California Carpet Stewardship Program
An initiative of CARE: Carpet America Recovery Effort

Crowe

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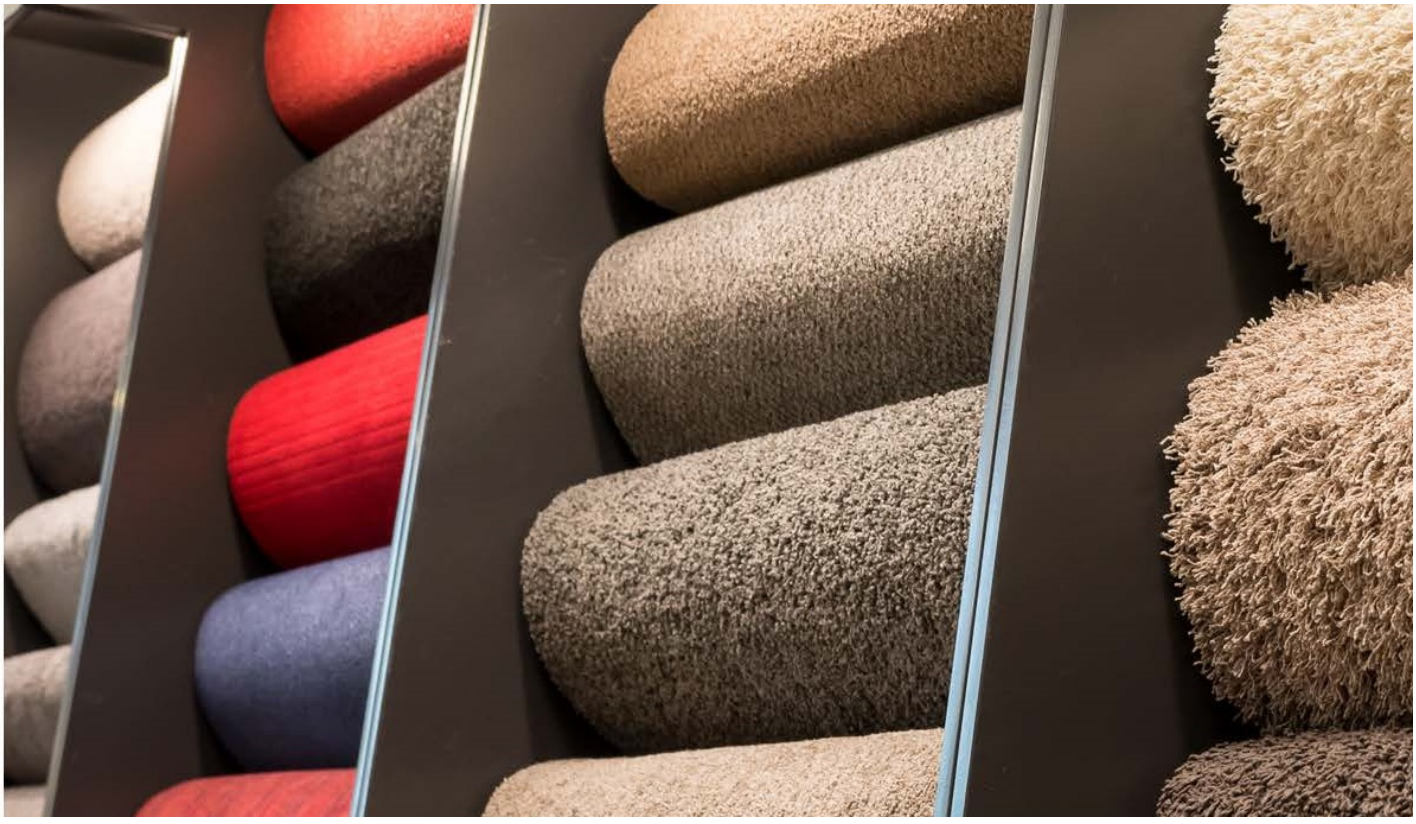
CARE Phase 2 Economic Analysis

REDACTED VERSION

June 30, 2021



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Acknowledgments

This Phase 2 Economic Study required a high degree of communication and collaboration by all involved. Crowe LLP thanks CARE management and staff for their support throughout the entire project. In addition, we acknowledge and appreciate the cooperation and time commitment of the many CSEs, Processors, and Manufacturers that participated in the study.

Executive Summary

Crowe LLP (Crowe) prepared this Independent Economic Analysis report under contract with Carpet America Recovery Effort (CARE). This report provides the results of our independent economic analysis of California post-consumer carpet (PCC) and is intended to support the CARE's 2018-2022 California Carpet Stewardship Plan (Plan) Chapter 0 requirements. This report also summarizes the tasks that Crowe conducted, and the methodology used in order to obtain the results presented. Crowe prepared a redacted version of the report for publication by CalRecycle. This version redacts sensitive information and/or information that could be further analyzed and result in exposure of proprietary information. Where appropriate, rather than redact results entirely we provide a range of results. This executive summary is organized as follows:

A. Economic Analysis Background
B. Economic Analysis Methodology
C. Economic Analysis Results
D. Economic Findings and Conclusions.

A. Economic Analysis Background

CARE operates the California Carpet Stewardship Program (CCSP) in partnership with and through the oversight of the California Department of Resources Recycling and Recovery (CalRecycle). CARE has prepared a five-year Plan, covering 2018 to 2022, to support California's Carpet Stewardship Laws and recovery targets. The Plan's Chapter 0 requirements, developed in December 2018, contain a number of specific provisions and studies, including the commitment to:

- "Conduct and provide to CalRecycle an independent detailed economic analysis to validate the Subsidy Justification and Conversion Cost Models that justifies the assessment based on actual costs of program participants…This must include a summary of the range of costs for collecting, processing, and recycling different materials, along with other programmatic expenditures, that is sufficient to estimate how much overall funding, and therefore what assessment level is needed to achieve the goal of a 24 percent recycling rate by January 1, 2020 and 26 percent by 2022."
- "Demonstrate CARE's Subsidy Justification and Conversion Cost Models use California-specific data and account for regional cost differences. A commitment to demonstrate to what extent its economic analysis accounts for regional differences in cost data."

In order to meet these requirements, Chapter 0 commits CARE to the following:

1. CARE will hire an independent firm to conduct an analysis of CARE's Conversion Cost Model (CCM) and SJM to validate accuracy including the costs of collecting/sorting, processing, and recycling PCC. A statistical analysis will be included as part of the independent work. Finally, the independent firm will evaluate the sufficiency of the assessment to meet or exceed the 2020 24% recycling goal.
2. CARE will work with CalRecycle during the analysis process to provide a sufficient level of detail while protecting the confidential business information (CBI) of the recycling community participants… CARE will work to include a description of the range of costs for collecting, sorting, processing and other program expenditure costs while balancing CBI considerations.
3. During analysis of the SJM and CCM, CARE will look at California versus non-California costs along with regional costs within the state. This review will be sensitive to protection of confidential business information.

Phase 1 Study – Cost Analysis of PCC Recycling

In 2018, CARE contracted with Crowe to conduct a cost analysis study to support specific objectives detailed within the Plan's Chapter 0 requirements at the request of CalRecycle. Based on the requirements specified by CalRecycle, the key tasks Crowe sought to address were:

1. Validate the accuracy of the Subsidy Justification and Conversion Cost Models in determining subsidy levels based on actual costs of program participants
2. Determine the range of costs for recycling different PCC materials
3. Demonstrate that the SJM and CCM utilize California costs and evaluate regional cost differences.

CARE submitted its Chapter 0 Report to CalRecycle on September 3, 2019. The report consisted of several individual reports responding to CalRecycle's request. Crowe's Cost Analysis and Model Evaluation were among those reports. In November 2019, CalRecycle determined that CARE had not adequately fulfilled all the requirements of Chapter 0. CalRecycle agreed to provide additional time for CARE to meet the requirements. CARE initially responded with a schedule that would meet all outstanding Chapter 0 requirements by November 30, 2020. However, CARE requested, and CalRecycle approved, a delay in that date due to the disruptions caused by COVID-19 pandemic.

In November 2019, CalRecycle found that:

- CARE partially fulfilled the requirement to conduct an independent, detailed economic analysis. CalRecycle found that Crowe's initial study provided some justifications for the conclusions reached but used relative costs rather than actual costs due to the low number of participants. CalRecycle believes that CARE can require subsidy recipients to provide data, a requirement that CARE addressed in their 2020 contracts with recyclers.
- CalRecycle "suggests Crowe define what it considers a "critical mass" of carpet recyclers, that would enable CARE to conduct another independent analysis that provides quantitative data once the "critical mass" has been reached.
- Crowe reviewed and validated the Conversion Cost Model
- Crowe "reviewed, but did not confirm that it validated, CARE's Subsidy Justification Model."
- Revenue was not included in the Phase 1 analysis
- Crowe did not specifically state whether an increase in subsidies would support CARE's achievement of a 24 percent recycling rate and thus the study did not justify the assessment level needed to achieve the goal of 24 percent recycling rate by January 1, 2020 and 26 percent by 2022.

Phase 2 Study – Economic Analysis of PCC Recycling

Building upon the lessons learned from our Phase 1 cost study of PCC Recycling, we addressed CalRecycle's feedback using an approach that incorporates commodity revenues as well as providing numerical results while protecting confidential and proprietary data. Below are four (4) objectives we addressed through this Phase 2 economic analysis of PCC recycling to support CARE's Chapter 0 requirements:

1. Independent economic analysis with commodity revenues and subsidy justification
2. Demonstrate how assessment will provide funding to meet the Plan
3. Validate Subsidy Justification Model (SJM)
4. Define [and utilize a] "critical mass" to allow Crowe to provide actual cost data.[1]

[1] Crowe provided actual cost data to CalRecycle in a confidential report.

Between 2019 and 2020, there were a total of 28 companies[2] receiving subsidies from CARE: 6 standalone CSEs, 4 CSE-Processors, 3 CSE-Processor-Manufacturers, 3 Processor-Manufacturers, and 12 standalone manufacturers. Of these companies, Crowe surveyed a total of 26 companies from July 2020 to March 2021 and received, from 22 recyclers[3], detailed cost information and estimated revenue data from 2019 and 2020.[4] We analyzed the financial data for 96 percent of the combined subsidized volume among the two years.

We describe our approach to meet the study's objectives in the Methodology section of this report. The Crowe team has over thirty years of experience working on recycling policies and programs in California, and nearly 20 years of experience conducting cost of recycling surveys in support of California's beverage container recycling program.

B. Economic Analysis Methodology

Exhibit ES-1 provides an overview of the key tasks we performed to meet the four (4) Chapter 0 requirements as part of this Phase 2 economic study of PCC recycling.

[2] In late 2020, a processor-manufacturer acquired a CSE-processor, and have become an integrated CSE-processor-manufacturer.

[3] We received limited financial data for the remaining four companies.

[4] 2020 includes a mix of half to full year data.

Exhibit ES-1
Phase 2 Economic Study of PCC Recycling Objectives and Tasks

1. **Independent economic analysis with commodity revenues and subsidy justification**
   - Average cost per pound by recycler type for CSEs and Processors
   - Cost to use PCC versus other inputs for Manufacturers
   - Market prices and anecdotal price data for sales revenue per pound

2. **Demonstrate how assessment will provide funding to meet the Plan**
   - Confirm subsidy levels for remainder of Plan
   - Use CARE's Financial Model to determine sales projections
   - Evaluate coverage at different carpet sales and recycling rates

3. **Validate Subsidy Justification Model (SJM)**
   - Calculate subsidies needed to incentivize PCC use based on #1
   - Compare to existing subsidies and SJM
   - Evaluate structure and assumptions in SJM

4. **Define "critical mass" to allow Crowe to provide actual cost data[5]**
   - Provide numerical results
   - Simple average costs per pound and regional adjustments maintaining confidentiality
   - Revenue per pound ranges maintaining confidentiality and reflecting market variability

[5] Crowe provided actual cost data to CalRecycle in a confidential report.

C. Economic Analysis Results and Findings

In Phase 2, we generated two primary sets of results: (1) integrated results, and (2) vertical results as a result of performing this study. First, Crowe determined the vertical results to specifically meet the objectives set forth by Chapter 0. During our initial analysis, we realized that these vertical results were designed to meet the objectives, but do not provide a realistic representation of recyclers' situations. Instead, we found that by performing an integrated analysis we would have a more comprehensive and thorough understanding of the sustainability of PCC recycling. **In the end, both approaches yielded similar results— the current subsidy levels and structure are adequate to meet CARE's objectives. Specifically, the current subsidy structure adequately incentivizes increases in RO to meet a 27 percent recycling rate goal by December 31, 2022.**

We calculated the percentage of costs covered by estimated revenues to demonstrate how recyclers actually envision the economics of PCC recycling – through an integrated perspective of total cost coverage rather than through a vertical perspective. We specifically focus on the study results of the integrated CSE-Processor-Manufacturer recyclers, which represent three (3) California-based companies, given that they reported over 80 percent[6] of total subsidized volumes in 2019 and 2020 combined.

Our integration results consist of the following five (5) components: 1) total PCC costs of the integrated group, 2) total per pound CARE subsidy, 3) total carpet sales revenue, 4) total padding sales revenue, and 5) total disbursed grants revenue. We calculated the percentage of cost coverage by taking total PCC costs divided by the sum of all revenue sources for the three largest recyclers combined across 2019 and 2020. *Revenues exclude manufacturer sales revenue (e.g. carpet cushion, padding, pellets, etc.).*

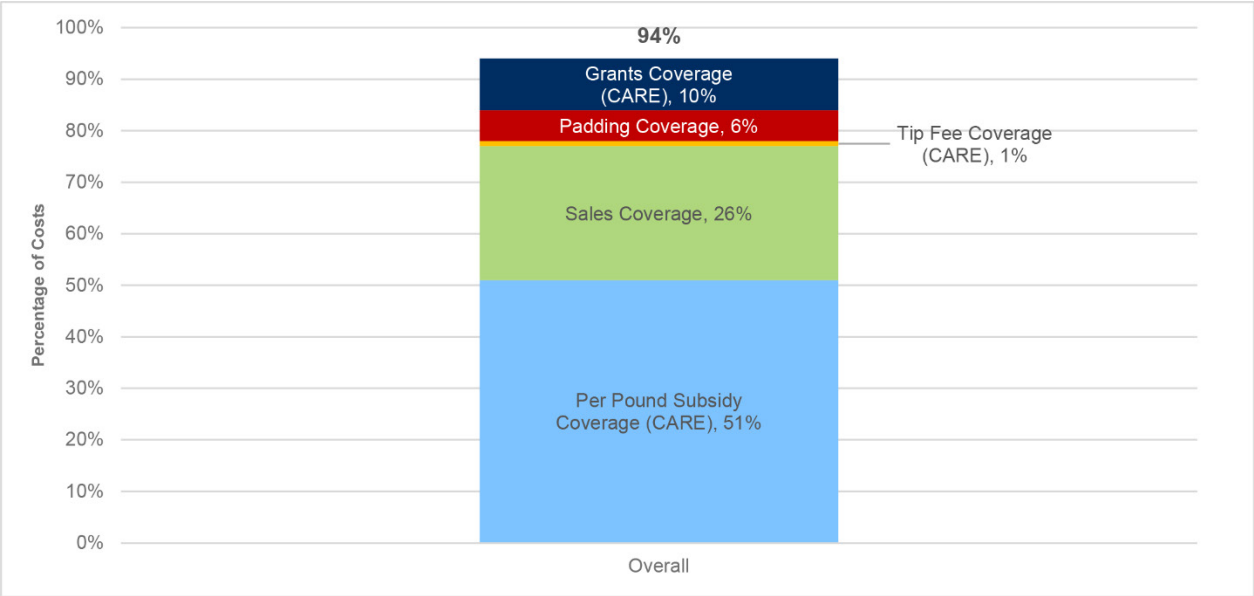
We present integrated CSE-Processor-Manufacturer results in **Exhibit ES-2,** as well as a visually in **Exhibit ES-3.**

[6] CSE-only and manufacturer-only groups represent the remaining 20 percent of subsidized volumes reported in 2019 and 2020 combined. Standalone CSEs costs are fully covered by a mix of revenue sources (e.g., subsidies, carpet and padding sales). Standalone manufacturers' and processor-manufacturer shipping costs are covered by the CARE's subsidy.

Exhibit ES-2
Summary of Integrated CSE-Processor-Manufacturer Results

Public/ Private Funds	Revenue Component	Estimated Percentage of Costs Covered	Revenue Description
Public Funds	CARE Per Pound Subsidies	51%	CARE's subsidies at the collection, processing and manufacturing levels
Public Funds	CARE Grant Disbursements	10%	Grant funds provided (disbursed) to support capacity improvements
Public Funds	CARE Collection Tipping Fee	1%	A collection tipping fee provided upon accepting CARE DoS loads
Private Funds	Estimated Carpet Sales Revenue	26%	Based on estimated revenue on volumes not utilized in processing
Private Funds	Estimated Padding Sales Revenue	6%	Based on estimated revenue on padding volumes reported
Total		**94%**	

Exhibit ES-3
CSE-Processor-Manufacturer Integration Results[7]



In determining whether CARE's subsidies provide adequate incentives to promote PCC recycling and use of PCC in end-products, we considered the differential between the costs to recycle as compared to the resulting revenue. The underlying assumption is that, on average, the costs must be roughly equivalent to the revenue for a company to be incentivized to utilize PCC. Thus, our coverage analysis shown in Exhibit ES-2 measures the extent to which the costs to utilize PCC (for the integrated CSE-Processor-Manufacturers) are covered by the various revenue sources. The coverage results presented in Exhibit ES-2 and ES-3 indicate that associated costs for the majority of subsidized PCC volumes in 2019 and 2020 were covered by a combination of revenue sources.

[7] Three (3) California-based integrated CSE-Processor-Manufacturers representing over 80 percent of total subsidized volumes in 2019 and 2020 combined.

The 94 percent coverage figure represents a conservative number because revenue generated from sales of end-products are not incorporated in the analysis.[8] Thus, our analysis shows that manufacturer revenue from selling end-products only needs to cover a six percent gap for manufacturers to break-even. This is a small margin that we can confidentially state will be met by end-product sales.[9] **Our results combined with the continued participation of recyclers clearly demonstrate that subsidies provide an adequate incentive to meet program objectives.** Our analyses further confirm that CARE's subsidies are necessary to incentivize PCC recycling in California; without incentives, PCC recycling would not be economically viable or sustainable.

To meet the study objectives, we circle back to the four (4) study objectives of this Phase 2 Economic Analysis.

Exhibit ES-4 provides a summary of results for each task for Objective #1.

Exhibit ES-5 provides a summary of results for each task for Objective #2.

Exhibit ES-6 provides a summary of results for each task for Objective #3.

Exhibit ES-7 provides a summary of results for each task for Objective #4.

Exhibit ES-8 provides a roll-up summary of our vertical results as presented in *Section 4* of this report. From this perspective, the combination of sales and CARE subsidy revenue generally provides adequate coverage of costs. However, these direct comparisons alone do not provide a comprehensive view of whether subsidies provide adequate incentives to recycle PCC, rather, these results should be used to support the overall, integrated analysis presented within our integrated and coverage results in *Section 3* that demonstrate that subsidies provide adequate incentives to meet the program goals.

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[8] In order to provide a consistent comparison, Crowe did not incorporate manufacturers' end-product revenue in the analysis. End-products made from PCC vary widely – for example carpet padding, erosion control, plastic pellets, or house siding – revenue from these products varies widely as well. Furthermore, as we discuss Section 4, the key decision point for manufacturers to utilize PCC is the price differential between processed PCC fiber and alternative inputs to their manufacturing processes.

[9] To provide a conservative estimate of end-product revenue we calculated a coverage level of 105 percent by assuming that end-product revenue was equivalent to the price manufacturers pay for processed fiber. Since manufacturers add value to the processed fiber they purchase when they manufacturer products, we know that the actual coverage will be greater than 105 percent.

