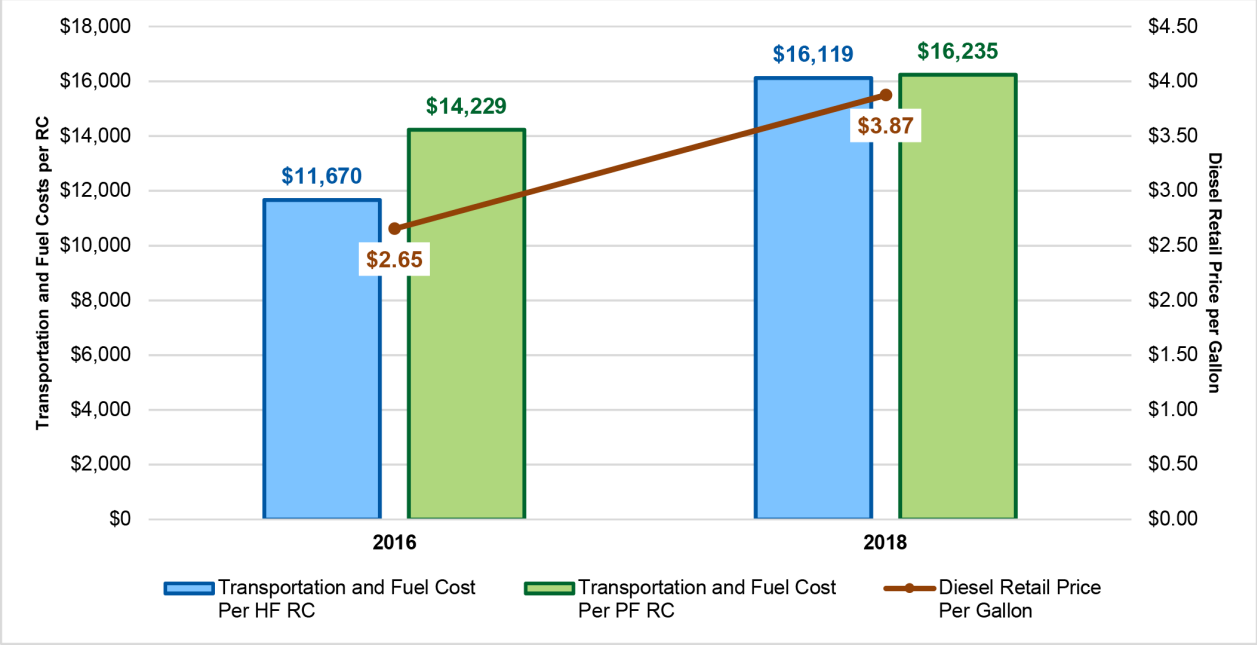


Transportation Costs

Crowe analyzed CRV transportation costs to gain a better understanding of how transportation impacted the increase in cost per container between 2016 to 2018. To evaluate the impact of transportation on recycler costs, Crowe evaluated the changes in transportation and fuel costs for sampled HF and PF recyclers. The transportation and fuel line items include non-labor costs that should generally reflect the cost to recyclers of hauling material to processors. These line items also include general transportation costs and fuel for forklifts, so they are not exclusive to transporting specific materials. However, these non-hauling costs are minimal (compared to hauling). In 2018, transportation (and fuel) costs represent roughly nine percent of total CRV costs for sampled HF recyclers and seven percent for sampled PF recyclers.

Exhibit 3-19 provides a comparison between diesel retail price per gallon[8] and average transportation costs per HF and PF recycler from 2016 to 2018. Between 2016 and 2018, transportation costs per sampled HF recycler increased by $4,449, or an increase of 38 percent, while sampled PF recyclers increased by $2,006, or an increase of 14 percent. In 2016, California averaged $2.65 per gallon of diesel, whereas, in 2018, the average price increased to $3.87 per gallon, or an increase of 46 percent. The increase in diesel price per gallon from 2016 to 2018 is likely a primary contributor to the increase in transportation costs.

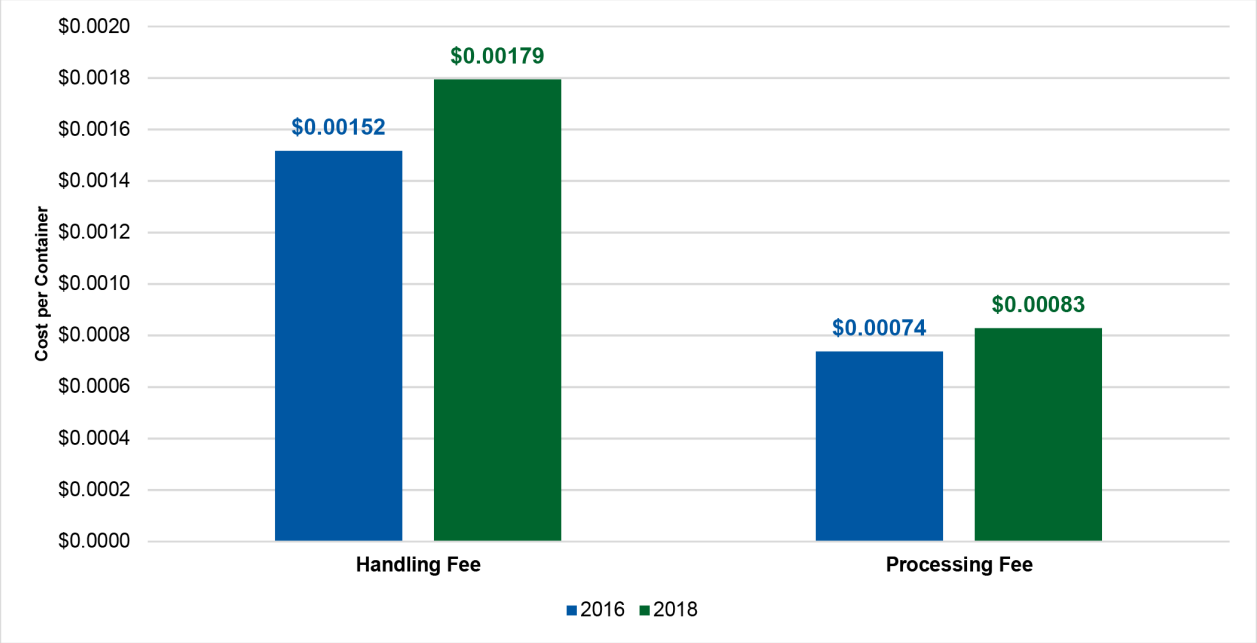
Exhibit 3-19
Comparison of Average Transportation Cost per Surveyed Recycling Center and Diesel Prices (2016 vs 2018)



[8] Source: U.S. Energy Information Administration, Annual Retail Gasoline and Diesel Prices: https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_sca_w.htm (Accessed November 14, 2019)

Exhibit 3-20 shows a comparison between 2016 and 2018 for transportation cost per container for sampled HF and PF recyclers. Transportation cost per container was calculated by taking the sum of transportation and fuel costs divided by the total number of containers for the 2016 and 2018 survey samples. The results show that transportation cost per container for sampled HF and PF recyclers increased 18 percent and 12 percent, respectively.

Exhibit 3-20
Transportation Cost Per Container (2016 vs 2018)



E. Distribution of Sample

This subsection covers the distribution of our survey samples for PF and HF recyclers. These data confirm the validity of our survey results.

Distribution of Cost per Container Results for HF and PF for HF Recyclers

Exhibit 3-21 and **3-22** illustrate an interesting difference between the HF and PF for HF sample results. Exhibits 3-21 and 3-22 are frequency histograms of the cost-per-container results. The vertical axis is the number of recycling centers and the horizontal axis is the cost per container. The horizontal axis is in one-half cent increments.

Exhibit 3-21 provides the HF recycler histogram and Exhibit 3-22 provides the PF for HF recycler histogram. Generally, both histograms are “right skewed” normal distributions, as were the PF for PF histograms. However, there are slight apparent differences between the two figures:

- The HF distribution is wider than in the prior survey, with more sites falling into the right tail portion of the curve, with 22 recycling centers at or above 3.5-cents per container
- The PF distribution is tighter than in the prior survey, starting at less than ½ cent per container, with only 5 recycling centers at or above 3.5-cents per container

Exhibit 3-21
Distribution of Cost per Container, Handling Fee Recyclers Sample (2018)

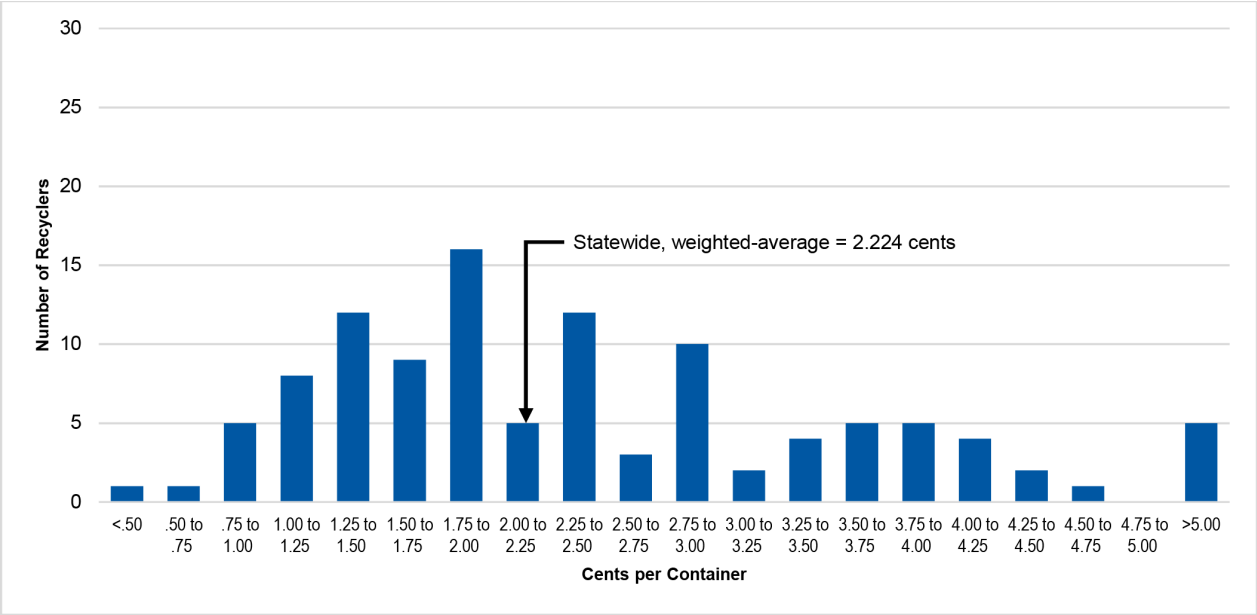
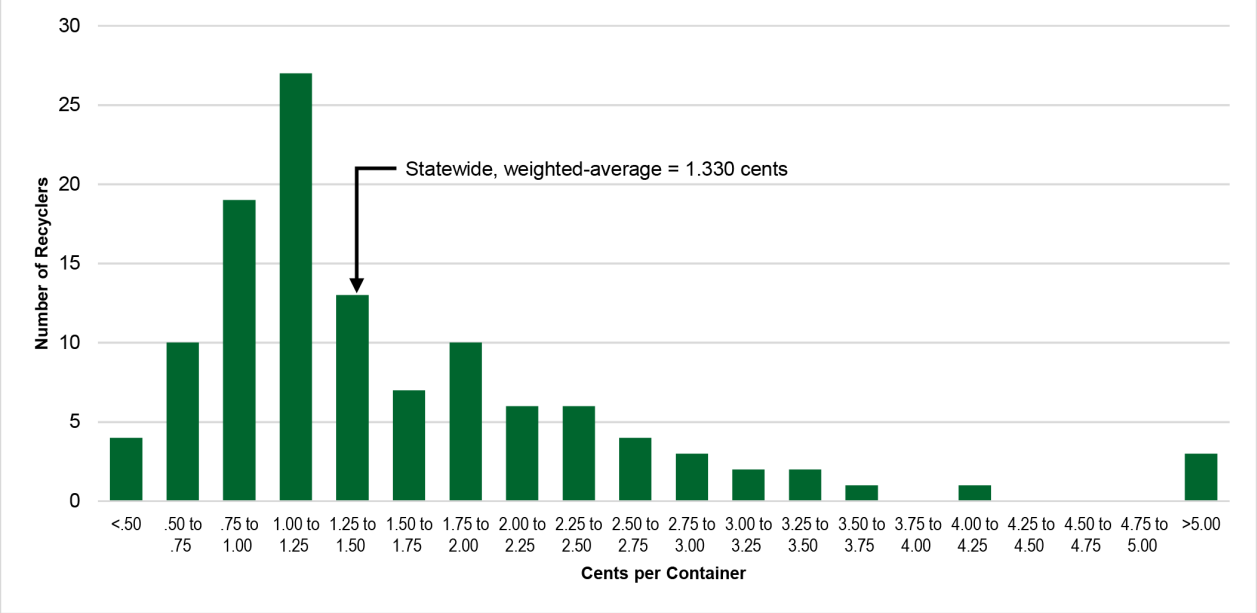