Exhibit ES-4
Completion Status of Study Objective #1 – Conduct an independent economic analysis with commodity revenues and subsidy justification

Task	Summary of Results
A. Average cost per pound by recycler type for CSEs and Processors	**Section 4** • Collection: 8 to 20 cents per pound to collect PCC broadloom and tile. • Processing: 50 to 55 cents for California (CA) and 40 to 45 cents for non-CA per pound to process PCC fiber. This reflects regionally adjusted costs using economic adjustment factors.
B. Cost to use PCC versus other inputs for Manufacturers	**Section 4** • Manufacturing: Differential ranges between 10 to 30 cents for the cost to use PCC versus the purchase price of the PI alternative (Nylon 6, Nylon 66, PET, PP) (point-in-time)
C. Market prices and anecdotal price data for sales revenue per pound	**Sections 4 and 5** • Market Prices: Provided a multi-year history of virgin, post-industrial, and post-consumer spot pricing for Nylon 6 pellets, Nylon 66 pellets, PET flake, and PP polymers to show fluctuations over time. Broad market prices provided validation for the range of anecdotal prices. Anecdotal pricing levels for each fiber type were within an appropriate range compared to the broad market. • Anecdotal Prices: Collected average sales prices per pound for whole carpet, processed fiber, and manufactured pellets. Utilized anecdotal prices, as validated, to estimate revenue per pound ranging from roughly 2 to 10 cents for collected whole carpet and roughly 18 to 33 cents for processed fiber.

Exhibit ES-5
Completion Status of Study Objective #2 – Demonstrate how assessment will provide funding to meet the Plan

Task	Summary of Results
A. Confirm subsidy levels for remainder of the Plan	**Section 3** • Our integrated results showed that for over 80% of subsidized volume, the CSE-Processor-Manufacturer recycler category has roughly 94% of costs covered without factoring in manufacturer sales revenue. Adding in a conservative figure for manufacturing sales revenue results in 105% coverage of costs. Thus, a significant majority of the PCC volume being recycled into RO is profitable (and thus adequately incentivized). • For the remaining 20% of subsidized volume, standalone CSEs costs are fully covered by a mix of revenue sources (e.g., subsidies, carpet and padding sales). Standalone manufacturers' shipping costs are covered by the CARE's subsidy. • **These results provide robust confirmation of the current subsidy levels for the remainder of the Plan.**
B. Use CARE's Financial Model to determine sales projections	**Section 7** • Assessed and confirmed CARE's financial model results for 2021 and 2022 to reasonably project for carpet sales projections
C. Evaluate coverage at different carpet sales and recycling rates	**Section 7** • **The current assessment adequately covers CARE's baseline funding needs to pay for subsidies, program costs, and maintain a reserve through 2022.** • CARE can cover approximately 1.5 times its expenditures through 2022 based on projected carpet sales and funding needs. • CARE will maintain a positive fund balance through 2022 even under stressed conditions (e.g., carpet sales decrease 10, 15, and 20 percent; recycling rate of up to 33%) signaling the current 35-cent assessment per square yard is sufficient to meet the Plan.

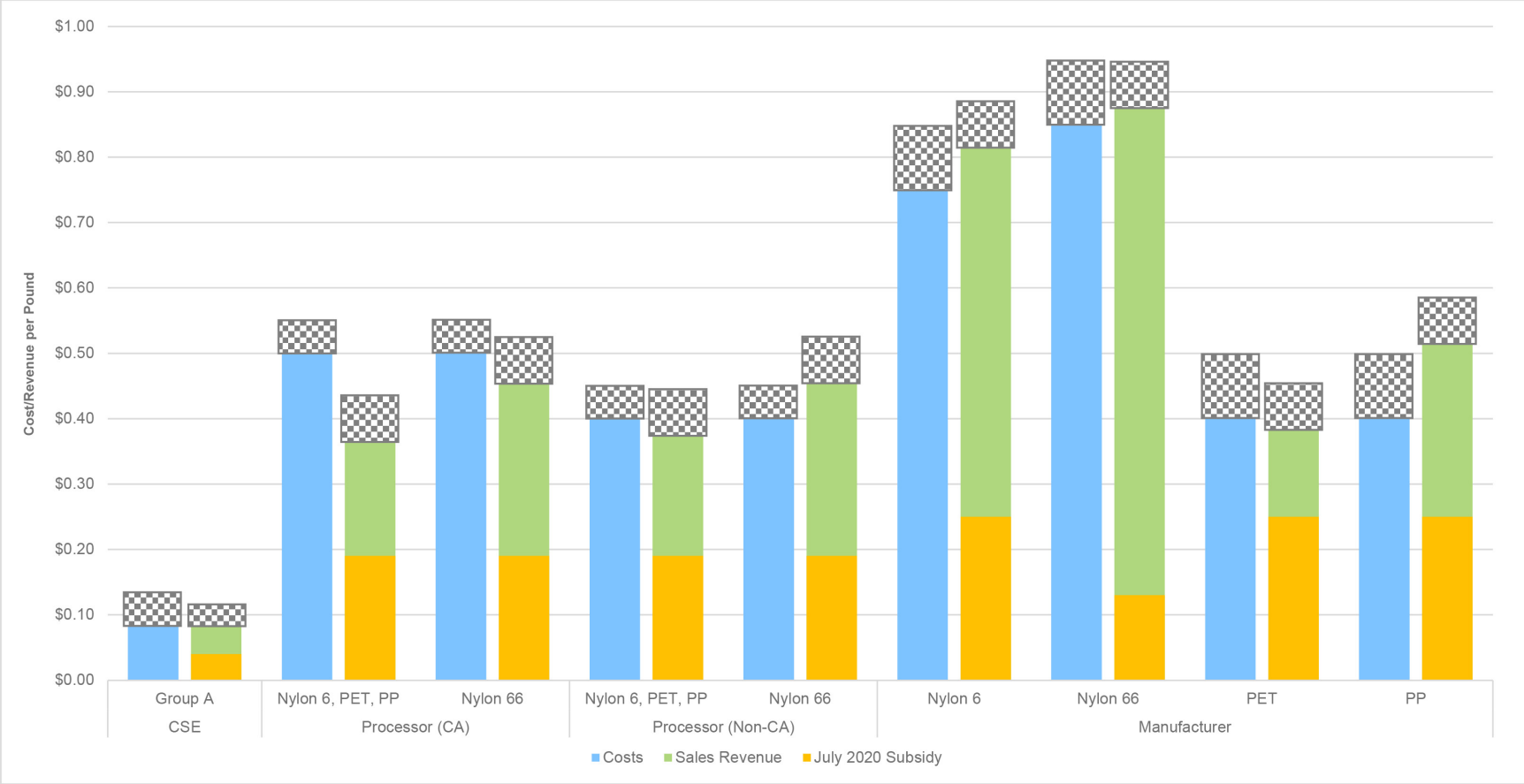
Exhibit ES-6
Completion Status of Study Objective #3 – Validate Subsidy Justification Model (SJM)

Task	Summary of Results
A. Calculate subsidies needed to incentivize PCC use based on #1	**Section 6** • **The current subsidy levels are where they need to be to continue to incentivize the use of PCC.** Our results reflect a balance between actual recycler costs and the fluctuations in sales revenue over the most recent two-year period. We modeled costs, revenues, and differentials on a per pound basis and an overall cost basis to validate the current subsidy levels.
B. Compare to existing subsidies and SJM	**Section 6** • Although Crowe's and the SJM methodologies are different, our results showed similar conclusions as the SJM, confirming that the SJM represents a valuable tool in setting proper levels.
C. Evaluate structure and assumptions in SJM	**Section 6** • The current structure and format of the SJM is adequate for its intended purpose, however, the model can benefit from simplification to improving readability, for example, converting Tier 2 calculations to reflect manufacturing only and providing more visual separation of different recycling phases.

Exhibit ES-7
Completion Status of Study Objective #4 – Define "critical mass" to provide actual cost data

Task	Summary of Results
A. Provide numerical results	**All Sections** • Crowe provided numerical results throughout the confidential report and numerical ranges in this redacted version.
B. Simple average costs per pound and regional adjustments maintaining confidentiality	**Section 4** • Our results reflect a simple average cost per pound, and we performed a regional adjustment to account for cost differences between California and other states, see Exhibit ES-4, 1A above. Our results in range format protect recycler confidentiality.
C. Revenue per pound ranges maintaining confidentiality and reflect market variability	**Sections 4 and 5** • Our results utilized a range in revenue per pound based on grade and fiber type, see Exhibit ES-4, 1C above. Our results in range format protect recycler confidentiality.

Exhibit ES-8
Comparison of Vertical Results: Costs and Revenues by Recycler Type



D. Economic Findings and Conclusions

Study Objective #1 Findings: Conduct an independent economic analysis with commodity revenues and subsidy justification

Current subsidies in combination with PCC sales and other revenue sources adequately cover relevant collection and processing costs and incentivize PCC recycling, production of RO, and use of RO in manufactured products. As a result, PCC fiber types are competitively priced with PI alternatives providing an adequate incentive for manufacturers to utilize PCC versus alternative inputs (see *Section 4* for results by recycler vertical).

An integrated view of recycler types (e.g., CSE/Processor/Manufacturers) provides further and overall substantiation of CARE's current subsidy structure based on the participants' exhibited behavior to sustain their collection, processing, and manufacturing activities and corresponding output levels (see *Section 3* for integrated results). **Even under volatile market conditions, participants' behavior in combination with actual cost and revenue data indicates CARE's recycling rate goals are in reach.**

Study Objective #2 Findings: Demonstrate how the assessment will provide funding to meet the Plan

Crowe provides results of the assessment evaluation in *Section 7* of this report. **The current assessment adequately covers CARE's baseline funding needs to pay for subsidies (at or above target recycling rates), program costs, and maintain a reserve through 2022.** CARE can cover approximately 1.5 times its expenditures through 2022 based on projected carpet sales and funding needs. In summary, CARE will maintain a positive fund balance through 2022 even under stressed conditions (e.g., carpet sales decrease 10, 15, and 20 percent; recycling rate of up to 33%) signaling the current 35-cent assessment per square yard is sufficient to meet the Plan.

Study Objective #3 Findings: Validate Subsidy Justification Model (SJM)

Crowe provides results for SJM validation in *Section 6* of this report. Crowe's methodology and the SJM methodology are different, see Exhibit 6-2 for a comparison. As a result, it is not appropriate to evaluate the SJM based on a direct comparison of results. Despite differences, Crowe and the SJM methodologies came to similar conclusions, providing validation across the two methods (see Exhibit 6-1 for a summary). Both methodologies indicate there is not one number (i.e., subsidy) that fits all recyclers at all points in time; however, our data validates that the subsidies determined by the SJM are at appropriate levels. In addition, the SJM informs changes over time that reflect market activity.

The SJM is a valuable tool, supporting decisions and allowing CARE to iteratively update subsidies to reflect present conditions, refinements, and confirming levels that subsidies should be set at. The SJM was necessary to get to where CARE is now through ongoing evaluation of subsidy levels and providing a mechanism to adjust subsidies to ensure continued program success. The ongoing and increasing participation of recyclers in the CARE program provides further evidence that the SJM is fulfilling its purpose.

Study Objective #4 Findings: Define "critical mass" to allow Crowe to provide actual cost data

We utilized two years of financial data (calendar years 2019 and 2020), a range of simple averages, and a range of regional adjustment for processors to provide actual cost data for Phase 2 results. During this study, we were able to group recyclers together, allowing us to perform comparisons and present results without diluting the value of the analysis and without exposing confidential information. We strongly believe that the results we were able to provide in this Phase 2 Economic Study are dependable and actionable, while protecting confidential business information.

1. Introduction

This report provides the results of Crowe LLP (Crowe's) independent Economic Analysis of PCC recycling for the Carpet America Recovery Effort (CARE). This "Phase 2" study represents an extension of the original cost study Crowe conducted for CARE in 2019. This report is intended to support CARE's 2018-2022 California Carpet Stewardship Plan (Plan) Chapter 0 requirements. This introductory section is organized as follows:

A. Report Overview
B. Purpose of the Economic Study
C. Background of the California Carpet Stewardship Program
D. Current Status of Recycling California PCC.

A. Report Overview

This report is organized into the following eight (8) sections:

1. **Introduction** – Covers the purpose of the economic study, provides a background on CARE and the California Carpet Stewardship Program (CCSP), and provides an overview of carpet recycling and context for the economic analysis
2. **Methodology** – Provides an overview of Crowe's methodology in conducting the economic analysis
3. **An Integrated View of Results** – Provides a program-wide integrated analysis of the study's results
4. **CSE, Processor, and Manufacturer Vertical Results** – Provides a detailed analysis of relevant results related to collecting, processing, and manufacturing with PCC (post-consumer carpet)
5. **Market Revenue Validation Results** – Provides detailed analysis and the results of our commodity revenue validation
6. **Subsidy Justification Model Validation** – Provides detailed analysis and the results of our validation of the Subsidy Justification Model (SJM)
7. **Assessment Evaluation Results** – Provides detailed analysis and the results of our evaluation of the current assessment
8. **Summary of Findings** – Summarizes our analyses and the overall implications of study results.

B. Purpose of the Economic Study

CARE operates the California Carpet Stewardship Program (CCSP) in partnership with and through the oversight of the California Department of Resources Recycling and Recovery (CalRecycle). CARE prepared a five-year Plan, covering 2018 to 2022, to support California's Carpet Stewardship Laws and recovery targets. The Plan's Chapter 0 requirements, developed in December 2018, contain a number of specific provisions and studies, including the commitment to:

- "Conduct and provide to CalRecycle an independent detailed economic analysis to validate the Subsidy Justification and Conversion Cost Models that justifies the assessment based on actual costs of program participants…This must include a summary of the range of costs for collecting, processing, and recycling different materials, along with other programmatic expenditures, that is sufficient to estimate how much overall funding, and therefore what assessment level is needed to achieve the goal of a 24 percent recycling rate by January 1, 2020 and 26 percent by 2022."
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In order to meet these requirements, Chapter 0 commits CARE to the following:

1. CARE will hire an independent firm to conduct an analysis of CARE's Conversion Cost Model (CCM) and SJM to validate accuracy including the costs of collecting/sorting, processing, and recycling PCC. A statistical analysis will be included as part of the independent work. Finally, the independent firm will evaluate the sufficiency of the assessment to meet or exceed the 2020 24% recycling goal.
2. CARE will work with CalRecycle during the analysis process to provide a sufficient level of detail while protecting the confidential business information (CBI) of the recycling community participants… CARE will work to include a description of the range of costs for collecting, sorting, processing and other program expenditure costs while balancing CBI considerations.
3. During analysis of the SJM and CCM, CARE will look at California versus non-California costs along with regional costs within the state. This review will be sensitive to protection of confidential business information.

Phase 1 Study – Cost Analysis of PCC Recycling

In 2018, CARE contracted with Crowe to conduct a cost analysis study to support specific objectives detailed within the Plan's Chapter 0 requirements at the request of CalRecycle. Based on the requirements specified by CalRecycle, the key tasks Crowe sought to address were:

1. Validate the accuracy of the Subsidy Justification and Conversion Cost Models in determining subsidy levels based on actual costs of program participants
2. Determine the range of costs for recycling different PCC materials
3. Demonstrate that the SJM and CCM utilize California costs and evaluate regional cost differences.

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- CalRecycle "suggests Crowe define what it considers a "critical mass" of carpet recyclers, that would enable CARE to conduct another independent analysis that provides quantitative data once the "critical mass" has been reached.
- Crowe reviewed and validated the Conversion Cost Model
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- Revenue was not included in the Phase 1 analysis
- Crowe did not specifically state whether an increase in subsidies would support CARE's achievement of a 24 percent recycling rate and thus the study did not justify the assessment level needed to achieve the goal of 24 percent recycling rate by January 1, 2020 and 26 percent by 2022.

Phase 2 Study – Economic Analysis of PCC Recycling

Building upon the lessons learned from our Phase 1 cost study of PCC Recycling, we are seeking to address CalRecycle's feedback using an approach that incorporates commodity revenues as well as providing numerical results while protecting confidential and proprietary data. Below are four (4) objectives we seek to address through this Phase 2 economic analysis of PCC recycling to support CARE's Chapter 0 requirements:

1. Independent economic analysis with commodity revenues and subsidy justification
2. Demonstrate how assessment will provide funding to meet the Plan
3. Validate Subsidy Justification Model (SJM)
4. Define [and utilize a] "critical mass" to allow Crowe to provide actual cost data.[10]

Between 2019 and 2020, there were a total of 28 companies[11] receiving subsidies from CARE: 6 standalone CSEs, 4 CSE-Processors, 3 CSE-Processor-Manufacturers, 3 Processor-Manufacturers, and 12 standalone manufacturers. Of these companies, Crowe surveyed a total of 26 companies from July 2020 to March 2021 and received, from 22 recyclers, detailed cost information and estimated revenue data from 2019 and 2020[12]. We analyzed the financial data for 96 percent of the combined subsidized volume among the two years.

We describe our approach to meet the study's objectives in the next section of this report. The Crowe team has over thirty years of experience working on recycling policies and programs in California, and nearly 20 years of experience conducting cost of recycling surveys in support of California's beverage container recycling program.

C. Current Status of California Carpet Recycling

While performing this study, Crowe was mindful of the COVID-19 pandemic's impact on the status of California carpet recycling. In 2018 and 2019, the CCSP, through CARE's management, generated progressive increases to California's carpet recycling rate. To sustain and continue this growth, in mid-March 2020, CARE implemented a COVID-19 Action Plan, which included several financial and strategic initiatives to support CCSP participants through this volatile period. In particular, CARE increased its per pound subsidy rates paid to CSEs, processors, and manufacturers, as detailed in **Exhibit 1-1.**

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[10] Crowe provided actual cost data to CalRecycle in a confidential report.

[11] In late 2020, a processor-manufacturer acquired a CSE-processor, and became an integrated CSE-processor-manufacturer.

[12] 2020 includes a mix of half to full year data. We received limited financial data for the remaining four companies.

Exhibit 1-1
Summary of CARE's Subsidies – 2019 to 2021

Category	2019 per lbs.	March/July 2020 (COVID) per lbs.	March/July 2020 (COVID) Δ%	April 2021 (Tile) per lbs.	April 2021 (Tile) Δ%	July 2021 (Post-COVID) per lbs.	July 2021 (Post-COVID) Δ%	2019 vs. July 2021 Δ%
CSE – Broadloom (Recycling)	**0.02**	**0.04**	100%	0.04	0%	0.02	-50%	0%
CSE – Broadloom (Reuse)	**0.10**	**0.10**	0%	0.10	0%	0.10	0%	0%
CSE – Tile (Recycling or Reuse)	**0.05**	**0.05**	0%	0.05	0%	0.05	0%	0%
CSE – Tile (Reuse)*	**0.10**	**0.10**	0%	0.30	200%	0.30	0%	200%
Processor – Nylon 6	**0.10**	**0.15**	50%	0.15	0%	0.10	-33%	0%
Processor – Nylon 66	**0.10**	**0.15**	50%	0.15	0%	0.10	-33%	0%
Processor – PET	**0.10**	**0.15**	50%	0.15	0%	0.10	-33%	0%
Processor – PP	**0.10**	**0.15**	50%	0.15	0%	0.10	-33%	0%
Processor – PC4	**0.17**	**0.17**	0%	0.17	0%	0.17	0%	0%
Processor – Tile	**0.10**	**0.10**	0%	0.30	200%	0.30	0%	200%
Processor – Nylon 6 HR**	**0.05**	**0.05**	0%	0.05	0%	0.05	0%	0%
Processor – Nylon 66 HR**	**0.05**	**0.05**	0%	0.05	0%	0.05	0%	0%
Manufacturer – Nylon 6	**0.10**	**0.25**	150%	0.25	0%	0.10	-60%	0%
Manufacturer – Nylon 66	**0.10**	**0.13**	30%	0.13	0%	0.10	-23%	0%
Manufacturer – PET	**0.25**	**0.25**	0%	0.25	0%	0.25	0%	0%
Manufacturer – PP	**0.25**	**0.25**	0%	0.25	0%	0.25	0%	0%
Manufacturer – PET Pellet***	**0.11**	**0.11**	0%	0.11	0%	0.11	0%	0%
Manufacturer – PP Pellet***	**0.05**	**0.05**	0%	0.05	0%	0.05	0%	0%

** CSE receives both tile (reuse) and tile (recycling or reuse) subsidies when tile is being reused*
*** Processor receives both the 5-cent Highest Recyclability (HR) subsidy and either the Nylon 6 or 66 subsidy*
**** Manufacturer receives both pellet and non-pellet subsidy when pellets are being manufactured*

Our study accounts for these subsidy increases as well as fluctuations in carpet material sales prices. The results we represent in this report are reflective of the subsidies bolded in Exhibit 1-1. It is extremely important to note the following:

- The status of California carpet recycling is an ever-changing environment that directly faces broad market pressures
- The subsidy adjustments made by CARE reflect an on-going effort to adapt to both small and significant changes as a result of both regular market fluctuations and substantial fluctuations caused by force majeures.

D. Background of the California Carpet Stewardship Program

The CCSP was established in 2010 by AB2398 (Perez, Statutes of 2010, Chapter 681) and further defined in 2017 with the passage of AB1158 (Chu, Statutes of 2017, Chapter 794). AB729 (Chu, Statutes of 2019, Chapter 680) requires the Stewardship organization (CARE) to establish an escrow account in event that current carpet stewardship plan expires and replaces the current assessment with a differential assessment. AB2398 provides the foundation and the structure of the CCSP, while AB1158 and AB729 provide additional program requirements.

As defined in statute, the purpose of AB2398 was to "increase the amount of postconsumer carpet that is diverted from landfills and recycled into secondary products or otherwise managed in a manner that is consistent with the state's hierarchy for waste management practices pursuant to Section 40051."[13] AB2398 further specified that "it is in the interest of the state to establish a program, working to the extent feasible with the carpet industry and related reclamation entities, to increase landfill diversion and recycling of postconsumer carpet generated in California."

AB1158 added specificity to the program and established the 24 percent recycling rate to be achieved by January 1, 2020. In addition, AB1158 included provisions such as:

- Requiring a carpet stewardship plan to achieve that goal, with quantifiable 5-year and annual goals
- Providing data for CalRecycle to evaluate the effectiveness of the program
- Prohibiting subsidies for engineered solid waste conversion (cement kilns and waste to energy)
- Creating an Advisory Committee
- Requiring the Department of General Services to recycle carpet and purchase carpet with PCC

[13] Section 40051 identifies the priority of waste management practices as: 1) source reduction; 2) recycling and composting; 3) environmentally safe transformation and environmentally safe disposal.

- Specifying requirements for the assessment
- Specifying a subsidy/grant structure that incentivizes highest recyclability (although not defining the term).

The requirements of the carpet stewardship plan provide further insight into the legislative intent behind AB1158. The Carpet Stewardship Plan is to describe how CARE will:

- Increase PCC recycling and reduce PCC disposal
- Increase collection of PCC and improve convenience of collection
- Expand and incentivize markets for products made from PCC
- Increase processor capacity, including within California
- Increase the recyclability of carpet.

Ultimately, these carpet stewardship laws are intended to create an industry-driven effort to reduce landfill disposal of post-consumer carpet and increase the recycling rate to 24 percent by January 1, 2020, with further increases annually. The added specificity in the statutes are intended to further support those objectives.

2. Methodology

This section describes Crowe's methodology to conduct an independent economic study of PCC recycling to support CARE's Chapter 0 requirements. We first provide an overview of our overall approach, including a description of key tasks and associated activities to meet the study's objectives. We then describe how we developed both an *integrated* and *vertical* framework to adequately evaluate CARE's current subsidies and planned PCC recycling goals through 2022. This section is organized as follows:

A. Overall Approach
B. Determining Integrated Results
C. Determining Vertical Results.

A. Overall Approach

Our objective in conducting this study was to support CARE's Chapter 0 requirements within the 2018-2022 CCSP Plan. Specifically, we developed our overall approach based on the following four (4) CalRecycle Chapter 0 requirements:

1. Conduct an independent economic analysis with commodity revenues and subsidy justification
2. Demonstrate how the assessment will provide funding to meet the Plan
3. Validate Subsidy Justification Model (SJM)
4. Define "critical mass" to provide actual cost data.

Exhibit 2-1 provides an overview of the key tasks we performed to meet the four (4) Chapter 0 requirements as part of this Phase 2 economic study of PCC recycling. In the remainder of this section, we primarily describe our overall approach to conduct this study (e.g., an overview of fieldwork activities, data collection and analysis, development of results, etc.). We provide detailed descriptions of our methodology and key assumptions to perform supplementary analyses within the following sections of the report:

- In *Section 5 – Market Validation Results*, we describe our research and consolidated market data analyses to validate commodity revenue prices for PCC and alternatives
- In *Section 6 – Subsidy Justification Model Validation*, we describe key tasks to support the third objective detailed in Exhibit 2-1
- In *Section 7 – Assessment Evaluation Results,* we describe key tasks to support the second objective detailed in Exhibit 2-1.

Exhibit 2-1
Phase 2 Economic Study of PCC Recycling Objectives and Tasks

1. **Independent economic analysis with commodity revenues and subsidy justification**
   - Average cost per pound by recycler type for CSEs and Processors
   - Cost to use PCC versus other inputs for Manufacturers
   - Market prices and anecdotal price data for sales revenue per pound

2. **Demonstrate how assessment will provide funding to meet the Plan**
   - Confirm subsidy levels for remainder of Plan
   - Use CARE's Financial Model to determine sales projections
   - Evaluate coverage at different carpet sales and recycling rates

3. **Validate Subsidy Justification Model (SJM)**
   - Calculate subsidies needed to incentivize PCC use based on #1
   - Compare to existing subsidies and SJM
   - Evaluate structure and assumptions in SJM

4. **Define "critical mass" to allow Crowe to provide actual cost data[14]**
   - Provide numerical results
   - Simple average costs per pound and regional adjustments maintaining confidentiality
   - Revenue per pound ranges maintaining confidentiality and reflecting market variability

[14] Crowe provided actual cost data to CalRecycle in a confidential report.

Summary of Economic Study Key Activities

Crowe conducted a number of activities to perform this Phase 2 economic analysis of PCC recycling. Key activities included: surveying recyclers, completing site files, performing quality control processes, and compiling and analyzing data.

1. Notification and Scheduling

Crowe initially intended to begin scheduling recycler surveys in April 2020. We delayed implementation of the survey until summer 2020 in response to the uncertainty created by the unfolding COVID-19 pandemic. Crowe prepared notification letters and a project description handout for CSEs/Processors/Manufacturers. After obtaining approval from CARE, Crowe emailed notification letters and the project description to participants. The letters identified the purpose of the study, described the study methodology, and described confidentiality procedures. Crowe developed a cost build-up template to assist recyclers in determining costs specific to carpet recycling. The collector version of the cost build-up template is provided in **Exhibit 2-2.** Crowe contacted recyclers starting in mid-July to schedule the first of two virtual meetings, described below.

Exhibit 2-2
Cost Build-Up Template

CA-PCC Cost Build-Up Form - Collectors

Overview: The objective of this form is to identify 2019 (and partial 2020) costs, by category, associated with collecting California post-consumer carpet (CA-PCC).

Cost Build-Up Form

Instructions: Use column B to enter 2019 costs involved in the handling of CA-PCC. If your operation handles only CA carpet, you can enter costs directly from your financial documentation. If your operation handles other materials or carpet from other states, you may need to prorate some costs based on share of input/recycling output (RO), labor, or by load. For example, transportation costs related to the collection of CA-PCC can be estimated based on costs per load to transport materials to another recycler or processor. Add additional rows to include cost categories, if needed. Use column C to enter partial costs for 2020. In the Notes section, identify the months included. You may add any other clarifications in the notes column. If you have questions, please reach out to the Crowe team.

Cost Category	2019 Costs	2020 Partial Costs	Notes
Wages			
Benefits	$ -	$ -	
Health Insurance			
Worker's Compensation			
Payroll Tax			
Other			
Transportation	$ -	$ -	
Hauling fees - incoming			
Hauling fees - outgoing			
Truck insurance			
Fuel			
Truck maintenance			
Other			
Rent	$ -	$ -	
Facility			
Equipment			
Property tax			
Other			
Depreciation	$ -	$ -	
Equipment			
Trucks			
Facility			
Other			
Utilities	$ -	$ -	
Electricity			
Gas			
Telephone/internet			
Waste disposal			
Other			
Maintenance	$ -	$ -	
Equipment			
Facility			
Other			
Miscellaneous	$ -	$ -	
Safety/training			
Supplies			
Other			

2. Conduct Remote Fieldwork

The Crowe team conducted remote field work starting in July 2020 and completed in March 2021. In general, Crowe conducted two (2) telephone/virtual interviews with recyclers – the first interview was to discuss the objectives of the study and to request financial information for 2019 and partial 2020 calendar years. The second interview was to review and clarify the recyclers' financial information. During each interview, Crowe discussed PCC recycling activities conducted by site employees, and reviewed financial and labor information (when available). **Exhibit 2-3** summarizes recycler participation.

Exhibit 2-3
Summary of Recycler Participation

Category	Number Receiving Subsidies	% Subsidized Volume	Number Surveyed	Number Providing Financial Information*	% Volume Analyzed within Category	# of Recycling Phases in Program
CSE only	6	~5%	6	6	100%	1
CSE-Processor	4	~1%	3	3	96%	2
CSE-Processor-Manufacturer	3	~80%	3	3	100%	3
Processor-Manufacturer	3	~5%	2	2	30%	2
Manufacturer Only	12	~10%	12	9	79%	1
Total	**28**	**100%**	**26**	**22**	**96%**	

**A few recyclers provided shipping costs only.*

3. Completing Files

Following the fieldwork, Crowe prepared site files for each recycler. All files and project documentation were maintained on a secure SharePoint site accessible only to the Crowe project team and a site administrator. The site files included a Site Memorandum that summarized activities at the site, financial information provided by the recycler, and the completed cost build-up files. We prepared a cost build-up for each recycler/recycler activity that summarized the financial and labor information provided by the recycler (i.e. for a company that operated as a CSE, Processor, and/or Manufacturer, we created one cost build-up for each activity). The cost build-ups summarized total costs, total pounds, cost per pound, and when applicable, operating costs by category. Cost categories included: labor, all other labor (AOL – benefits, worker's compensation), transportation, rent, property tax, depreciation, supplies, fuel, utilities, interest, insurance, and maintenance.

4. Quality Control and Review

Once the survey team completed the file, we began the three-step quality control review process. First, one of the project team members that did not conduct the site visit conducted a thorough review of the site file documentation. When the initial reviewer had questions about the site file, they submitted review comments back to the team members. Once the initial reviewer approved the site file, Crowe's Certified Public Accountant (CPA) Partner on the project team conducted a review of the site. When the CPA Partner had review questions, she submitted the file back to the team for their response. Once the file passed through the CPA Review, the Project Director conducted an additional review in order to finalize the files for data compilation and analysis.

5. Data Compilation and Analysis

Once the recycler files were submitted and reviewed, Crowe began the data analysis phase of the project. We compiled total PCC costs, volumes, wage data, and costs by category (labor, rent, transportation, etc.) into separate worksheets by recycler phase (e.g., Collection, Processing, Manufacturing) as well, by recycler category (e.g., CSE-Processor-Manufacturer, etc.). Compiling each dataset into a stand-alone format facilitated further analysis. We then developed integrated and vertical results, described in the remainder of this section.

B. Determining Integrated Results

This study's original intent was to meet CARE's Chapter 0 obligations by determining costs and revenues for the three (3) recycler categories: CSEs, Processors, and Manufacturers. In *Section 4* of the report, we meet CARE's Chapter 0 obligations by presenting relevant study results for CSEs, Processors, and Manufacturers. Yet, the "vertical" results presented in *Section 4* do not necessarily convey the overall integration between recyclers throughout the PCC recycling chain. We conducted additional analyses to provide an integrated perspective of the economics of carpet recycling that provide a holistic view of what PCC recyclers actually experience and to convey the complexity of this program. Below are the key components of generating the integrated results:

- Create recycler groups using each of the five (5) recycler categories (CSE only, CSE-Processor, CSE-Processor-Manufacturer, Processor-Manufacturer, and Manufacturer)
- For each group, sum the total costs and total combined revenues (CARE subsidies/grants and carpet/pad sales) across 2019 and 2020. These costs and revenues are reflected by category (company type), and account for collected material that is used internally within processing and manufacturing operations.
- For each group, generate the percentage of cost coverage by dividing the total costs and total combined revenues (excluding manufacturer sales) across 2019 and 2020. The end result is a reflection of the CARE subsidy program as a whole.

In *Section 3* of this report, we present specific numerical results for the CSE-Processor-Manufacturer category only as this category represents over 80 percent of total subsidized volume for 2019 and 2020 combined. We are able to show these results without exposing confidential business information (CBI) due to the distribution among recyclers in this category. Overall, by performing this analysis, Crowe effectively evaluated the CARE subsidy program from a holistic perspective.

C. Determining Vertical Results

To meet the study's original intent to meet CARE's Chapter 0 obligations, we provide relevant results at each PCC recycling phase – collection, processing, and manufacturing. The vertical results we generated support the integrated results. Below, we provide our methodology to general vertical results for collection, processing, and manufacturing. For collection and processing, we analyze three components (1) cost to recycle; (2) cost and revenue differentials; and (3) cost categories. For manufacturing, we compared the cost of using PCC against the price of purchasing the competitive post-industrial (PI) materials.

Determination of PCC Collection Results

We determined PCC collection results for each component which are based on actual costs and estimated revenues from 12 recyclers, nine (9) California-based recyclers and three (3) out-of-state recyclers, that received CARE CSE subsidies in 2019 and 2020. The main assumption for the collection results is:

- We treated each CSE as a standalone CSE that sells all their collected material to a processor for recycling or reuse, depending on recycler.[15]

Due to confidentiality concerns, we could not present results by individual recycler or calculate weighted average costs. Instead, to compare CSE costs, Crowe organized CSEs into three groups: A, B, and C, summarized in **Exhibit 2-4.**

Below, we provide our calculation methodologies for each comparison:

- **Cost to Recycle Comparison –** For each group, calculated by taking the simple average cost per pound results for CSEs in 2019 and 2020, separately, then performing another simple average to combine 2019 and 2020 together, then presenting the results as a range. We then compared each group to analyze differences. This provided a range of numerical results without exposing CBI.
- **Cost-Revenue Differential Comparison –** For each group, we compared the cost to recycle from above against average carpet sales and subsidy revenues and included carpet pad revenue. Sales revenue were based on anecdotal recycler data and subsidy revenue was based on blended rates across 2019 and 2020. We then compared each group to analyze differences. This provided a range of numerical results without exposing CBI.
- **Cost Category Comparison –** For each group, we totaled the costs in each category and represented them as percentages to show the proportions of each cost category. We then compared each group to analyze differences. This provided numerical results without exposing CBI.

[15] In reality, the vast majority of collected material is used within an internal processing operation.

Exhibit 2-4
CSE Groups

Group	Size	Region	# of Recyclers	% of Subsidized Collection Volume	Description	Volume per Recycler
A	Large	CA	4	>98%	"Large" CSEs collecting all materials, most of these recyclers have other verticals such as processing and manufacturing. Therefore, the results for this group do not provide a full perspective	Recyclers with >1% of total collected volume
B	Small	CA	5	<1%	"Small" CSEs collecting mostly tile, all recyclers in this group are standalone CSEs. Therefore, the results for this group provides a full perspective	Recyclers with <1% of total collected volume
C	Small	Non-CA	3	<1%	"Small" non-CA CSEs collecting mostly tile, all the recyclers in this group are also processors. Therefore, the results for this group do not provide a full perspective	Recyclers with <1% of total collected volume

Determination of PCC Processing Results

The PCC processing results[16] are based on actual costs and estimated revenues from six recyclers: two (2) California-based recyclers and four (4) out-of-state recyclers, that received CARE processing subsidies in 2019 and 2020. The main assumption for the procession results is:

- Treated each processor as a standalone processor that purchases all their whole carpet from a CSE and sells all their processed material to a manufacturer.[17]

Due to confidentiality concerns, we could not present results by individual recycler or calculate weighted average costs. Instead, to compare processor costs, Crowe organized processors into two groups: California and Non-California processors, summarized in **Exhibit 2-5.**

Exhibit 2-5
Processor Groups

Group / Region	# of Recyclers	% of Subsidized Processor Volume	Group Description
California Processors	2	~80%	Vast majority of processed volume, all are integrated CSE-Processor-Manufacturers
Non-California Processors	4	~20%	Minority of processed volume, mix of CSE-Processors, CSE-Processor-Manufacturers, and Processor-Manufacturers,

Below, we provide our calculation methodologies for each comparison:

- **Cost to Recycle Comparison –** For each group, we performed a regional adjustment to provide separate cost per pound results for California and non-California processors (more information below), presented as a range. We performed a comparison with and without PC4 volume to evaluate differences. We then compared each group to analyze differences. This provided a range of numerical results without exposing CBI.

[16] Crowe excluded two (2) small volume out-of-state processors because these recyclers only provided shipping costs.

[17] In reality, there are no standalone processors, the vast majority of whole carpet self-collected, and a significant portion of processed material is used in an internal manufacturing process.

- **Cost-Revenue Differential Comparison –** For each group, we compared the cost to recycle from number 1 above against average carpet sales and subsidy revenues for Nylon 6/ PET/ PP and Nylon 66. Sales revenue were based on anecdotal recycler data and subsidy revenue was based on blended rates across 2019 and 2020. In addition to the prime fiber subsidy, we included an additional 4 cents per pound to reflect PC4 subsidy on a per pound basis.[18] We then compared each group to analyze differences. This provided a range of numerical results without exposing CBI.
- **Cost Category Comparison –** For each group, we totaled the costs in each category and represented them as percentages to show the proportions of each cost category. We then compared each group to analyze differences. This provided numerical results without exposing CBI.

Crowe organized processors as California and non-California, performed our regional adjustment process, and presented results with and without PC4 volume. Both 2019 and 2020 costs are combined into a single result per combination. In the end, we calculated costs per pound for California and non-California, with and without PC4. To generate processor costs, we performed a multi-step process that involved utilizing economic adjustment indicators for the various regions across the U.S. (e.g., CA, AZ, GA, SC) and processor costs and entering them a regional adjustment model created by Crowe. This process is performed separately by year and with and without PC4 volume. We then took a simple average of the results from each year, presented in this report as a range, to generate the final results.

Exhibit 2-6 shows an example regional adjustment calculation process to adjust CA and non-CA recycler costs. *These are mock numbers to serve as an example only.* Note that only six (6) columns A-C, G, I and L are presented within the official results to preserve confidentiality. The impact of each indicator is dependent on the related cost category and its share of total costs. For example, an increase in weekly wages, which is tied to labor, will have a higher impact than an increase in shipping costs, which is tied to transportation, which represent a much smaller portion of costs. We regionally adjusted 2019 and 2020 results separately, and then averaged the two years together to come up with a single result, presented in this report as a range. Additionally, we calculated the costs with and without PC4 volume to show the results using the two methods.

[18] PC4 represents about a quarter of subsidized processed volumes and has a subsidy of 17 cents per pound. To calculate the PC4 subsidy on a per pound basis, we took a quarter of 17 cents, which is rounded to 4 cents per pound.