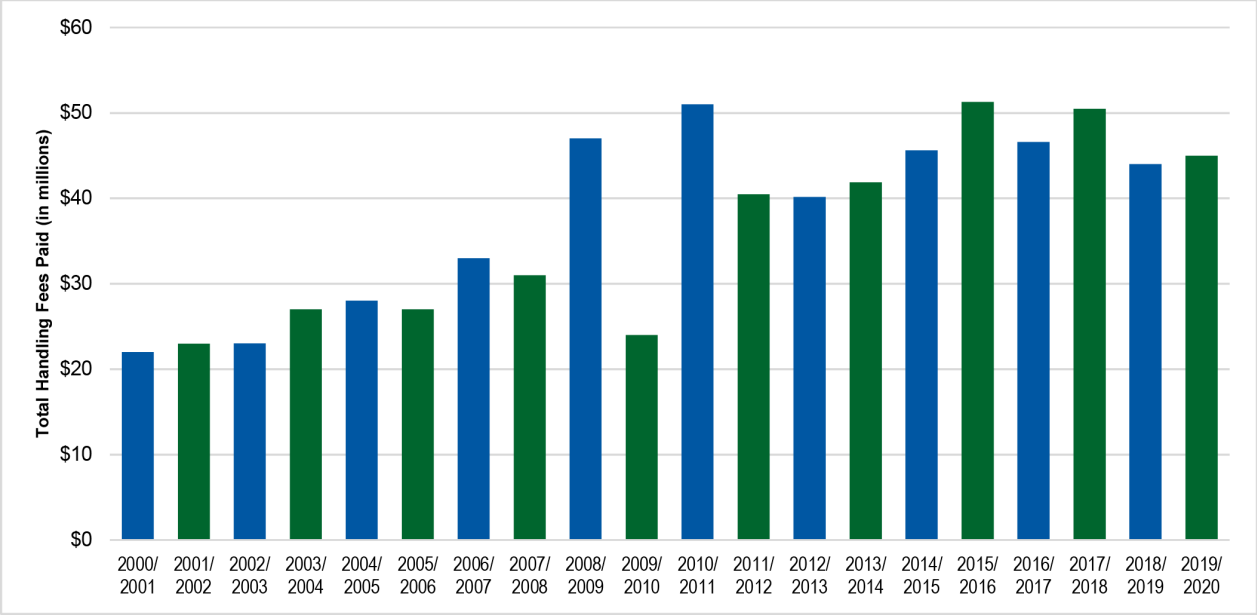
Exhibit 3-22
Distribution of Costs per Container, Processing Fee Recyclers (PF for HF) Sample (2018)



F. Total Annual Handling Fee Payments

Exhibit 3-23 provides total annual handling fee payments between fiscal year 2000/2001 and FY 2019/2020. The 34 percent increase in the handling fee calculated by the 2012 cost survey resulted in a significant increase in overall and per-site, handling fee payments. Based on 2018 containers recycled, the 13 percent increase in the handling fee between 2016 and 2018 will increase overall handling fee payments by $2.8 million in FY 2020/2021 (excluding a CPI adjustment, which would increase payments by $4.8 million). The increase could help ease the challenges that recyclers are facing due to poor markets for recyclable materials, particularly aluminum and PET.

Exhibit 3-23
Total Annual Handling Fee Payments (FY 2000/2001 through FY 2019/2020)



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

Exhibit 3-24 compares the average cost per container for each of the three handling fee recycler container strata, and the statewide, weighted-average cost per container of 2.224 cents. For handling fee recyclers, the average cost per container increases as the size of the recycling center decreases.

While the handling fee is not intended to cover the full cost of recycling for handling fee recyclers, the per container handling fee payment will provide less coverage for stratum 3 recyclers than for strata 1 or 2 recyclers. The 0.894 cent handling fee covers 53 percent of the average cost of recycling for stratum 1 recyclers, 45 percent of the average cost of recycling for stratum 2 recyclers, and only 30 percent of the average cost of recycling for stratum 3 recyclers. These coverage ratios are almost identical to those calculated for the 2016 survey.