Exhibit 2-6
Example Processor Regional Adjustment Calculation (Mock Cost Numbers)

Shown	*Shown*	*Shown*	*Hidden*	*Hidden*	*Hidden*	*Shown*	*Hidden*	*Shown*	*Hidden*	*Hidden*	*Shown*
				Regional Share			Adjustment				
A	B	C	D	E	F	G	H	I	J	K	L
			= C x $1.20	= D x 80%	= D x 20%		= F + (F x G)	= E + H	= E - (E x G)	= F	= J + K
Cost Category	Adjustment Indicator	% of Costs	Costs	CA	Non-CA	CA Increase	Increase to Non-CA Share	CA Adjusted Total	Decrease to CA Share	Non-CA Total	Non-CA Adjusted Total
Labor	Weekly Wages	22.1%	$ 0.265	$ 0.212	$ 0.053	34%	$ 0.071	$ 0.283	$ 0.139	$0.053	$ 0.192
Benefits	Health Insurance	8.1%	0.098	0.078	0.020	-8%	0.030	0.108	0.038	0.020	0.058
	Workers Compensation					110%					
Transportation	Shipping Cost per Pound	3.7%	0.044	0.035	0.009	-88%	0.001	0.036	0.066	0.009	0.075
Rent	Industrial Rent	5.5%	0.067	0.053	0.013	48%	0.020	0.073	0.027	0.013	0.041
Utilities	Industrial Electricity	8.0%	0.096	0.077	0.019	108%	0.040	0.117	(0.006)	0.019	0.013
All Other Categories	None	52.6%	0.631	0.505	0.126	0%	0.126	0.631	0.505	0.126	0.631
Total		100.0%	**$ 1.200**					**$ 1.247**			**$ 1.010**

Crowe evaluated and took these costs into account when determining costs without PC4.[19] All other processors claimed there were no additional costs associated with the PC4 byproduct – they are in the business of producing PCC fiber, not PC4. Diverting PC4 from landfills is an important benefit of CARE's subsidy program and it contributes to RO. However, performing a cost comparison without PC4 provides a more like-for-like comparison among all processors and more accurately reflects processor business and pricing decisions.

Exhibit 2-7 provides a summary of the economic indicators we used to make the CA and non-CA regional adjustments for 2019. This summary shows a range in rates across the different regions. The two California jurisdictions applying to processors have higher weekly wages, higher rents, and higher utility rates than the other states. Similar adjustments were made to 2020 costs.

[19] Although all processors generate PC4, they may not report all to CARE to receive a subsidy.

Exhibit 2-7
Regional Differences in Labor, Benefits, Transportation, Rent, and Electricity Costs (2019)

Category	Adjustment Indicator	Unit	CA-LA[7]	CA-Sac[7]	AZ[8]	GA[9]	SC[10]
Labor	Weekly Wages[1]	$/week	1,368	1,368	1,029	1,077	879
Benefits	Health Insurance[2]	$/person	439	439	471	487	552
Benefits	Workers Compensation[3]	Index	2.87	2.87	1.30	2.27	1.95
Transportation	Shipping Cost per Pound[4]	$/pound	< non-CA	< non-CA	> CA	> CA	> CA
Rent	Industrial Rent[5]	$/sqft/yr	10.84	7.89	6.98	4.66	5.67
Utilities	Industrial Electricity[6]	$/kWh	13.26	13.6	6.39	7.04	6.08

[1] *Source: Bureau of Labor Statistics. Average Weekly Wage in Private Total, all industries for All establishment sizes by State. 2019.*

[2] *Source: Kaiser Family Foundation. Average Benchmark Premiums for second-lowest cost silver (benchmark) premium for a 40-year-old in each county and weighted by county plan selections. 2019.*

[3] *Source: Information Technology & Research Section, Central Services Division, Oregon Department of Consumer and Business Services. Workers Compensation Index. 2018 (latest available data).*

[4] *Source: Recycler actual shipping costs. Relationship instead of numerical costs provided to protect confidentiality.*

[5] *Source: Cushman & Wakefield. Q4 2019 U.S. Industrial MarketBeat Report. Industrial Rent. 2019.*

[6] *Source: U.S. Energy Information Administration. Table 5.6.B. Average Price of Electricity to Ultimate Customers by End-Use Sector, industrial electricity rate.*

[7] *Industrial rent is the only adjustment indicator we used that differentiates CA by city.*

[8] *Average costs based on either Phoenix or State of Arizona, depending on indicator.*

[9] *Average costs based on either La Grange or State of Georgia, depending on indicator.*

[10] *Average costs based on either Johnsonville or State of South Carolina, depending on indicator.*

Determination of PCC Manufacturing Results

Our PCC manufacturing results consist of two (2) components: 1) PCC purchase price results by fiber type and 2) PCC pricing trade-off results by fiber type. The results for each component are based on PCC purchasing data collected from nine (9) manufacturers, two (2) California-based manufacturers and seven (7) out-of-state manufacturers, that received CARE manufacturing subsidies in 2019 and 2020. It is important to note that our PCC manufacturing results *do not* reflect actual costs to manufacture an end product with PCC. Rather, our PCC manufacturing results *highlight the PCC purchase price by fiber type on a per pound basis (i.e., the cost per pound by fiber type to purchase PCC from processors).* This distinction is important because a stand-alone manufacturer's decision to utilize California PCC is based on the purchase prices of potential inputs, not the cost of manufacturing.

Below, we describe our methodologies for each component:

- **PCC Purchase Price Results by Fiber Type –** Crowe observed that manufacturers are concerned with the purchase price of fiber inputs to produce an end product. We wanted to compare what manufacturers are generally paying for specific fiber inputs (e.g., N66, N6, and PET/PP) versus the total actual cost of collecting and processing PCC on a per pound basis. To make this comparison, we leveraged our cost per pound results for collecting and processing PCC and generated a rolled up "collected and processed" cost per pound, presented as a range. We then identified what manufacturers paid for N66, N6, and PET/PP, on average, to indicate generally how much the subsidies at the collection and processing levels "discount" the purchase price of processed PCC. The overall intent of this analysis provides an indication of the program subsidies' impact on the manufacturer purchase price of PCC fibers.
- **PCC Pricing Trade-Off Results by Fiber Type –** Crowe observed that manufacturers compare the full cost to obtain PCC with the cost of alternatives. To validate this "trade-off" decision or comparison that manufacturers make, we first developed rolled-up costs per pound to obtain PCC results by fiber type inclusive of: PCC purchase price (with a risk factor[20]), transportation costs, applicable centrifuge costs, and applicable pelletization costs. We then compared these rolled-up results to the costs to purchase PI alternatives to quantify the "trade-off" between PCC inputs versus PI inputs. We then confirmed that the differential between the cost of manufacturing PCC and purchasing the PI alternative was generally what the CARE subsidy needs to cover to incentivize the use of PCC.

[20] Based on industry norms, and consistent with the SJM, we valued the risk factor that manufacturers consider when purchasing PCC at approximately of 15 cents to more accurately reflect their decision-making process.

3. An Integrated View of Results

This study's original intent was to meet CARE's Chapter 0 obligations by determining costs and revenues for the three (3) recycler categories: CSEs, Processors, and Manufacturers. In *Section 4* of the report, we meet CARE's Chapter 0 obligations by presenting relevant study results for CSEs, Processors, and Manufacturers. Yet, the "vertical" results presented in *Section 4* do not necessarily convey the overall integration between recyclers throughout the PCC recycling chain. In this section, we provide an integrated perspective of the economics of carpet recycling to provide a holistic view of what PCC recyclers actually experience and to convey the complexity of this program. This section is organized as follows:

A. *Overview of PCC Recycler Categories*
B. *Integration Across PCC Recycler Categories*
C. *Integration of the Study Results*
D. *Implications.*

A. Overview of PCC Recycler Categories

Participants in the California Carpet Stewardship Program (CCSP) generally fall into five (5) business model categories based on the PCC recycling activities they perform and the subsidies they receive from CARE for performing the specific recycling activity (i.e., collection, processing, or manufacturing). These five (5) business model categories reflect one or a combination of the PCC recycler categories. It is important to distinguish the nuances between each business model category to understand the overall integration across recyclers, including the dependencies and relationships they form with one another to make PCC recycling economically viable. In **Appendix A,** we summarize the motivations of each business model category to provide additional context of what we observed as part of this study.

In **Exhibit 3-1,** we describe each of the five (5) business model categories and identify the number of PCC broadloom and tile recyclers[21] within each business model category. Specifically, we identify primary drivers that provide a sense of recycler motivations, as well as each category's significance to the program. It is important to realize that different types of support are needed for each category in order to properly incentivize continued use of PCC. For perspective of each business model's footprint within the entire PCC recycling chain, we provide a breakdown of the total subsidized volumes, for 2019 and 2020 combined, across the five (5) business model categories in **Exhibit 3-2.** Note that these are rounded numbers to protect recycler confidentiality.

[21] Includes entire participant population, including ones for which we did not receive financial information.

Exhibit 3-1
Summary of PCC Recycling Business Model Categories

Category	Description	Broadloom*	Tile**
CSE only	• Receives subsidies to collect all PCC fiber types and/or only collects carpet tile and sell to a processor • CSE only recyclers focus on covering costs at the collection level only • One high volume collector of all materials and many small collectors • This category provides additional input volume for the system • The primary drivers for this category are to collect as many pounds of PCC as possible at the lowest cost possible and to maximize padding during collection to supplement profitability	5	7
CSE-Processor	• Receives subsidies to collect and process, tile only • A few low volume tile collector-processors, who need tile to make new tile. Processing occurs outside of CA • This category provides the demand for tile recycling • The primary driver for this category is company goals to use PCC tile to make new tile and to provide closed loop recycling for customers	None	4

Category	Description	Broadloom*	Tile**
CSE-Processor-Manufacturer	• Receives a collection subsidy to collect all materials to primarily be used in own processing operation (may also sell whole carpet to other processors, such as tile) • Receives a processing subsidy to process primarily own collected material (may also purchase additional whole carpet to process) • Receives a manufacturing subsidy to manufacture products using primarily own processed material • Three high volume integrated CSE-Processor-Manufacturers representing the bulk of the entire program, accounting for the vast majority of the collection and processed volume, and half of the manufactured volume. Actions made by recyclers in this category have significant influence on the entire system • The primary drivers for this category are the end user markets that generate demand for this category and the demand from other PCC manufacturers. Can control all verticals of PCC recycling and aims to maximize RO and efficiency, directly faces market pressures	3	None
Processor-Manufacturer	• Receives a processing subsidy to process purchased whole collected carpet • Receives a manufacturing subsidy to manufacture feedstock using primarily own processed material • A few mid volume companies, processing and manufacturing outside of CA, where shipping is the prime cost component • The primary driver for this category is the end user market demand for use of recycled content, these companies directly face market pressures	3	None

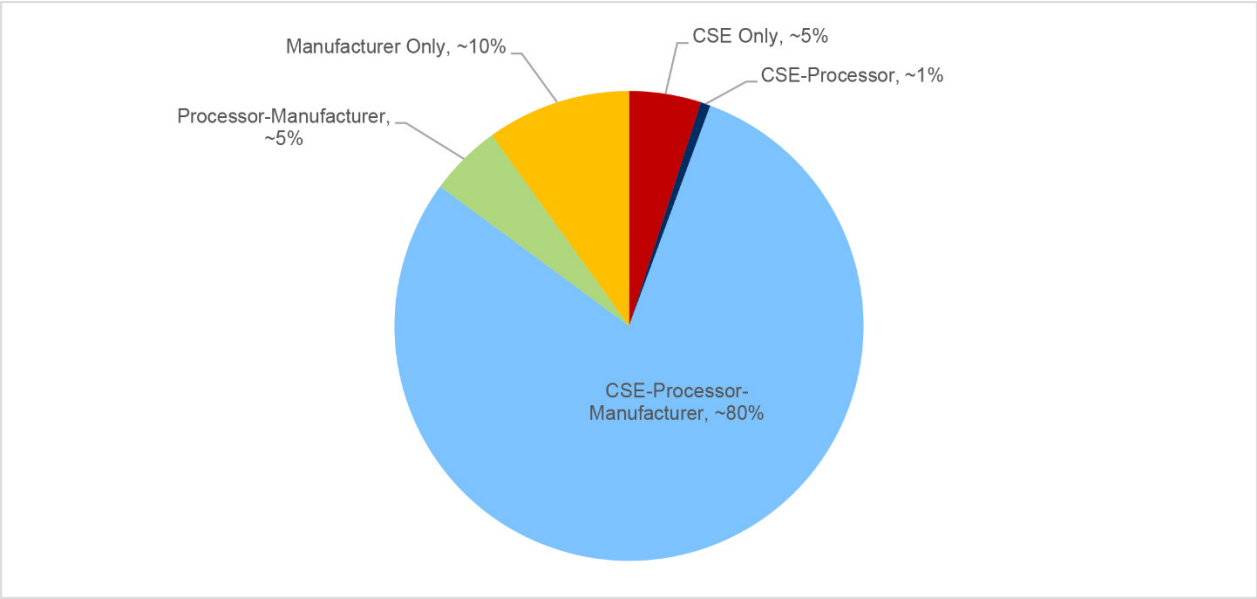
Carpet America Recovery Effort

Category	Description	Broadloom*	Tile**
Manufacturer Only	• Purchases processed fiber from processors primarily from CA • Several mid to low volume standalone manufacturers, all of which are outside of CA where shipping is the prime cost component • This category is critical to the program's success given that if these companies did not purchase recycled output (RO), there would be no end-user markets for about half of the RO, these companies directly face market pressures • The primary driver for this category is to supplement a Post Industrial (PI) alternative material at a lower cost than the cost to purchase the PI alternative plus the cost of risk of using post-consumer content	12	None
Total		**23**	**11**

** Treats Planet Recycling and Aquafil as a CSE-Processor-Manufacturer*

*** Includes LAF and CP acting as standalone CSEs, and Planet Recycling as a Tile Recycler*

Exhibit 3-2
Breakdown of Total Subsidized Volumes Across Business Model Categories



B. Integration Across PCC Recycler Categories

In this subsection, we present the overall integration across PCC recyclers by carpet type – broadloom carpet and carpet tile. Although some participants recycle both carpet types, we present the overall integration across PCC recycler categories for broadloom carpet and carpet tile separately due to the following reasons:

- Recycled Output (RO): Broadloom carpet and carpet tile produce different RO types. Broadloom carpet is collected as whole carpet, which is then processed into separated fiber with captured PC4 as a byproduct. Carpet tile is collected as whole tile and then processed as separated tile fiber.
- Total Subsidized Volumes: For combined 2019 and 2020, broadloom carpet encompassed roughly 95% of total RO, whereas, carpet tile encompassed less than 5% of total RO.
- Subsidy Structure: Broadloom carpet is subsidized based on the actual costs to collect and process, which is then further subsidized at the manufacturing level to make it competitive with post-industrial (PI) alternatives. Carpet tile generally requires a higher subsidy to collect and process because it is more labor intensive to remove, sort, and stack and often involves shipping to out-of-state processors who are mostly in Georgia.

PCC Recycler Integration – Broadloom Carpet

In 2019 and 2020, broadloom carpet recyclers generated the majority of RO and are essential for driving the overall success of the program. In particular, broadloom carpet recyclers are represented across four (4) PCC recycling business models: CSE only, CSE-Processor-Manufacturer, Processor-Manufacturer, and Manufacturer only. Recycled broadloom carpet can generally be made into a wide range of end products. As a result, broadloom carpet has exposure to a broader market in comparison to tile carpet. Demand for broadloom carpet is driven by a combination of the demand of specific PCC fibers to produce end products and the overall program subsidies that "discount" PCC fibers making them competitive on a price basis with PI alternatives.

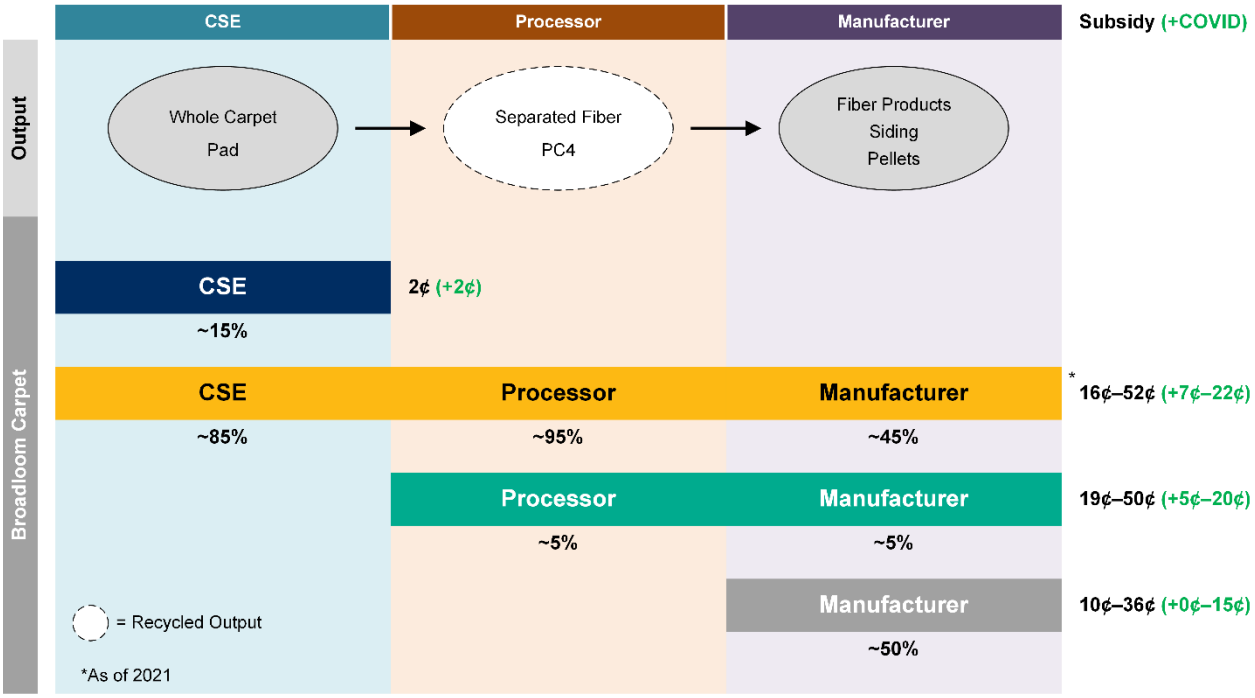
Exhibit 3-3 illustrates the integration of broadloom carpet recyclers from each business model category in 2019 and 2020. Companies that perform across PCC recycling phases receive subsidies across phases (and fiber types). The subsidies incentivize and support their overall carpet recycling businesses, not necessarily the individual category that the subsidy is directed to. Below are additional highlights:

1. **CSE only:** This group represents five (5) companies that collected roughly 15 percent of the total subsidized volumes at the collection level in 2019 and 2020. In 2019, this group earned two (2) cents per pound and in 2020 earned four (4) cents per pound to collect PCC.
2. **CSE-Processor-Manufacturer:** This group represents three (3) companies that performed the vast majority of PCC recycling in 2019 and 2020. Specifically, these three (3) companies reported approximately 80 percent of total subsidized volumes to CARE, as illustrated in Exhibit 3-2. This group collected roughly 85 percent of all PCC, processed roughly 95 percent of all PCC, and manufactured nearly one half of all PCC subsidized volumes reported to CARE. In total, individual companies within this group could earn roughly 16 cents per pound to 59 cents per pound[22], depending on the fiber type, based on total subsidized volumes reported to CARE at the collection, processing and manufacturing levels.

[22] It is important to note the maximum possible subsidy per pound of whole carpet collected will experience a yield of roughly 60 to 70% for face fiber, 25 to 35% for PC4, and leaving 5 to 15% of waste. Therefore, from an operational perspective, the percentage yield should be accounted when calculating total possible subsidy from whole carpet to processed fiber or manufactured product. For example, a pound of PET whole carpet to PET pellets, would have a maximum possible subsidy between 34 to 40 cents (pre-COVID) and 39 to 46 cents (COVID). The lower end of the pre-COVID subsidy for PET pellets is calculated as follows: (2 cents for collection) + (10 cents for processing * 70% yield) + (17 cents for processed PC4 *30% yield) + (36 cents for manufacturing * 70% yield) = ~39 cents for total maximum subsidy realized.

3. **Processor-Manufacturer:** This group represents three (3) companies and reported roughly five (5) percent of subsidized PCC volumes at the processor level and roughly (5) percent of subsidized PCC volumes at the manufacturer level. In total, individual companies in this group could earn anywhere from 29 cents per pound to 55 cents per pound, depending on fiber type, based on the total subsidized volumes reported to CARE at the processing and manufacturing levels.
4. **Manufacturer Only:** This group represents twelve (12) companies and reported roughly one half of PCC subsidized volumes at the manufacturing level. Individual companies in this group could earn anywhere from 10 cents per pound to 36 cents per pound, depending on fiber type, based on the total subsidized volumes reported to CARE at the manufacturing level.

Exhibit 3-3
PCC Recycling Integration – Broadloom Carpet



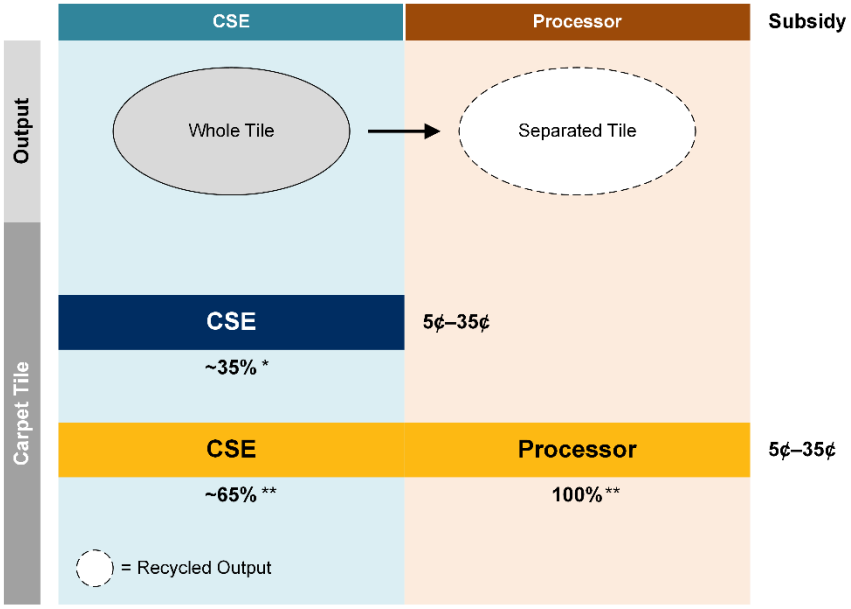
PCC Recycler Integration – Tile Carpet

In 2019 and 2020, carpet tile recyclers generated a minority of RO. Yet, carpet tile recycling presents an opportunity to grow overall program RO in the near to midterm. Most carpet tile are sourced from commercial buildings as a result of C&D projects. These recyclers are represented across CSE only and CSE-Processors. Currently, recycled carpet tile is exclusive made into new tile and directly competes against PI tile. Ultimately, demand is driven by company goals to make new tile out of recycled tile and to provide closed-loop recycling for their carpet tile customers.

Exhibit 3-4 illustrates the integration of tile carpet recyclers in each category in 2019 and 2020. With tile carpet recycling, the dynamics are quite different compared to broadloom. The two unique challenges and cost drivers are: (1) Incentivizing C&D companies to remove carpet tile earlier so it isn't too contaminated to recycling (the new 20 cents should help here); and (2) covering the costs of shipping from California to Georgia so that the tile manufacturers (the processor step in this case) are willing to utilize California post-consumer tile. The current high shipping costs make this step more challenging. Below are additional highlights:

1. **CSE only:** This group represents seven (7) companies that collected roughly 35% of the total subsidized volumes at the collection level in 2019 and 2020. This group can earn a range of 5 cents to collect carpet tile for recycling and 35 cents to collect carpet tile for reuse.
2. **CSE-Processor:** This group represents four (4) companies that collected roughly 65% of the total subsidized volumes at the collection level and 100 percent of subsidized volumes at the processor level in 2019 and 2020. This group can earn a range of 5 cents to 35 cents per pound to collect and process carpet tile.

Exhibit 3-4
PCC Recycling Integration – Tile Carpet



*Includes LAF and CP acting as CSEs.

**Includes Planet Recycling acting as a CSE-Processor

C. Integration of the Study Results

In this subsection, we present the percentage of costs that are covered by estimated revenues for the CSE-Processor-Manufacturer group. We calculate the percentage of costs covered by estimated revenues to demonstrate how recyclers actually envision the economics of PCC recycling – through an integrated perspective of total cost coverage rather than through a vertical perspective. We specifically focus on the study results of the integrated CSE-Processor-Manufacturer recyclers, which represent three (3) California-based companies, given that they reported over 80 percent[23] of total subsidized volumes in 2019 and 2020 combined.

Our integration results consist of the following five (5) components: 1) total PCC costs of integrated group, 2) total per pound CARE subsidy, 3) total carpet sales revenue, 4) total padding sales revenue, and 5) total disbursed grants revenue. We calculated the percentage of cost coverage by taking total PCC costs divided by the sum of all revenue sources for the three largest recyclers combined across 2019 and 2020. *Revenues exclude manufacturer sales revenue (e.g. carpet cushion, padding, pellets, etc.).*

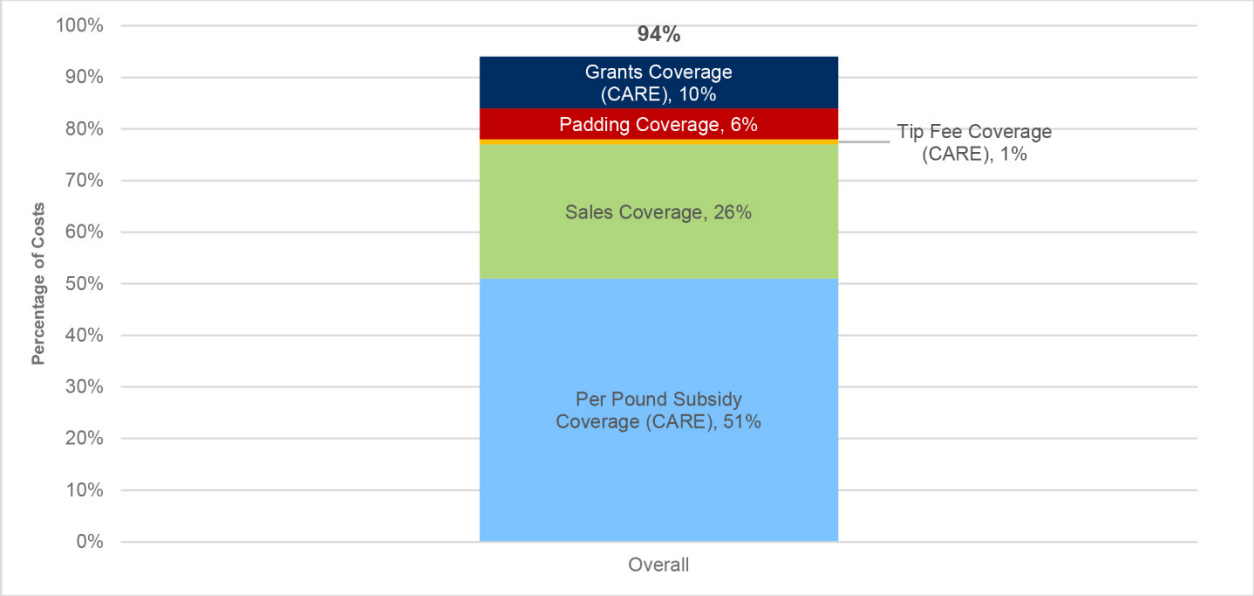
We present integrated CSE-Processor-Manufacturer results in **Exhibit 3-5**, as well as visually in **Exhibit 3-6.**

[23] CSE-only and manufacturer-only groups represent the remaining 20 percent of subsidized volumes reported in 2019 and 2020 combined. Standalone CSEs costs are fully covered by a mix of revenue sources (e.g., subsidies, carpet and padding sales). Standalone manufacturers' shipping costs are covered by the CARE's subsidy.

Exhibit 3-5
Summary of Integrated CSE-Processor-Manufacturer Results

Public/ Private Funds	Revenue Component	Estimated Percentage of Costs Covered	Revenue Description
Public Funds	CARE Per Pound Subsidies	51%	CARE's subsidies at the collection, processing and manufacturing levels
Public Funds	CARE Grant Disbursements	10%	Grant funds provided (disbursed) to support capacity improvements
Public Funds	CARE Collection Tipping Fee	1%	A collection tipping fee provided upon accepting CARE DoS loads
Private Funds	Estimated Carpet Sales Revenue	26%	Based on estimated revenue on volumes not utilized in processing
Private Funds	Estimated Padding Sales Revenue	6%	Based on estimated revenue on padding volumes reported
Total		**94%**	

Exhibit 3-6
CSE-Processor-Manufacturer Integration Results



In determining whether CARE's subsidies provide adequate incentives to promote PCC recycling and use of PCC in end-products, we considered the differential between the costs to recycle as compared to the resulting revenue. The underlying assumption is that, on average, the costs must be roughly equivalent to the revenue for a company to be incentivized to utilize PCC. Thus, our coverage analysis shown in Exhibit ES-2 measures the extent to which the costs to utilize PCC (for the integrated CSE-Processor-Manufacturers) are covered by the various revenue sources. The coverage results presented in Exhibit 3-5 and 3-6 indicate that associated costs for the majority of subsidized PCC volumes in 2019 and 2020 were covered by a combination of revenue sources.

The 94 percent coverage figure represents a conservative number because revenue generated from sales of end-products are not incorporated in the analysis.[24] Thus, our analysis shows that manufacturer revenue from selling end-products only needs to cover a six percent gap for manufacturers to break-even. This is a small margin that we can confidentially state will be met by end-product sales.[25] **Our results combined with the continued participation of recyclers clearly demonstrate that subsidies provide an adequate incentive to meet program objectives.** Our analyses further confirm that CARE's subsidies are necessary to incentivize PCC recycling in California; without incentives, PCC recycling would not be economically viable or sustainable.

D. Implications

We believe an integrated approach is necessary to assess whether the subsidies effectively incentivize PCC collection, processing, and manufacturing. In particular, an integrated perspective provides a realistic understanding of the cost and revenue drivers that form the economics of PCC recycling. **Our analyses demonstrate that the current subsidies are providing a level of cost coverage that adequately incentivizes program participants to collect, process, and manufacture California PCC**. Additionally, our analyses demonstrate the following:

- Subsidies bridge the gap between costs to recycle and revenue (sales prices) to incentivize participation in the program and production of recycled output
- The program would not be achieving the current level of recycled output and manufacturers would not be utilizing recycled output without subsidies
- The reasonableness of current subsidies is also supported by market activity and the recycling rate. The results of the program further validate subsidies: recycled output is increasing, and manufacturers are using PCC, even in an extremely challenging year.

[24] In order to provide a consistent comparison, Crowe did not incorporate manufacturers' end-product revenue in the analysis. End-products made from PCC vary widely – for example carpet padding, erosion control, plastic pellets, or house siding – revenue from these products varies widely as well. Furthermore, as we discuss Section 4, the key decision point for manufacturers to utilize PCC is the price differential between processed PCC fiber and alternative inputs to their manufacturing processes.

[25] To provide a conservative estimate of end-product revenue we calculated a coverage level of 105 percent by assuming that end-product revenue was equivalent to the price manufacturers pay for processed fiber. Since manufacturers add value to the processed fiber they purchase when they manufacturer products, we know that the actual coverage will be greater than 105 percent.

4. PCC Collection, Processing, and Manufacturing Vertical Results

In this section, we provide relevant results at each PCC recycling phase – collection, processing, and manufacturing. The results presented in this section support the integrated results of PCC recycling presented in *Section 3*. Our results are based the approach and survey activities described in *Section 2*. This section is organized as follows:

A. Overview of Results
B. PCC Collection Results
C. PCC Processing Results
D. PCC Manufacturing Results.

A. Overview of Results

Overall, our results indicate that CARE subsidies are an effective tool for incentivizing the use of PCC. For the collection phase, CSE costs are generally covered with the combination of carpet/pad sales and CARE subsidy revenue. For the processing phase, a significant majority of California processor costs are covered, and all non-California processor costs are covered. Finally, at the manufacturing phase, which focuses on the differential between the cost of PCC and the PI alternative, CARE subsidies provide adequate coverage of the differential. It is very important to note that our results in this section are comparisons of each phase, separately. Although comparing each recycler phase separately provides one perspective, a more realistic representation of the CARE subsidy program is to view the results holistically, from an integrated view. Our results combined 2019 and 2020 calendar years. Below we provide highlights of our results and assumptions:

- **Collection:** The combination of carpet sales and CARE subsidies generally allow a CSE to break-even and become profitable by selling carpet pad. The main assumption for this comparison is that we are treating each CSE as a standalone CSE that sells all their collected material to a processor for recycling or reuse, depending on recycler. However, in reality, the vast majority of collected material is used within an internal processing operation.
- **Processing:** A significant majority of California processor costs are covered, and all non-California processor costs are covered. The main assumption for this comparison is a standalone processor that purchases all their whole carpet from a CSE and sells all their processed material to a manufacturer. In reality, as there are no standalone processors, the vast majority of whole carpet is self-collected, and a significant portion of processed material is used in an internal manufacturing process.

- **Manufacturing:** CARE subsidies provides adequate coverage of the differentials for each fiber type. The results we provide reflect a snapshot in time, but in reality, manufacturers face pricing decisions and situations that fluctuate over time. Only half of manufactured volume (measured as PCC recycled output) is used by stand-alone manufacturers, the other half of recycled output is used by integrated collectors, processors, and manufacturers.

Throughout our analysis, we emphasize the importance of focusing on an integrated view of results rather than individual phases. However, by performing these comparisons, we were able to build an integrated perspective, which is more reflective of a recycler's situation. We provide further details and implications of our results in the remainder of this section.

B. PCC Collection Results

Our PCC collection results consist of the following three components: 1) PCC collection cost per pound results, 2) PCC collection cost differential per pound results, and 3) PCC collection cost category results. The results for each component are based on actual costs and estimated revenues from 12 recyclers, nine (9) California-based recyclers and three (3) out-of-state recyclers, that received CARE CSE subsidies in 2019 and 2020. As described in *Section 2 Methodology*, we grouped CSE recyclers into three categories based on the following criteria presented in **Exhibit 4-1.**

Exhibit 4-1
CSE Groups

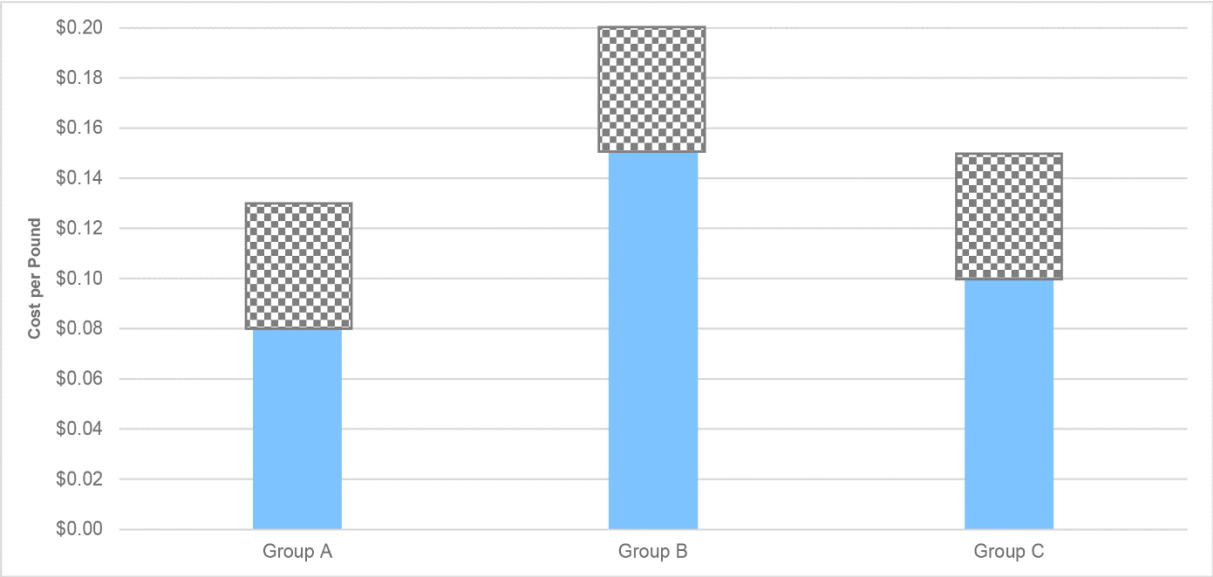
Group	Size	Region	# of Recyclers	% of Subsidized Collection Volume	Description	Volume per Recycler
A	Large	CA	4	>98%	"Large" CSEs collecting all materials, most of these recyclers operate in other verticals such as processing and manufacturing. Therefore, the results for this group does not provide a full perspective.	Recyclers with >1% of total collected volume
B	Small	CA	5	<1%	"Small" CSEs collecting mostly tile, all recyclers in this group are standalone CSEs. Therefore, the results for this group provides a full perspective.	Recyclers with <1% of total collected volume
C	Small	Non-CA	3	<1%	"Small" non-CA CSEs collecting mostly tile, all the recyclers in this group are also processors. Therefore, the results for this group do not provide a full perspective.	Recyclers with <1% of total collected volume

1. PCC Collection Cost per Pound Results

Our PCC collection cost per pound results reflect the simple average cost per pound to collect PCC for each group described in Exhibit 4-1. We calculated the simple average cost per pound to collect PCC for each group by dividing total actual costs by subsidized PCC pounds. In **Exhibit 4-2,** we provide our PCC collection cost per pound results for each group. Below is a summary of the results:

- **Group A's cost per pound range was roughly $0.08 to $0.13 for 2019 and 2020.** Group A represents four (4) large California recyclers that collect all material types (e.g. all types of broadloom and tile). Each member of this group collected more than 1 percent of the total subsidized PCC collection volumes in 2019 and 2020.
- **Group B's cost per pound range was roughly $0.15 to $0.20 for 2019 and 2020.** Group B represents five (5) California recyclers that predominately collect carpet tile and each recycler in this group represent less than 1 percent of total collected volume in 2019 and 2020. The higher costs of Group B are primarily driven by generally immature collection networks, since some in this group recently started collecting, and inefficiencies due to low collection volumes.
- **Group C's cost per pound range was roughly $0.10 to $0.15 for 2019 and 2020.** Group C represents three (3) out-of-state recyclers that predominately collect carpet tile and each recycler in this group represents less than 1 percent of total collected volume in 2019 and 2020. The costs for Group C only include shipping/ transportation costs of tile from CA to their processing sites across the country, which are the only costs unique to recycling California PCC for this group.

Exhibit 4-2
PCC Collection Cost per Pound Results by Group



2. PCC Collection Cost Differential per Pound Results

Our PCC collection cost differential per pound results indicate the estimated margin (i.e., the difference between estimated revenue and actuals costs) each group makes on a per pound basis for collecting PCC. In 2019 and 2020, Group A and Group B generated revenue from three sources: 1) PCC sales revenue from collected carpet, 2) CSE subsidy revenue excluding tipping fee payments from CARE drop-off site loads[26] and the monthly reporting incentive[27] and 3) sales revenue from collected carpet padding. Group C generated revenue from the same sources as Group A and B with the exception of carpet pad sales revenue given that this group only collects carpet tile. For each group, we calculated estimated revenue per pound by taking the average revenue per pound by material type, multiplied by the number of subsidized pounds of processed material. *The main assumption for this comparison is that we are treating each CSE as a standalone CSE that sells all their collected material to a processor for recycling or reuse, depending on recycler. However, in reality, the vast majority of collected material is used within an internal processing operation,* which reiterates the importance of an integrated perspective.