Exhibit 3-24
Handling Fee Recycler Costs per Container and Population Size, by Strata (2018)

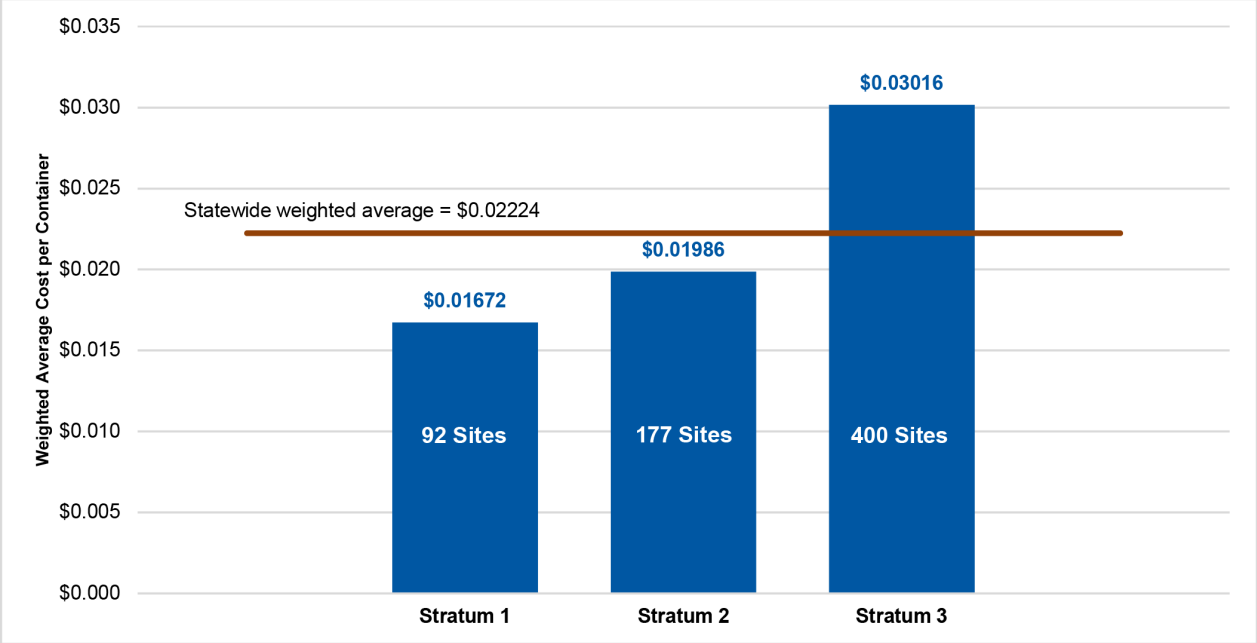


Exhibit 3-25 compares the average cost per container for each of the three processing fee recycler container strata, and the statewide, weighted-average cost per container of 1.330 cents. Similar to handling fee recyclers, stratum 1 recyclers had the lowest average cost per container to recycle and stratum 3 recyclers had the highest average cost per container to recycle.

Exhibit 3-25
Processing Fee Recycler Costs per Container and Population Size, by Strata (2018)

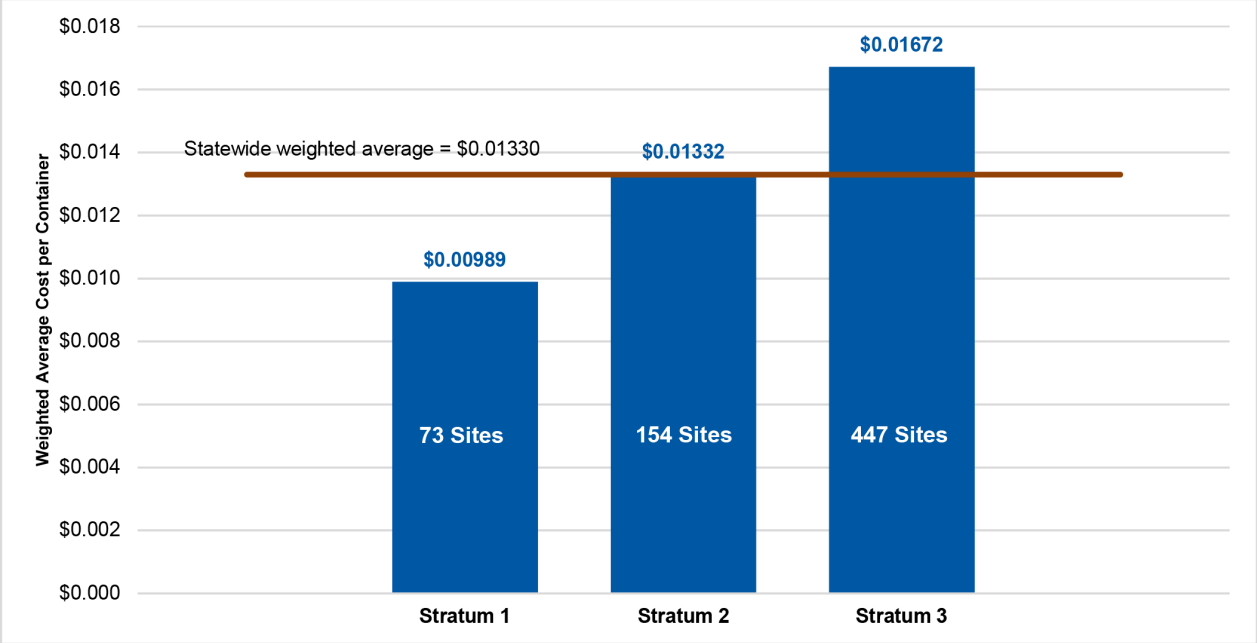


Exhibit 3-26 provides a comparison of population and total containers recycled by strata for handling fee recyclers over the seven handling fee cost surveys. The full population of handling fee recyclers remained relatively stable over the first four years, 2006 to 2010, then declined by 10 percent in 2012, declined another 5 percent in 2014, a substantial 24 percent in 2016, and another 5 percent in 2018. In 2019, with the loss of rePlanet, the population suffered another significant drop. The number of containers recycled by HF recycling centers statewide increased significantly between 2006 and 2010; declined between 2010 and 2012 by 16 percent; increased by 11 percent between 2012 and 2014, increased 9 percent between 2014 and 2016, and increased by a smaller 3 percent between 2016 and 2018. The number of HF recyclers in each of the three strata is the lowest it has been since the start of the Handling Fee Cost Survey; however, the number of containers recycled by each of the strata is among the highest.