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[26] Tipping fee payments were excluded due to the vast majority going to a single CSE, which would not be reflective of the group. A tipping fee that varies between 1.7 to 3.5 cents per pound ($33 to $70 per ton) is given to a CSE when DoS material is accepted. Some CSEs will receive more tipping fee revenues than others depending on the DoS volume they receive.

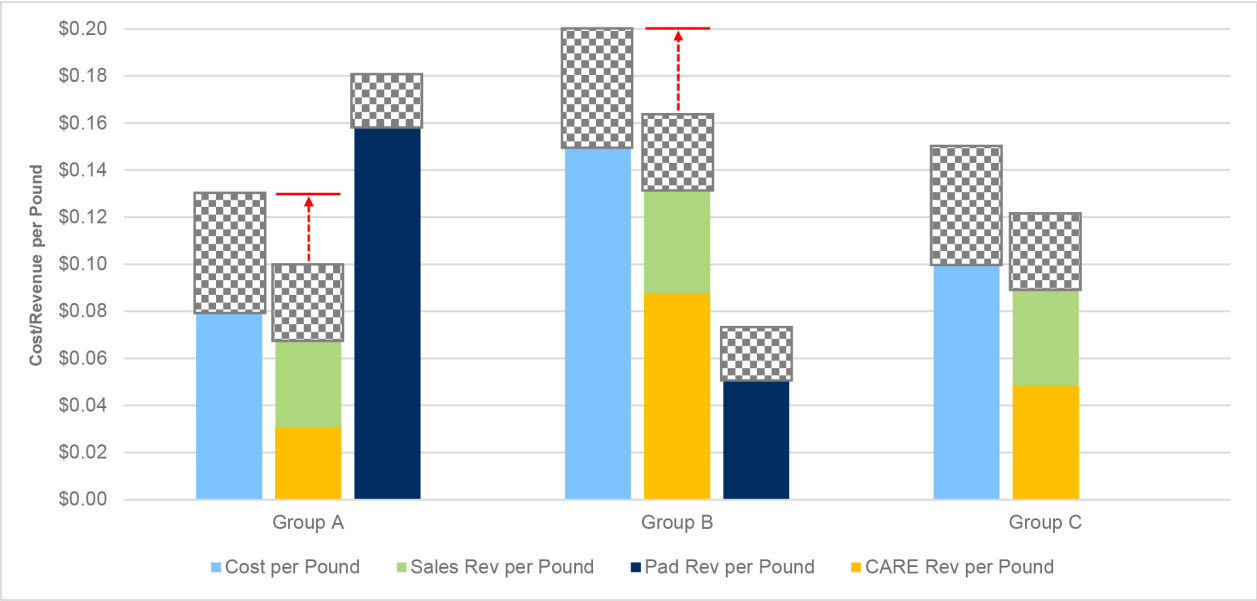
[27] The $1,000 monthly reporting incentive was excluded as it is only available to new/low volume/standalone CSEs.

In **Exhibit 4-3**, we provide our PCC collection cost differential per pound results, presented as a range, which includes both the simple average cost per pound results and estimated revenue per pound by source for each group. The red arrow on top of the sales and CARE revenue bar indicates the estimated per pound margin without carpet pad revenue. Below is a summary of the results:

- **Group A's cost per pound results are slightly higher than its estimated revenue per pound results (without carpet pad revenue).** Group A's estimated PCC sales revenue covers approximately one half of its costs on a per pound basis. CSE subsidy revenue inclusive of tipping fee payments from CARE's drop-off site load covers roughly one third of Group A's costs on a per pound basis. Group A's estimated per pound margin is approximately -6 cents to +2 cents without carpet pad revenue. Carpet pad revenue allows Group A CSEs to be profitable. All four (4) recyclers in this group reported carpet pad. Since Group A represents over 95 percent of total collected volume, the results from Group A are representative of the CARE collection program.
- **Similar to Group A, Group B's cost per pound results are also slightly higher than its estimated revenue per pound results (without carpet pad revenue).** Group B's estimated PCC sales revenue covers approximately one third of its costs on a per pound basis. The CSE subsidy revenue inclusive of tipping fee payments from CARE's drop-off site load covers roughly one half of Group B's costs on a per pound basis. Group B's estimated per pound margin is approximately -7 cents to +1 cents, without carpet pad revenue. Carpet pad is reported for some, and some collected, but did not report carpet pad to CARE. Carpet pad revenue allows CSEs that collect it to be profitable.
- **Group C's cost per pound results are roughly equal to its estimated revenue per pound.** This indicates Group C's costs to collect PCC (transportation costs) are generally covered by its estimated revenue. Group C does not collect any carpet pad and therefore has no revenue associated with pad.

It is important to note that the variability in CARE revenue per pound between the groups is driven by the mix of collected PCC fiber reported to CARE as well as the ratio of recycling and reuse. The selling price for baled Nylon 66 and 6 whole carpet are greater than the price of baled PET and PP whole carpet. The subsidy for broadloom or tile reuse is 14 and 15 cents per pound while recycling is only 4 to 5 cents per pound. Group A has a mix of all material types that include all types of broadloom and tile with 95 percent of volume for recycling, while Group B is primarily tile with only about 70 percent of volume for recycling and 30 percent for reuse. Similarly, variability in carpet padding revenue, which currently averages 17 cents per pound, is driven by whether a CSE reports padding sales. CSEs collecting all materials would typically collect pad as it is usually paired with broadloom. Should CSEs fully report padding sales, estimated margins would be higher.

Exhibit 4-3
PCC Collection Cost Differential per Pound Results



3. PCC Collection Cost Category Results

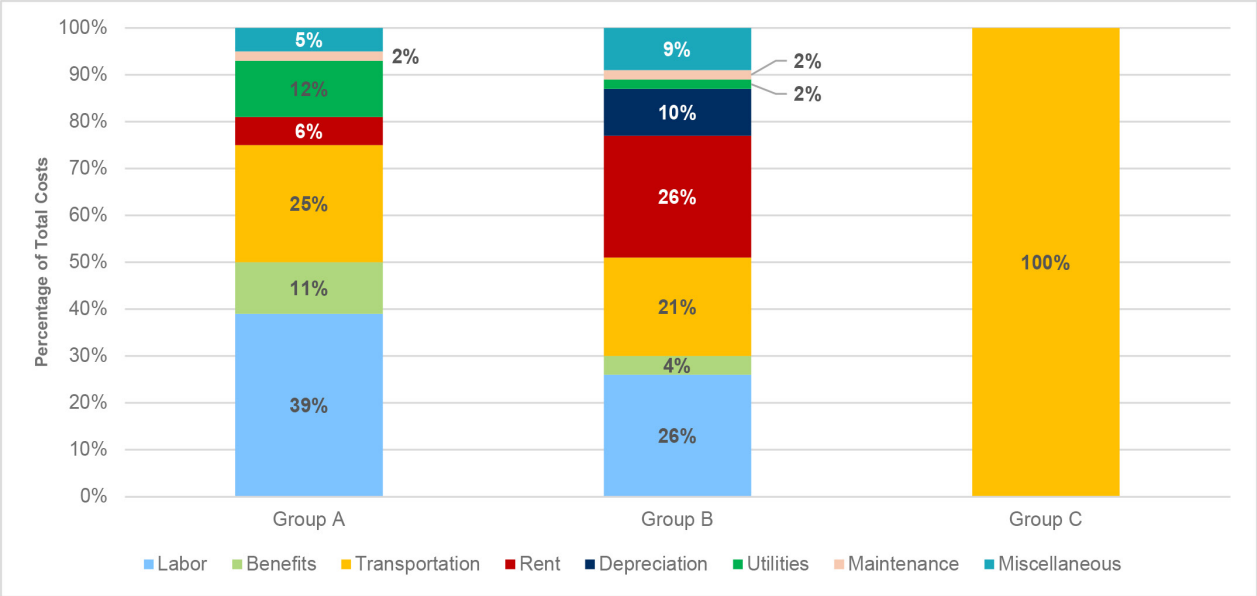
Our PCC collection cost category results provide the overall results of PCC collection costs, as a percentage of total costs for the 12 recyclers, nine (9) California-based recyclers and three (3) out-of-state recyclers, that received CARE CSE subsidies in 2019 and 2020. We identify and discuss specific costs (e.g., labor, transportation, rent, etc.) to highlight categories where the results indicate variability and similarity in costs between the groups.

Exhibit 4-4 provides a breakdown of total PCC collection costs as a percentage, by category, for each group in 2019 and 2020. Below is a summary of the results:

- Group A's top four cost categories are: 1) Direct Labor (39%), 2) Transportation (25%), 3) Utilities (12%), and 4) Benefits (11%). Each of the remaining cost categories account for an additional 13 percent of allowable costs. For Group A, most of the activity is associated with driving to and from collection sites, unloading material with equipment operators, manually sorting and baling material, and the utility costs to run the warehouse, balers, and fuel for forklifts. Labor and truck expenses (e.g. drivers, fuel) are the largest input costs for Group A. A collector may be in an area with a higher cost of labor, but shorter hauling distance, or in an area of a lower cost of labor, but longer hauling distance.

- Group B's top four cost categories are: 1) Direct Labor (26%), 2) Rent (26%), 3) Transportation (21%), and 4) Depreciation (10%). Each of the remaining cost categories account for roughly 17 percent of allowable costs. As these are low volume CSEs, it is expected that the share of fixed costs (i.e. rent) would be a larger portion of total costs. As CSEs increase volume, the percentage of rent should decrease. However, in order for these CSEs to increase volume, as they are mostly tile collectors, additional tile volume may likely come at a higher cost per pound to collect.
- **Group C's only relevant cost category is transportation, which reflects 100% of its applicable PCC collection costs.** The transportation costs for Group C represent the cost to haul material from collection facilities in CA to processing facilities outside of CA, therefore, Group C's costs are proportional to hauling distance and hauling rates. Out-of-state hauling rates have been significantly elevated (2 to 3 or more times higher) for the second half of 2020 and continued in 2021, which impacts these CSEs' ability to continue to collect and ship tile.

Exhibit 4-4
PCC Collection Cost Category Results by Group



Note: Miscellaneous includes general expenses such as administrative expenses, office expenses, supplies, insurance, and interest.

Overall, one half of total PCC collection costs consists of direct labor and benefits. This finding is consistent with other types of recycling operations. Approximately one quarter of total PCC collection costs is transportation related. All of which are driven by Group A as they represent the significant majority of collected volume. Total labor, including benefits, and transportation costs equate to roughly 75 percent of total PCC collection costs – this is within range of beverage container recycling costs in California.

C. PCC Processing Results

Processors are never a standalone operation, they are either a collector-processor, processor-manufacturer, or even a collector-processor-manufacturer. Processors encompass a wide range in size and complexity. Our PCC processing results consist of the following three components: 1) PCC processing cost per pound results, 2) PCC processing cost differential per pound results, and 3) PCC processing cost category results. The results[28] for each component are based on actual costs and estimated revenues from six recyclers: two (2) California-based recyclers and four (4) out-of-state recyclers, that received CARE processing subsidies in 2019 and 2020. In **Exhibit 4-5,** we provide a summary of the processor groups used in this comparison.

Exhibit 4-5
Processor Groups

Group / Region	# of Recyclers	% of Subsidized Processor Volume	Group Description
California Processors	2	~80%	Vast majority of processed volume, all are integrated CSE-Processor-Manufacturers
Non-California Processors	4	~20%	Minority of processed volume, mix of CSE-Processors, CSE-Processor-Manufacturers, and Processor-Manufacturers

[28] Crowe excluded two (2) small volume out-of-state processors because these recyclers only provided shipping costs.

1. PCC Processing Cost per Pound Results

Our PCC processing cost per pound results reflect the simple average cost per pound to process PCC for California-based recyclers and out-of-state recyclers that received CARE processing subsidies in 2019 and 2020. We first calculated the simple average cost per pound to process PCC for both California and out-of-state processor recyclers by dividing total actual costs to process PCC by subsidized PCC pounds. We then adjusted the PCC processing cost per pound results based on key regional economic indicators for specific cost categories (e.g., labor, benefits, transportation, rent etc.) to account for regional differences in costs to process PCC.

In **Exhibit 4-6,** we provide our PCC processing cost per pound results for California and out-of-state processor recyclers with and without PC4.[29] Both results are presented as a range. Below is a summary of the results:

- **California processors:** Average 40 to 45 cents per pound with PC4, and 50 to 55 cents per pound without PC4.
- **Non-California (out-of-state) processors:** Average 30 to 35 cents per pound with PC4, and 40 to 45 cents per pound without PC4.

Without PC4, California processors costs are approximately 30 percent higher than Non-CA. With PC4, CA costs are approximately 25 percent higher than non-CA. This indicates that PC4 is roughly equal in proportion among both California and non-California processors. Therefore, including or excluding PC4 does not bias the comparison between CA and non-CA processors. Ultimately, processor costs without the PC4 byproduct volume allows for a better comparison between processors that do not report PC4[30], or much of it, and the ones that do. There was only one recycler that reported additional costs associated with PC4, which was due to upgrading machinery to extract higher volume and higher quality PC4.

Crowe evaluated and took these costs into account when determining costs without PC4.[31] All other processors claimed there were no additional costs associated with the PC4 byproduct – they are in the business of producing PCC fiber, not PC4. Diverting PC4 from landfills is an important benefit of CARE's subsidy program and it contributes to RO. However, performing a cost comparison without PC4 provides a more like-for-like comparison among all processors and more accurately reflects processor business and pricing decisions.

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[29] The difference between with and without PC4 is whether the processing costs for a recycler are divided by volume including PC4, or volume excluding PC4. With PC4, means including PC4 pounds, without PC4, means excluding PC4 pounds.

[30] Although processors generate PC4, they may not all report it to CARE.

[31] PC4 represents about a quarter of subsidized processed volumes and has a subsidy of 17 cents per pound. To calculate the PC4 subsidy on a per pound basis, we took a quarter of 17 cents, which is rounded to 4 cents per pound.

Exhibit 4-6
Processor Regional Adjustment Calculation

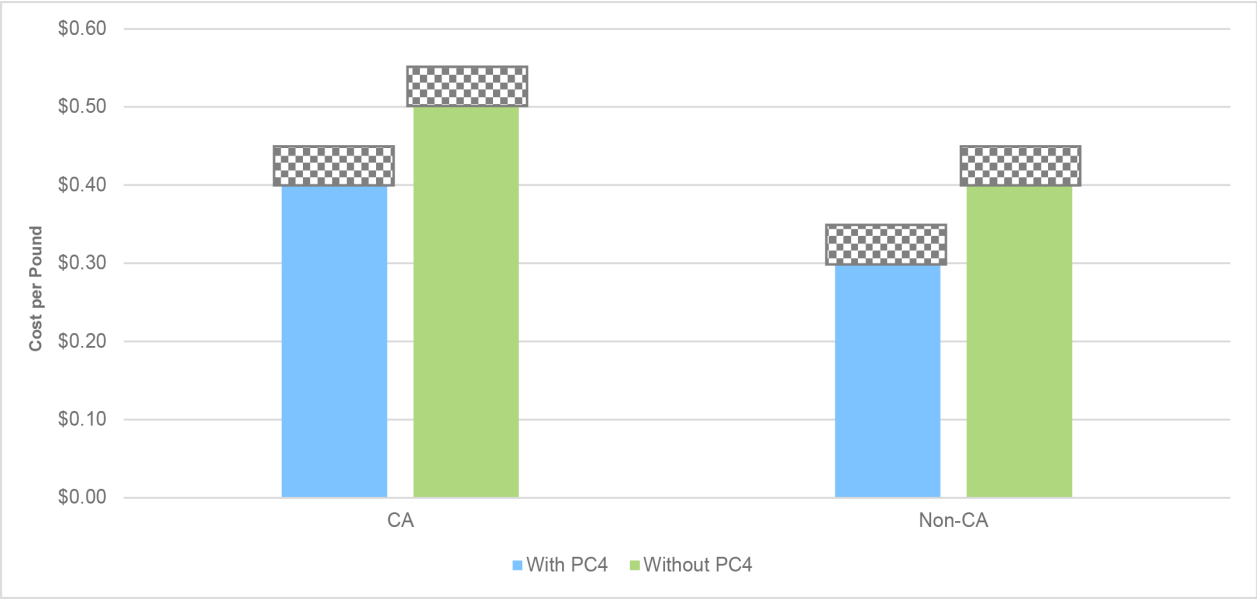


Exhibit 4-7 summarizes the regional adjustment results that support our regionally adjusted PCC processing cost per pound results without PC4 presented in Exhibit 4-6. All adjustment indicators are higher for California-based processors, with the exception of health insurance and shipping.

Exhibit 4-7
Processor Regional Adjustment Calculation (without PC4)

Cost Category	Adjustment Indicator	% of Costs	CA Increase	CA Adjusted Total	Non-CA Adjusted Total
Labor	Weekly Wages	22.5%	37%	[redacted]	[redacted]
Benefits	Health Insurance Workers Compensation	8.0%	-7% 103%	[redacted]	[redacted]
Transportation	Shipping Cost per Pound	4.2%	-91%	[redacted]	[redacted]
Rent	Industrial Rent	5.4%	47%	[redacted]	[redacted]
Utilities	Industrial Electricity	8.6%	132%	[redacted]	[redacted]
All Other Categories	None	51.2%	0%	[redacted]	[redacted]
Total		100.0%		**$0.50 to $0.55**	**$0.40 to $0.45**

2. PCC Processing Cost Differential per Pound Results (without PC4)

Our PCC processing cost differential per pound results indicate the estimated margin (i.e., the difference between estimated revenue and actuals costs) recyclers make on a per pound basis for processing PCC. As PC4 is a byproduct, these comparisons are calculated without PC4 to reflect the differentials of recycling fiber. In 2019 and 2020, processor recyclers generated revenue from two sources: 1) PCC sales revenue from processed carpet and 2) Processor and PC4 subsidy revenue from CARE. We calculated estimated revenue per pound by multiplying the pounds of material processed by the average selling prices and subsidy rates. *The main assumption for this comparison is a standalone processor that purchases all their whole carpet from a CSE and sells all their processed material to a manufacturer. In reality, as there are no standalone processors, the vast majority of whole carpet is self-collected, and a significant portion of processed material is used in an internal manufacturing process.* This reiterates the importance of focusing on the integrated perspective.

We segmented our PCC processing cost differential per pound results by fiber type because nylon 6, polyethylene terephthalate (PET) and polypropylene (PP) have roughly equal selling prices, whereas, nylon 66 has roughly a 50 percent higher selling price. We present the PCC processing cost differential per pound results for Nylon 6, PET and PP in **Exhibit 4-8** and the Nylon 66 results in **Exhibit 4-9.** The red arrow on top of the sales and CARE revenue bar indicates the estimated per pound margin to process PCC. Below is a summary of the results:

- **California processors:** Nylon 6, PET and PP sales revenue and subsidies cover around 40 percent of PCC processing costs each, or about 80 percent combined. Nylon 66 sales revenue covers about a two-thirds of processing costs and nylon 66 subsidies cover the remaining roughly 40 percent of costs. In total, California-based processors' estimated per pound margin is approximately -18 cents to +2 cents.
- **Non-California (out-of-state) processors:** Nylon 6, PET and PP sales revenue and subsidies each cover roughly half of PCC processing costs each, or about 100 percent combined. Nylon 66 sales revenue covers about 75 percent of processing costs, while nylon 66 subsidies cover another 50 percent, totaling about 125 percent of costs. In total, out-of-state processors' estimated per pound margin is approximately -8 cents to +12 cents.

It is extremely important to remember that these standalone processor results are not reflective of actual recycler situations as there are *no standalone processors*. All processors in the program also conduct another phase of recycling such as collecting and/or manufacturing, which significantly improves the dynamics of business operations and profitability.