Exhibit 3-26
Population and Container Detail, by Strata, for Handling Fee Recyclers (2006–2018)

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

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

Exhibit 3-27 provides a similar comparison of the full population and total containers recycled by strata for processing fee recyclers over the seven handling fee cost surveys. Similar to handling fee recyclers, the number of recyclers decreased significantly between 2014 and 2016 and again between 2016 and 2018, with reductions across all three strata. Generally, between 2006 and 2012, with the exception of a slight decrease in the number of stratum 1 processing fee recyclers between 2006 and 2008, the number of recyclers in each strata had increased between each survey. The number of containers recycled by strata increased significantly between 2006 and 2008, just slightly between 2008 and 2010, and between 6 and 11 percent between 2010 and 2012. The total number of containers recycled by the full population of PF recyclers was essentially flat between 2012 and 2014, at 10.1 billion, and only slightly lower in 2016, at 10.0 billion. The number of containers recycled by the survey population declined again between 2016 and 2018.

Exhibit 3-27
Population and Container Detail, by Strata, for Processing Fee Recyclers (2006–2018)

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

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

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

Processing fee recyclers and handling fee recyclers represent two unique populations of CRV recycling centers. In general, processing fee recyclers are: (1) larger; (2) more likely to accept scrap metal, paper and other non-CRV materials; and (3) not necessarily located near supermarkets. Handling fee recyclers tend to: (1) be smaller, (2) accept only CRV containers, and (3) be located at or near supermarkets.[9]

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

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

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

Exhibit 3-28
Comparison of Percent of CRV Tons Recycled by Major Recycler Type (2001–2018)

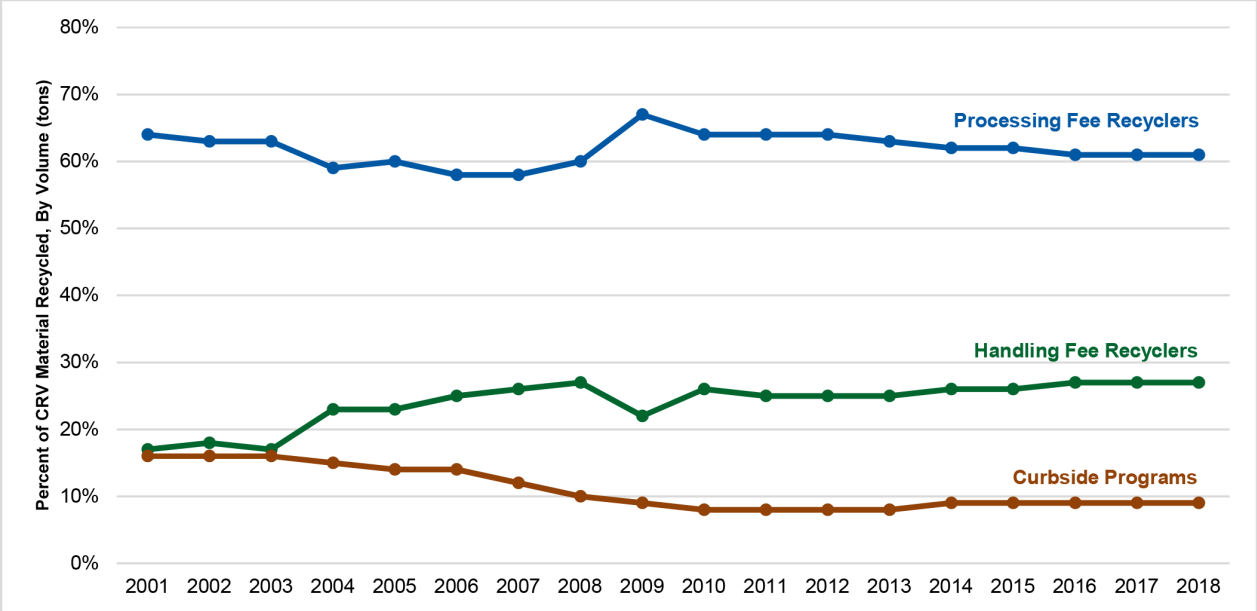


Exhibit 3-29 illustrates the total number of containers recycled by processing fee and handling fee recyclers from 2006 to 2018, as well as the number of processing fee and handling fee recyclers during the same time period. Handling fee recyclers recycled just over 3.1 billion containers in 2006, increasing to just fewer than 4 billion containers in 2008, increasing to 4.5 billion containers in 2010, declining to just over 3.8 billion containers in 2012, and increasing each survey year to 4.6 billion containers in 2018. Processing fee recyclers recycled over 6.8 billion containers in 2006, increasing to just fewer than 9 billion containers in 2008, increasing to a peak of 10.1 billion containers in 2012, and then fluctuating over the last three survey years to 9.6 billion containers in 2018. In 2018, the total number of containers recycled by PF and HF recyclers decreased slightly to 14.4 billion.

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

Exhibit 3-30 illustrates the total CRV recycling cost by processing fee and handling fee recyclers for 2006 to 2018, as well as the number of processing fee and handling fee recyclers during the same time period. Over the seven handling fee cost surveys, handling fee recycler costs represent between 40 percent and 44 percent of total combined costs. Total costs for both recycler types were higher overall in 2018 than any previous survey years, with the exception of the peak in 2012. Similar to Exhibit 3-29, the two lines represent the number of handling fee and processing fee recycling centers.

Exhibit 3-29
Total Number of Containers Recycled by Handling Fee and Processing Fee Recyclers (2006–2018)

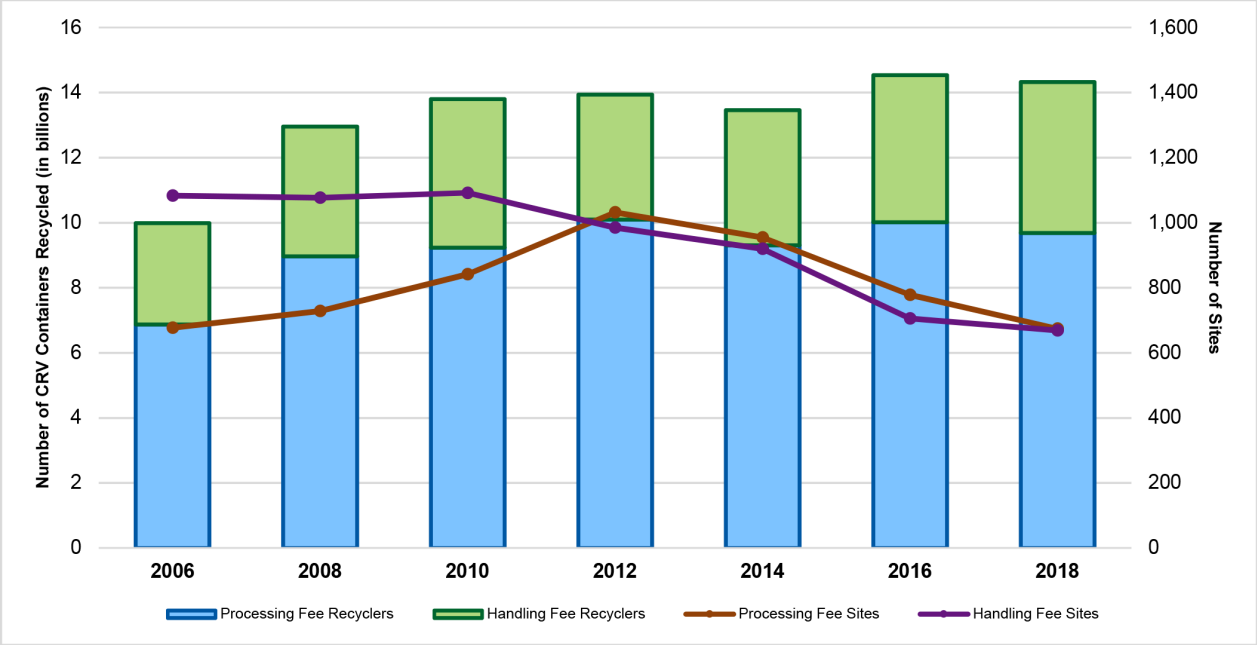
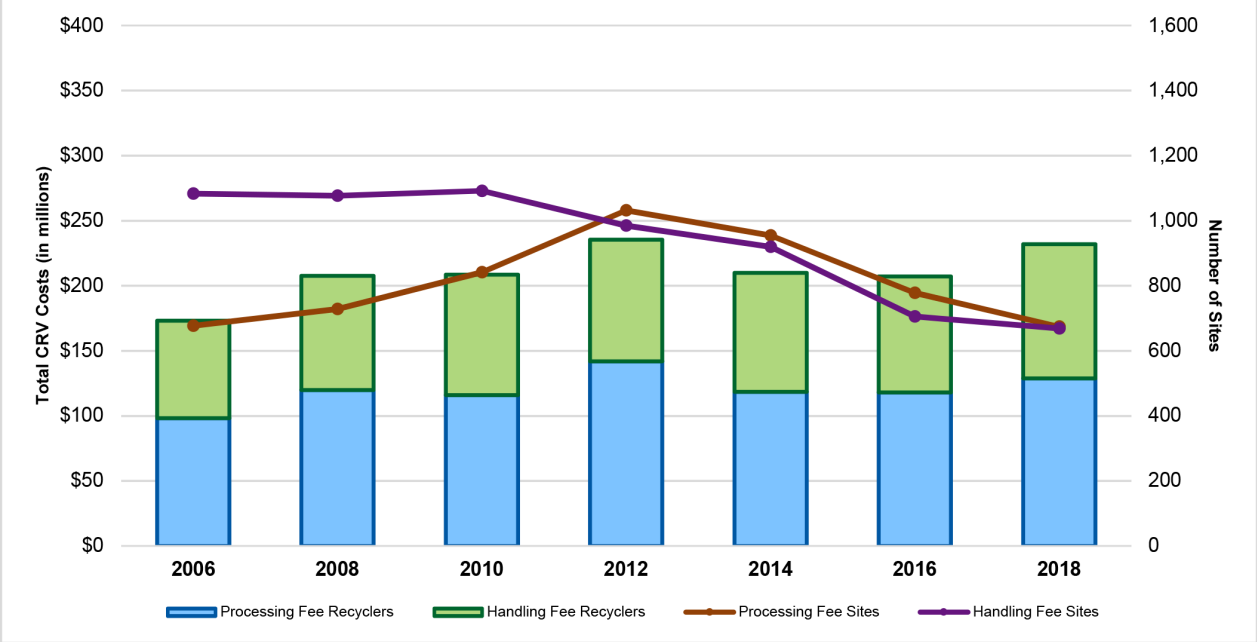


Exhibit 3-30
Total Cost of CRV Recycling for Handling Fee and Processing Fee Recyclers (2006–2018)



I. Summary of Handling Fee Cost Survey Analyses

The cost per container to recycle for both handling fee recyclers and processing fee recyclers increased by 13 percent between 2016 and 2018. The current cost-per-container results, and the 0.894 cent handling fee, are within the range of expected results.