Exhibit 4-8
Nylon 6, PET, and PP Cost per Pound versus Revenue per Pound

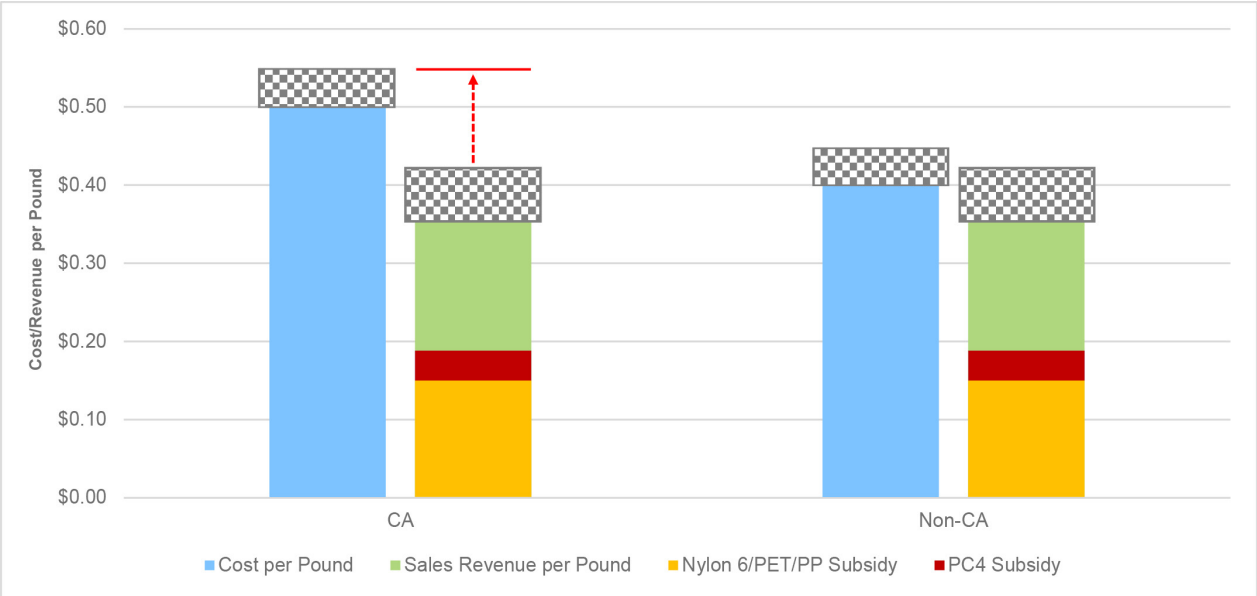
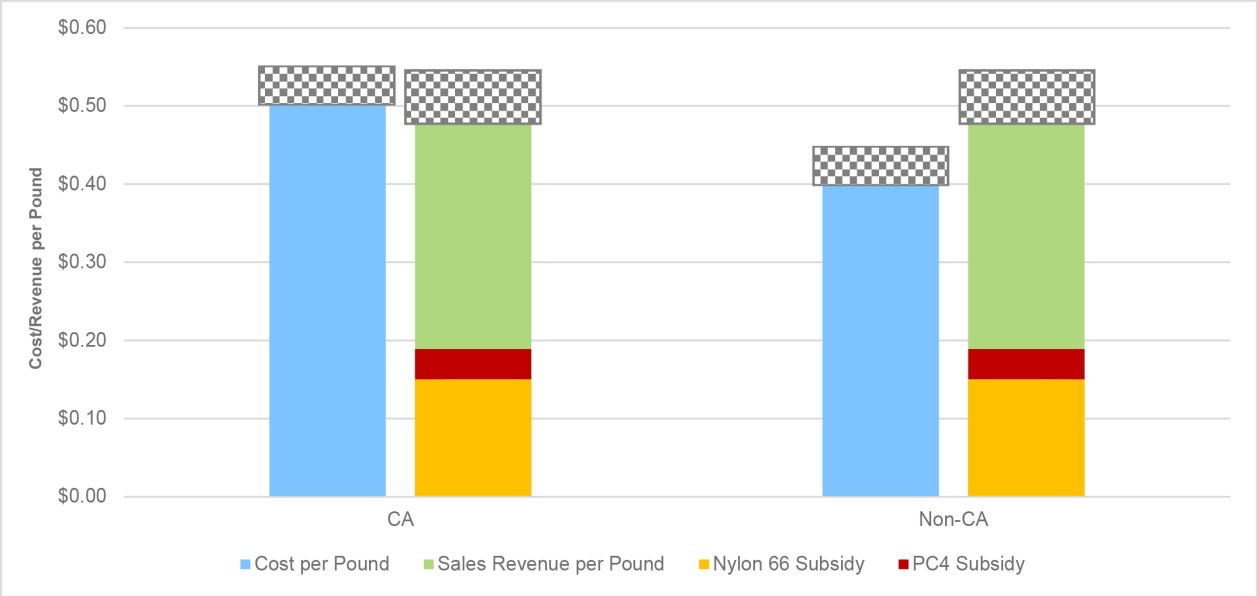


Exhibit 4-9
Nylon 66 Cost per Pound versus Revenue per Pound



3. PCC Processing Cost Category Categories

Our PCC processing cost category results provide the overall results of PCC processing costs, as a percentage of total costs, for the six recyclers; two (2) California-based recyclers and four (4) out-of-state recyclers, that received CARE processor subsidies in 2019 and 2020. We identify and discuss specific costs (e.g., labor, transportation, rent, etc.) to highlight categories where the results indicate variability and similarity in costs between the groups.

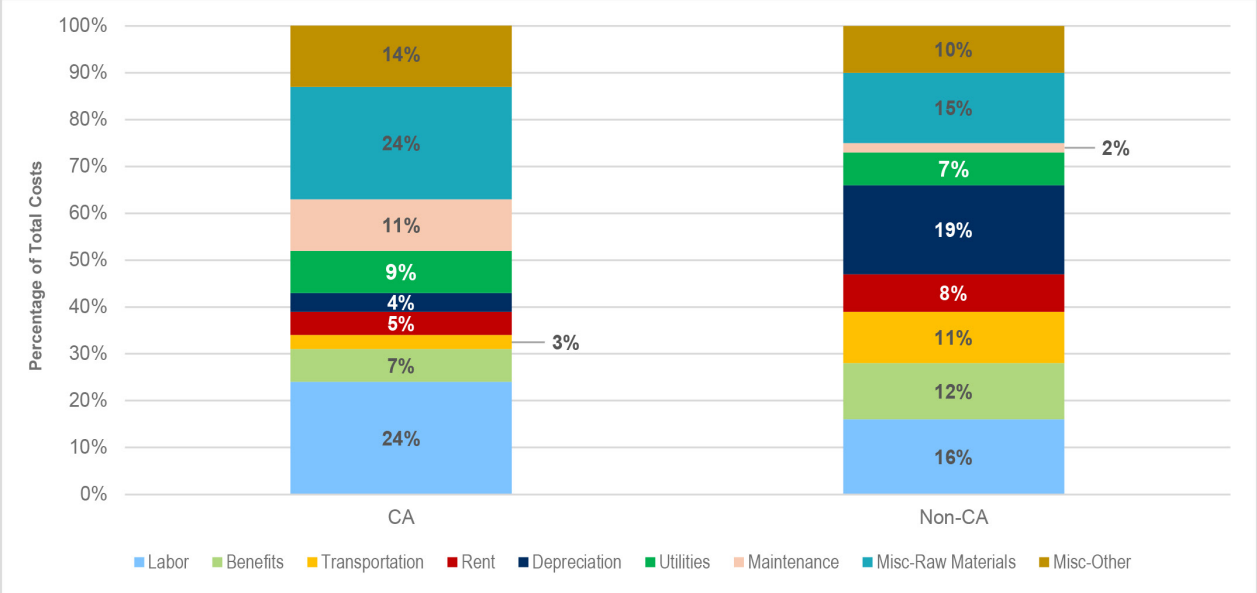
Exhibit 4-10 provides a breakdown of total PCC processing costs as a percentage, by category, for each group in 2019 and 2020. Below is a summary of the results:

- California processors' top four cost categories are: 1) Direct Labor (24%), 2) Raw Materials (whole carpet) (24%), 3) Miscellaneous-Other (14%), and 4) Maintenance (11%). Direct labor and purchasing whole carpet from a CSE are equal in costs and are roughly 50% of total costs combined. Miscellaneous-Other consists primarily of insurance, processing supplies, general expenses, and taxes/licenses. The mix of California processors include a large portion of older equipment, which means less depreciation and more maintenance and repairs.
- Non-California (out-of-state) processors' top four cost categories are: 1) Depreciation (19%), 2) Direct Labor (16%), 3) Raw Materials (whole carpet) (15%), and 4) Benefits (12%). A large portion of the recyclers in this mix have newer equipment which has not been fully depreciated. Depreciation and maintenance are the primary differences between the cost categories of California and non-California processors. Transportation does not show up as a significant portion of processing costs as the hauling distance varies from an adjacent state to across the country. It's important to note that transportation costs starting in mid-2020 have been elevated and our 2019 and 2020 combined results reflect a blend of low to high transportation pricing.

California-based processors process higher volumes of PCC so a higher percentage of whole carpet costs compared to non-California is reasonable. On average, California processors are working with older equipment and therefore have a smaller portion of depreciation and higher portion of maintenance than non-California processors, which have newer facilities and equipment. As expected, the portion of transportation costs for California recyclers is much lower than non-California recyclers, which is about 3.5 times higher. Although the portion of labor costs is significantly higher for California recyclers, when combining labor and benefits, they are roughly equal at 30 percent.

Overall, about a third of PCC processor costs are labor and benefits, while another 20 percent are raw materials (bales of whole PCC carpet) purchased from CSEs, for a combined 50 percent of total costs. The remaining cost categories are about 10 percent each or less.

Exhibit 4-10
Processor Cost Category Allocation



D. PCC Manufacturing Results

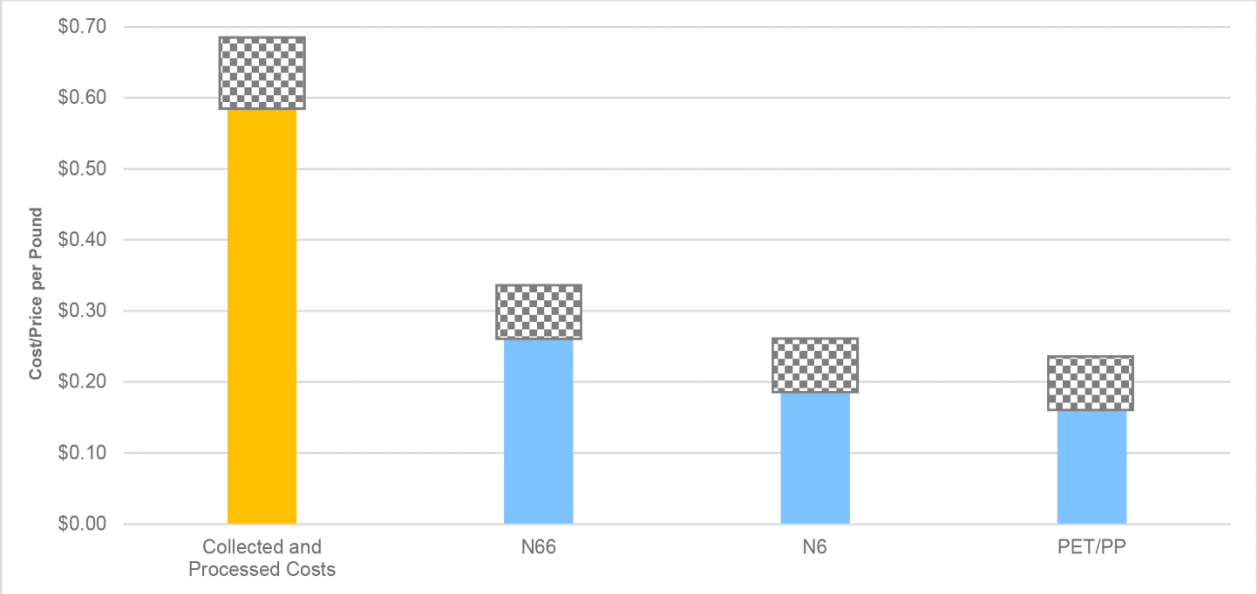
Our PCC manufacturing results consist of two (2) components: 1) PCC purchase price results by fiber type and 2) PCC pricing trade-off results by fiber type. The results for each component are based on PCC purchasing data collected from nine (9) manufacturers, two (2) California-based manufacturers and seven (7) out-of-state manufacturers, that received CARE manufacturing subsidies in 2019 and 2020. It is important to note that our PCC manufacturing results do not reflect actual costs to manufacture an end product with PCC. Rather, our PCC manufacturing results highlight the PCC purchase price by fiber type on a per pound basis (i.e., the cost per pound by fiber type to purchase PCC from processors).

1. PCC Purchase Price Results by Fiber Type

In **Exhibit 4-11,** we provide PCC purchase price results by fiber type (N66/N6/PET/PP) in comparison to the cost to process and have PCC ready to sell. Processed PCC cost per pound reflects the bottom-line cost to have fiber processed and ready to sell, equating to roughly 58 to 68 cents per pound (collection plus processing). This reflects the combined collection and processing costs without subsidies at the collection and processing phase of the PCC recycling chain.

In contrast to the processed PCC cost per pound results, we found that manufacturers actually purchased processed PCC fiber (Nylon 66/Nylon 6/PET/PP) at a lower rate on a per pound basis. The lower PCC purchase price for N66/N6/PET/PP indicates the subsidies at the collection and processing phases of the PCC recycling phase allow for manufacturers' purchase prices to be lower than the processed PCC cost per pound. This pricing dynamic acts a pricing "discount" for the manufacturers and signifies that the collection and processing subsidies reduce the actual purchase price for PCC at the manufacturer level, creating an economic incentive to use PCC to produce an end product.

Exhibit 4-11
PCC Purchase Price Results by Fiber Type



2. Manufacturer Pricing Trade-Off Results by Fiber Type

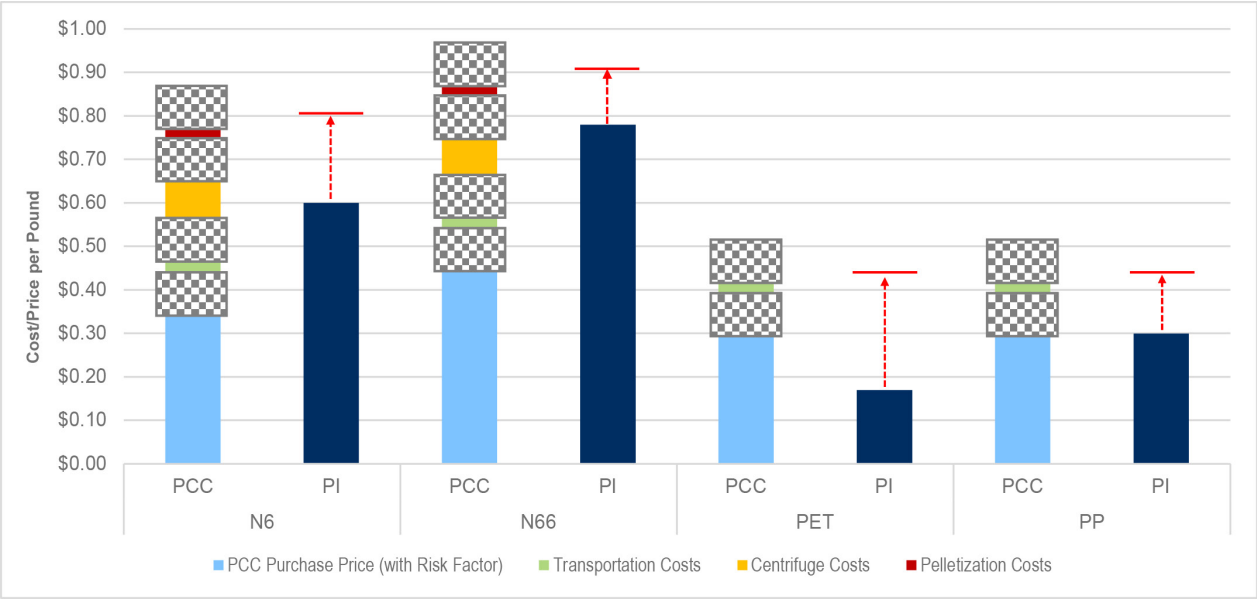
Manufacturers compare the full cost to obtain PCC with the cost of alternatives. If PCC costs are lower that alternatives, then manufacturers are incentivized to use PCC. In **Exhibit 4-12,** we provide PCC pricing trade-off results by fiber type. The results reflect a trade-off comparison between total PCC purchase costs per pound (i.e., PCC purchase price, transportation costs, pelletization costs, centrifuge costs etc.) and post-industrial (PI) purchase prices for the four (4) major fiber types. The differential between the cost of manufacturing PCC and purchasing the post-industrial (PI) alternative is generally what the CARE subsidy needs to cover to incentivize the use of PCC. *The results we provide reflect a snapshot in time, but in reality, manufacturers face pricing decisions and situations that fluctuate over time.* Below is a summary of the results:

- **Nylon 6: Cost of manufacturing PCC Nylon 6 is roughly 75 to 85 cents while the PI alternative is roughly 60 cents.** The differential between the cost of PCC and the PI alternative is roughly 20 cents, which is slightly below the 25 cents Nylon 6 manufacturing subsidy.
- **Nylon 66: Cost of manufacturing PCC Nylon 66 is roughly 85 to 95 cents while the PI alternative is roughly 78 cents.** The differential between the cost of PCC and the PI alternative is roughly 12 cents, which is about at the 13 cents Nylon 66 manufacturing subsidy.
- **PET: Cost of manufacturing PET is roughly 40 to 50 cents while the PI alternative is roughly 17 cents.** The differential between the cost of PCC and the PI alternative is roughly 28 cents, which is just above the 25 cents PET manufacturing subsidy.
- **PP: Cost of manufacturing PET is roughly 40 to 50 cents while the PI alternative is roughly 30 cents.** The differential between the cost of PCC and the PI alternative is roughly 15 cents, which is below the 25 cents PP manufacturing subsidy.

Overall, the results demonstrate current subsidy levels are likely adequate under current market conditions because PCC pricing for all fiber types is competitive with PI alternatives. However, to provide a perspective of the dynamic market environment, as of March/April 2021, the price per pound of Nylon 6 PI pellets is around $0.70, Nylon 66 PI pellets is around $1.20, and PET PI fiber and PP PI fiber are around $0.40 each. In the current setting, subsidizing based on pure differentials may not be needed, but that may not be the case a week or month later. As manufacturers experience price volatility, situations are dynamic, and therefore the exact subsidy level needed fluctuates on an ongoing basis. The current subsidy levels strike balance among the volatility.

Manufacturers face trade-off decisions including risk, quality, material, and output pricing of the total product. As a result, PCC must be less than PI alternatives for manufacturers to be willing to absorb that risk. Other hard to measure costs include quality and contamination, inconsistent availability, lower end-product selling prices, and size of loads – these make PCC less desirable and mean that they require a better price discount than the straight numbers might imply.

Exhibit 4-12
Manufacturer Pricing Trade-Off Results by Fiber Type



Note: PCC purchase price includes a risk factor of 15 cents. Based on industry norms, and consistent with the SJM, we valued the risk factor that manufacturers consider when purchasing PCC at approximately of 15 cents to more accurately reflect their decision-making process.