- Handling fee recycler costs per container are typically inversely dependent on the number of containers recycled. Between 2016 and 2018, the number of containers recycled by the full population of HF recyclers increased 3 percent, and the average number of containers recycled per handling fee recycler increased by 8 percent. However, consistent with the processing fee cost survey results, other factors, such as higher labor and transportation costs, drove costs per container upward, even while average containers per recycling center increased.
- Labor accounts for approximately 50 percent of recycler costs. Between 2016 and 2018, labor costs increased for both processing fee and handling fee recyclers. The increase in average CRV hourly wages for both types of recyclers was a significant factor in the increased cost per container. CRV hourly wages for sampled HFs increased 20 percent while it increased by 18 percent for sampled PFs between 2016 and 2018.
- Increased transportation costs were another factor in higher costs per container. Between 2016 and 2018, transportation cost per sampled HF recycler increased by $4,449, or an increase of 38 percent, while sampled PF recyclers increased by $2,006, or an increase of 14 percent. During this same time, the average cost per gallon of diesel increased by 46 percent. The increase in diesel price per gallon from 2016 to 2018 is likely a primary contributor to the increase in transportation costs.
- The 2018 cost per container methodology and results are valid. Statewide weighted averages for PF and HF recyclers align appropriately to stratum averages, histograms of cost per container show normal, right-skewed distribution, and proportion of labor and non-labor costs per container align to those of prior cost surveys.
- Overall annual handling fee payments (with a COLA) are expected to increase by approximately $4.8 million in FY 2020/2021, reflecting the 13 percent increase in handling fee payment. The increase may slightly alleviate the challenges that recyclers are facing due to poor markets for recyclable materials, particularly aluminum and PET.
- There are relative differences between processing fee and handling fee recyclers. Over the last seven handling fee surveys, handling fee recyclers recycled approximately one-third of the containers but accounted for just over 40 percent of total CRV costs, and 48 to 62 percent of the total number of recycling sites.

Appendix A: Accessibility Additional Information

This section provides tables and alternative text to meet ADA requirements.

Exhibit ES-3
Statewide Processing Fee and Handling Fee Recycler Cost per Container[a] (2006–2018)

Year	Processing Fee Cost per Container	Percent Change	Handling Fee Cost per Container	Percent Change
2006	$0.01430		$0.02410	
2008	$0.01337	-7%	$0.02196	-9%
2010	$0.01256	-6%	$0.02029	-8%
2012	$0.01405	12%	$0.02440	20%
2014	$0.01274	-9%	$0.02198	-10%
2016	$0.01179	-7%	$0.01972	-10%
2018	$0.01330	13%	$0.02224	13%

Exhibit ES-4
Handling Fee Cost Survey Calculated Handling Fee Payments (2006–2018 Cost Years)

Year	Handling Fee per Container	Percent Change
2006	$0.00980	
2008	$0.00859	-12%
2010	$0.00773	-10%
2012	$0.01035	34%
2014	$0.00924	-11%
2016	$0.00793	-14%
2018	$0.00894	13%

Exhibit 1-6
Processing Fee and Handling Fee Cost Survey Sample (2018)

- This relationship diagram illustrates the total number of processing fee and handling fee recyclers surveyed, and the number of recyclers in the processing fee cost survey. A total of 343 total unique PF and HF sites is broken down into 110 unique HF for HF sites and 233 unique PF sites. For the 233 unique PF sites, it is further broken down into 154 unique PF for PF sites and 79 unique PF for HF sites. The 154 unique PF for PF sites is even further broken down into 115 unique PF for PF only sites and 39 non-unique PF for PF and PF for HF sites. These 39 non-unique PF for PF and PF for HF combined with the 79 unique PF for HF sites result in a total of 118 total PF for HF sites.

Exhibit 2-1
Cost per Container Calculation (2018)

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

Exhibit 2-3
2018 Handling Fee and Processing Fee Recycler Cost per Container[a]

Year	Cost per Container	Percent Change
2018 Processing Fee Recycler Statewide, Weighted-Average Cost per Container	$0.01330	
2018 Handling Fee Recycler Statewide, Weighted-Average Cost per Container	$0.02224	67%

Exhibit 3-1
Processing Fee and Handling Fee Recycler Cost per Container (2006–2018)

Year	Processing Fee Cost per Container	Percent Change	Handling Fee Cost per Container	Percent Change
2006	$0.01430		$0.02410	
2008	$0.01337	-7%	$0.02196	-9%
2010	$0.01256	-6%	$0.02029	-8%
2012	$0.01405	12%	$0.02440	20%
2014	$0.01274	-9%	$0.02198	-10%
2016	$0.01179	-7%	$0.01972	-10%
2018	$0.01330	13%	$0.02224	13%

Exhibit 3-4
Handling Fee Cost Survey Calculated Handling Fee Payments (Effective July 1 of Each Year) (2008–2018)

Year	Cost per Container	Percent Change
2008	$0.00980	
2010	$0.00859	-12%
2012	$0.00773	-10%
2014	$0.01035	34%
2016	$0.00924	-11%
2018	$0.00793	-14%

Exhibit 3-6
Number of Containers Recycled by Processing Fee Recyclers and Handling Fee Recyclers (2006–2018 Populations)

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

Exhibit 3-7
Number of Population Handling Fee Recycling Centers and Processing Fee Recycling Centers (2006–2018)

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

Exhibit 3-8
Population CRV Costs and Containers of Handling Fee Recyclers (2006–2018)

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

Exhibit 3-9
Population CRV Costs and Containers of Processing Fee Recyclers (2006–2018)

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

Exhibit 3-10
Average Containers Recycled per Population Handling Fee Recycler and Processing Fee Recycler (2006–2018)

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

Exhibit 3-11
2016 and 2018 Sampled Handling Fee and Processing Fee Recyclers Percent Change in Containers per Recycler, Percent Change in Costs per Recycler, and Percent Change in Statewide, Weighted-Average Handling Fee Recycler and Processing Fee Recycler Cost per Container

	Handling Fee Recycling Centers	Processing Fee Recycling Centers
Containers per Recycling Center	8%	12%
Cost per Recycling Center	22%	26%
Cost per Container	13%	13%

Exhibit 3-12
2012, 2014, 2016, and 2018 Sampled Handling Fee Recyclers and Processing Fee Recyclers Average Labor Hours per 1,000 Containers Recycled

Year	Handling Fee Recyclers	Processing Fee Recyclers
2012	0.80	0.51
2014	0.63	0.43
2016	0.61	0.38
2018	0.63	0.37

Exhibit 3-15
2012, 2014, 2016, and 2018 Sampled Handling Fee and Processing Fee Recyclers Average Wages per Hour

Year	Handling Fee Recyclers	Processing Fee Recyclers	Minimum Wage
2012	$12.20	$13.94	$8.00
2014	$14.75	$14.42	$9.00
2016	$14.21	$15.27	$10.00
2018	$17.12	$18.05	$11.00

Exhibit 3-16
2012, 2014, 2016, 2018 Sampled Handling Fee and Processing Fee Recyclers Labor and Non-Labor Costs per Container

Category	Handling Fee Recycling Centers	Processing Fee Recycling Centers
2012 Labor	$0.01038	$0.00713
2014 Labor	$0.00932	$0.00625
2016 Labor	$0.00865	$0.00574
2018 Labor	$0.01072	$0.00677
2012 Non-Labor	$0.01402	$0.00692
2014 Non-Labor	$0.01049	$0.00522
2016 Non-Labor	$0.00963	$0.00504
2018 Non-Labor	$0.00939	$0.00565

Exhibit 3-17
Comparison of HF CRV Hourly Wages Overall and by Strata (2016 and 2018)

Year	2016	2018
Overall	$14.21	$17.12
Strata 1	$15.48	$20.36
Strata 2	$13.94	$15.11
Strata 3	$13.04	$14.65

Exhibit 3-18
Comparison of PF CRV Hourly Wages Overall and by Strata (2016 and 2018)

Year	2016	2018
Overall	$15.27	$18.05
Strata 1	$17.13	$18.45
Strata 2	$15.12	$18.99
Strata 3	$11.74	$16.29

Exhibit 3-19
Comparison of Average Transportation Cost per Surveyed Recycling Center and Diesel Prices (2016 vs 2018)

Year	Transportation and Fuel Cost Per HF Recycling Center	Transportation and Fuel Cost Per PF Recycling Center	Diesel Retail Price Per Gallon
2016	$11,670	$14,229	$2.65
2018	$16,119	$16,235	$3.87

Exhibit 3-20
Transportation Cost Per Container (2016 vs 2018)

Year	Handling Fee	Processing Fee
2016	$0.00152	$0.00074
2018	$0.00179	$0.00083

Exhibit 3-21
Distribution of Cost per Container, Handling Fee
Recyclers Sample (2018)

Cents per Container	Frequency
<.50	1
.50 to .75	1
.75 to 1.00	5
1.00 to 1.25	8
1.25 to 1.50	12
1.50 to 1.75	9
1.75 to 2.00	16
2.00 to 2.25	5
2.25 to 2.50	12
2.50 to 2.75	3
2.75 to 3.00	10
3.00 to 3.25	2
3.25 to 3.50	4
3.50 to 3.75	5
3.75 to 4.00	5
4.00 to 4.25	4
4.25 to 4.50	2
4.50 to 4.75	1
4.75 to 5.00	0
>5.00	5

Exhibit 3-22
Distribution of Costs per Container, Processing Fee Recyclers (PF for HF) Sample (2018)

Cents per Container	Frequency
<.50	4
.50 to .75	10
.75 to 1.00	19
1.00 to 1.25	27
1.25 to 1.50	13
1.50 to 1.75	7
1.75 to 2.00	10
2.00 to 2.25	6
2.25 to 2.50	6
2.50 to 2.75	4
2.75 to 3.00	3
3.00 to 3.25	2
3.25 to 3.50	2
3.50 to 3.75	1
3.75 to 4.00	0
4.00 to 4.25	1
4.25 to 4.50	0
4.50 to 4.75	0
4.75 to 5.00	0
>5.00	3

Exhibit 3-23
Total Annual Handling Fee Payments
(FY 2000/2001 through FY 2019/2020)

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	$45,600,000
2015/2016	$51,300,000
2016/2017	$46,600,000
2017/2018	$50,500,000
2018/2019	$44,000,000
2019/2020	$45,000,000

Exhibit 3-24
Handling Fee Recycler Costs per Container and Population Size, by Strata (2018)

Strata	Costs per Ton	Benchmark	Sites
Stratum 1	$0.01672	$0.02224	92
Stratum 2	$0.01986	$0.02224	177
Stratum 3	$0.03016	$0.02224	400

Exhibit 3-25
Processing Fee Recycler Costs per Container and Population Size, by Strata (2018)

Strata	Costs per Ton	Benchmark	Sites
Stratum 1	$0.00989	$0.01330	73
Stratum 2	$0.01332	$0.01330	154
Stratum 3	$0.01672	$0.01330	447

Exhibit 3-28
Comparison of Percent of CRV Tons Recycled by Major Recycler Type (2001–2018)

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

Exhibit 3-29
Total Number of Containers Recycled by Handling Fee and Processing Fee Recyclers (2006–2018)

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

Exhibit 3-30
Total Cost of CRV Recycling for Handling Fee and Processing Fee Recyclers (2006–2018)

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