5. Market Revenue Validation Results

Crowe gathered broad market commodity data from several sources, including public and private data sources to provide a relative pricing benchmark to evaluate the price data collected during fieldwork site visits. Crowe gathered broad market prices for the same or similar polymers for differing qualities (virgin, post-industrial and post-consumer). Since there is no central pricing market for polymer commodities, Crowe used both the average spot prices as well as the historical price trends to validate the reasonableness of field recycler prices collected. Our comparison confirmed that reported recycler prices are in line with the broad market price averages when adjusted for quality. The results presented in this section supports our overall analysis. This section is organized as follows:

A. Approach and Assumptions
B. Market Revenue Validation Results.

A. Approach and Assumptions

Crowe gathered two types of market pricing data for 2019 and 2020: broad market pricing and observed recycler pricing. We used observed pricing received from recyclers to compare costs and sales revenues. We validated pricing received from recyclers against multiple broad market data sources before applying recycler pricing to our calculations. Below are the key components to arrive at sales revenue we used to compare to costs.

Collecting Broad Market Pricing Data

We utilized the following steps, during broad market pricing data collection and analysis:

- Research potential plastics market pricing data to use, both public and private (fee-based) data
- Select and/or purchase market pricing data for comparison. Crowe focused selection criteria on availability of comparable material types and pricing structure. Most sources we utilized were existing purchases or were free of charge. See **Exhibit 5-1** for a summary of the selected sources for comparison, most prices were updated at least monthly
- Calculate the monthly average pricing for virgin, post-industrial (PI), post-consumer (PC) for each material type across the various market sources
- Perform a 4-year historical comparison (December 2015 to December 2020) for each material and grade to analyze the relationship between Virgin, PI, and PC pricing over time.

Exhibit 5-1
Market Data Sources

Market Pricing Data Source	Material Type(s) and Grade	Company Website	Fee-based
Wood Mackenzie	• [redacted]	woodmac.com	Yes
Plastics News	• [redacted]	plasticsnews.com	Yes
RecyclingMarkets.net	• [redacted]	recyclingmarkets.net	Yes
ICIS	• [redacted]	icis.com	Yes
Plastics Exchange	• [redacted]	theplasticsexchange.com	No
Plastics Technology	• [redacted]	ptonline.com	No
Independent	• [redacted]	N/A	No

Collecting Recycler Anecdotal Pricing Data

To collect observed pricing data from recyclers, we performed the following:

- Request purchase and/or selling prices of post-consumer material used for 2019 and 2020 separately. For example, a processor may provide their average purchase price for baled Nylon 6 as well as their selling price for processed Nylon 6
- Cross-validate pricing data between recyclers (i.e. making sure that pricing from two or more recyclers for the same material from the same source are similar)
- Calculate the average price for each post-consumer material type.

Comparing Broad Market and Recycler Anecdotal Pricing Data

We compared the broad market data and recycler observed pricing data to determine if the provided recycler prices fell within reasonable or expected ranges of comparable costs. We utilized a similar methodology to validate sales pricing data. For example, we expect that the collected post-consumer PET carpet would be less valuable than baled post-consumer PET bottles and baled post-consumer PET bottles are less valuable than processed PET carpet and so on. We found that pricing provided by recyclers were consistent amongst each other and reasonable and therefore we used average recycler sales prices for similar materials to compare against recycler costs for similar materials.

B. Market Revenue Validation Results

Key Findings

There were several key takeaways from our comparison of broad market polymer prices and post-consumer carpet prices. The market effects of price drivers are categorized within **Exhibit 5-2.**

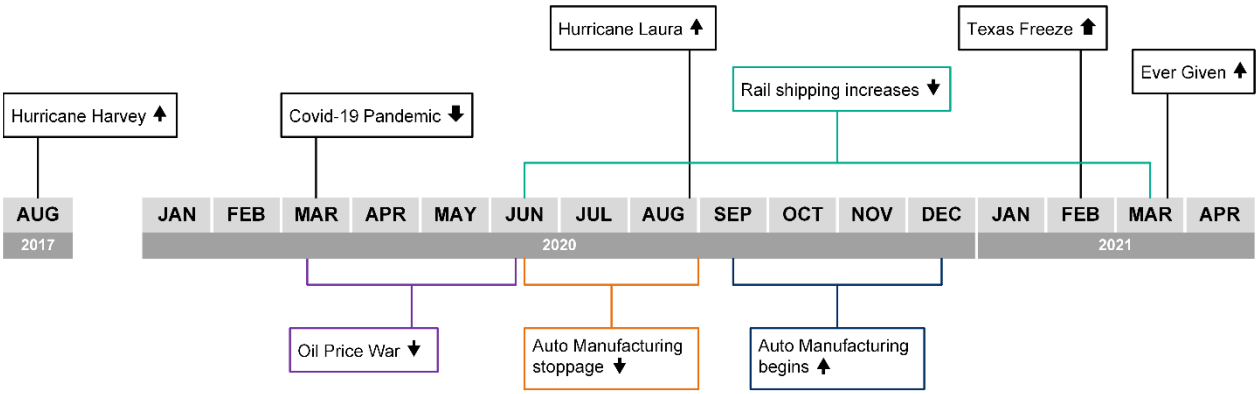
Exhibit 5-2
Key Takeaways from Market Pricing Comparisons

Category	Key Takeaways
Broad Market Polymer Prices	• Macro-economic market dynamics had a significant influence on broad market polymer prices as well as post-consumer carpet prices. • Polymer price volatility increased in accordance to fiber quality (virgin, post-industrial and post-consumer) • Polymer prices trends were positively correlated with fiber quality.
Post-Consumer Carpet (PCC) Prices Comparisons	• PCC prices collected from field surveys were validated against broad market polymer pricing • PCC price volatility increases in accordance with fiber quality • Manufacturer PCC prices were more correlated to broad market polymer alternatives • Collector and processor PCC prices are more stable and less correlated to broad market polymer prices • Subsidies temper PCC prices against market volatility.

Macro-Economic Impacts

Broad market polymer prices for post-consumer carpet are significantly influenced by global macro-economic events. **Exhibit 5-3** demonstrates how some force majeures and other recent macro-economic events have affected polymer pricing. Hurricanes can cause supply disruptions of the petrochemical supply chain whether the hurricane hits an industrial area or not. The expectation of a hurricane to threaten oil production or refining areas is often enough to shut down oil well and refinery operations. These interruptions may be temporary or sustained. Hurricane Harvey was one of the major factors during the fall of 2017 that created tight supply conditions that led to elevated polymer prices until the Covid-19 pandemic started during the spring of 2020. Similarly, the deep freeze in Texas in February of 2021 led to a temporary shutdown of oil production and refining operations that further tightened the already short supplies of monomers and critical reagents. This reduced the supply of polymers and drove the price of polymers even higher (both virgin and recycled). The state of polymer prices as of May 2021 is one of very tight supply and high demand.

Exhibit 5-3
Timeline of Market Price Drivers



Nylon 6 Market Pricing and PCC Pricing

Exhibit 5-4 details the average spot price history of Nylon 6 virgin, post-industrial (PI) and post-consumer (PC) pellets. The prices differences vary in range according to fiber quality: virgin polymer are the cleanest and highest quality fibers and are the most expensive, then post-industrial polymers are priced at the mid-range, and post-consumer with the lowest pricing due to the higher levels of impurities. It is worthy to note that the relative prices of each type do vary similarly over time while the price volatility of fiber decreases as quality decreases.

Exhibit 5-5 details the smoothed Nylon 6 price trend using a three-quarter moving average. Crowe used a three-quarter moving average to even out the price fluctuations we observed during our surveys of recyclers, especially during the COVID-19 pandemic in 2020. The thicker lines in the chart represent “ballpark” prices collected by survey teams for collectors, processor and manufacturers. The two thinner lines at the top represent the price trends for broad market post-consumer pellets and post-industrial pellets. The dashed lines at the left of the chart detail actual price data points, not a smooth moving average. The dashed lines are included to provide the reader with a sense of the price history despite the unavailability of data to “smooth” with a moving average. The exhibit shows that relative prices collected from field work and the broad market prices do generally move in tandem. The exhibit also shows that manufacturer prices are generally more correlated to broad market prices than collector and processor prices which exhibit more price stability.

Exhibit 5-4
Nylon 6 Price History

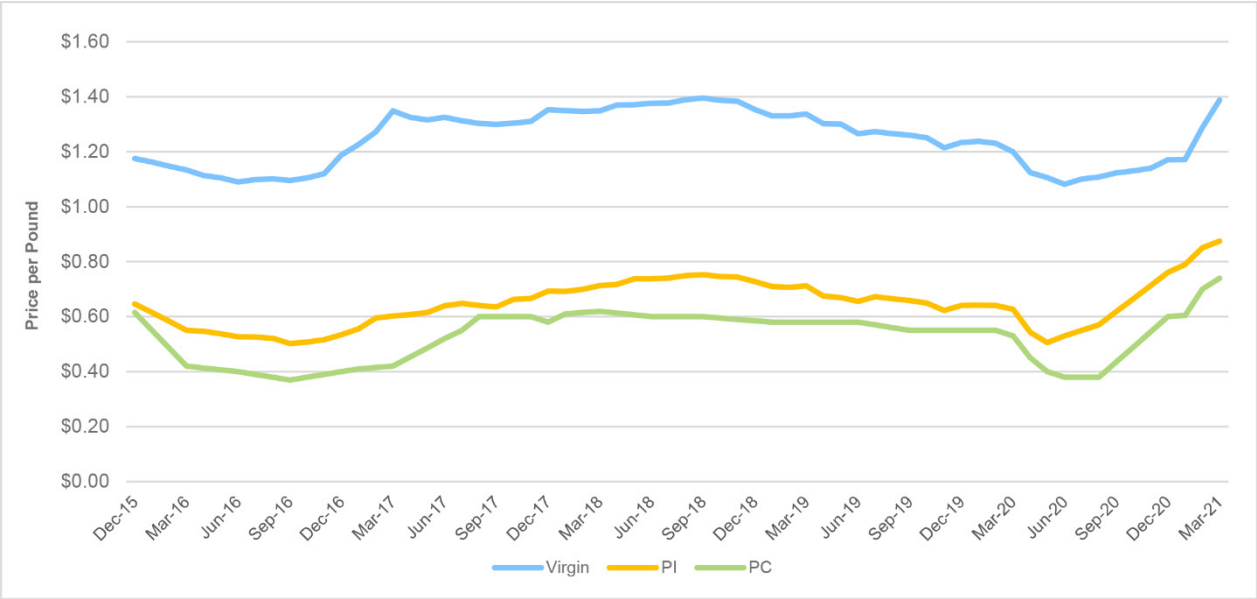
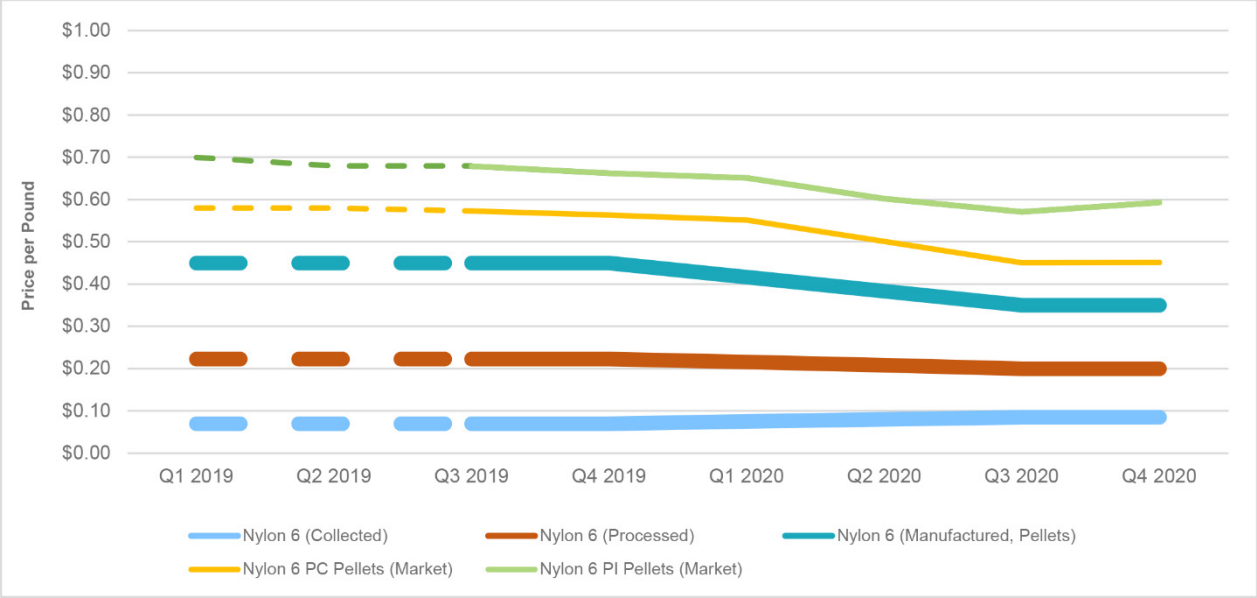


Exhibit 5-5
Nylon 6 – Three-Quarter Moving Average



Nylon 66 Market Pricing and PCC Pricing

Exhibit 5-6 details the average spot price history of Nylon 66 pellets on the broad market. Similar to Exhibit 5-2 for Nylon 6, the Nylon 66 polymer chart shows the average spot prices of virgin, post-industrial, and post-consumer prices. Virgin Nylon 66 pellets also similarly show more price volatility than do post-industrial and post-consumer polymers.

Exhibit 5-7 shows the three-quarter smoothed relationship of average prices between the collected price data from carpet collectors, processors and manufacturers and the broad market price averages of post-consumer and post-industrial polymers. The thin lines near the top of the of the chart represent the price average trends of post-industrial and post-consumer polymers and exhibit much more price volatility than do the three thicker lines that represent average “ballpark” carpet collector, processor, and manufacturer price trends. The relative price stability of the collector and processor prices trends suggest that the subsidies are effectively insulating those parts of the value chain from market volatility. The price increases seen in broad market post-industrial, post-consumer and post-consumer carpet polymer prices in late 2020 are reflective of the increased tightness in commodity supply and the demand. The demand side saw increased industrial demand for nylon 66 largely stemming from reopening of automobile manufacturing plants. The supply side also tightened in late 2020 and continued into early 2021. Some of the contributing factors that restricted available polymer supply included force majeures in petrochemical refineries including the cold snap in early 2021 in the south that slowed refinery output and the five-day blockage of the Suez Canal by the Ever Given container ship (Exhibit 5-1).

Exhibit 5-6
Nylon 66 Price History

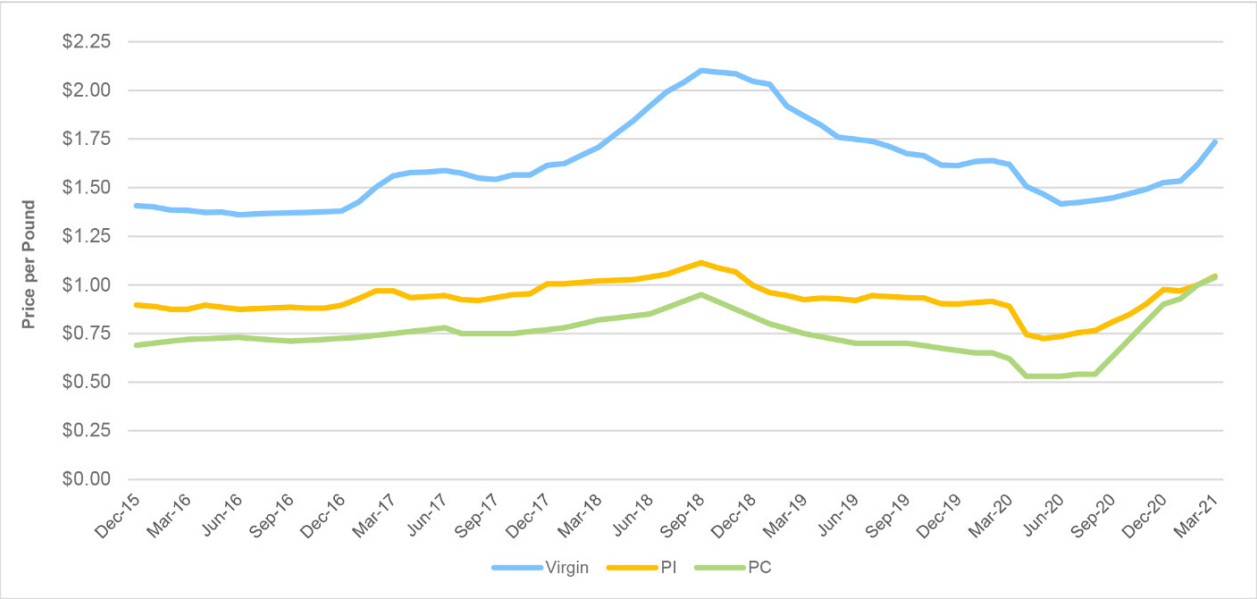
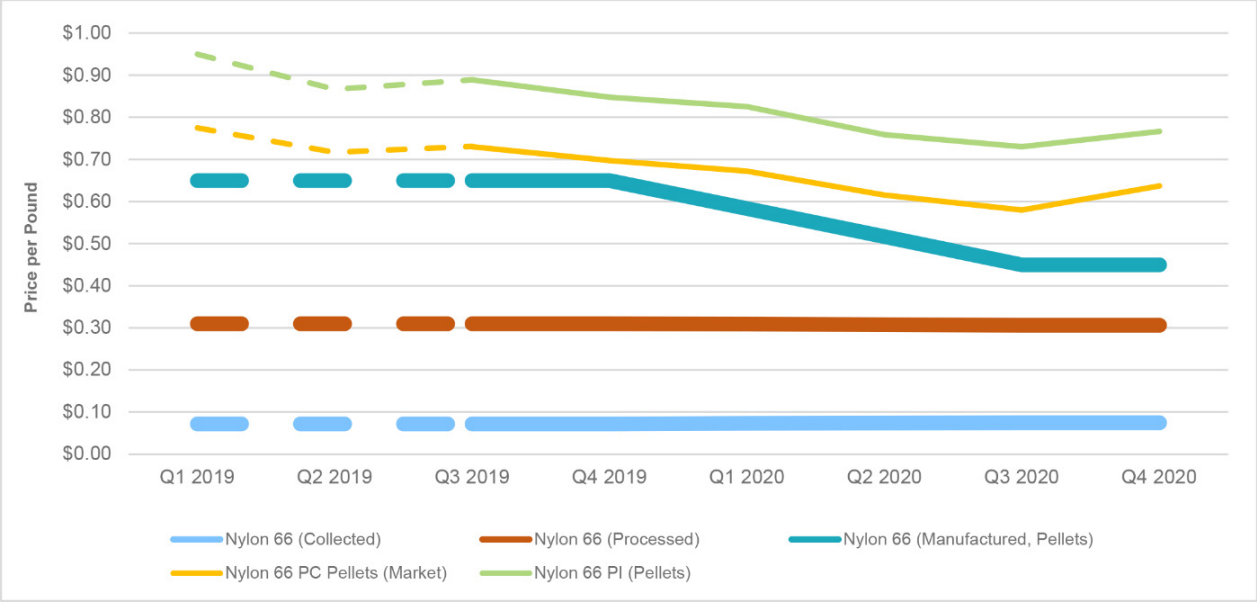


Exhibit 5-7
Nylon 66, Three-Quarter Moving Average



PET Market Pricing and PCC Pricing

Exhibit 5-8 depicts the average price history for PET virgin and post-consumer flake spot prices. Virgin PET prices exhibit more price volatility than the post-consumer prices.

Exhibit 5-9 shows the three-quarter moving averages of carpet collectors and processors as thick solid lines and the broad market data (post-consumer baled bottle, green flake and virgin) prices as thin sold lines. The dashed lines near the left of the chart represents data points (not a moving average) as the data was unavailable to create averages. The exhibit illustrates that the collector and processor prices exhibit stable pricing likely due to the effect of the subsidies, while the broad market data exhibits a decreasing trend. The price history of Green PET flake was included in this chart as a close proxy for post-consumer carpet pricing although the material is not a substitute. Crowe infers the market price of post-consumer carpet to lie between the ranges of PET processors and Green PET flake.

Exhibit 5-8
PET Price History

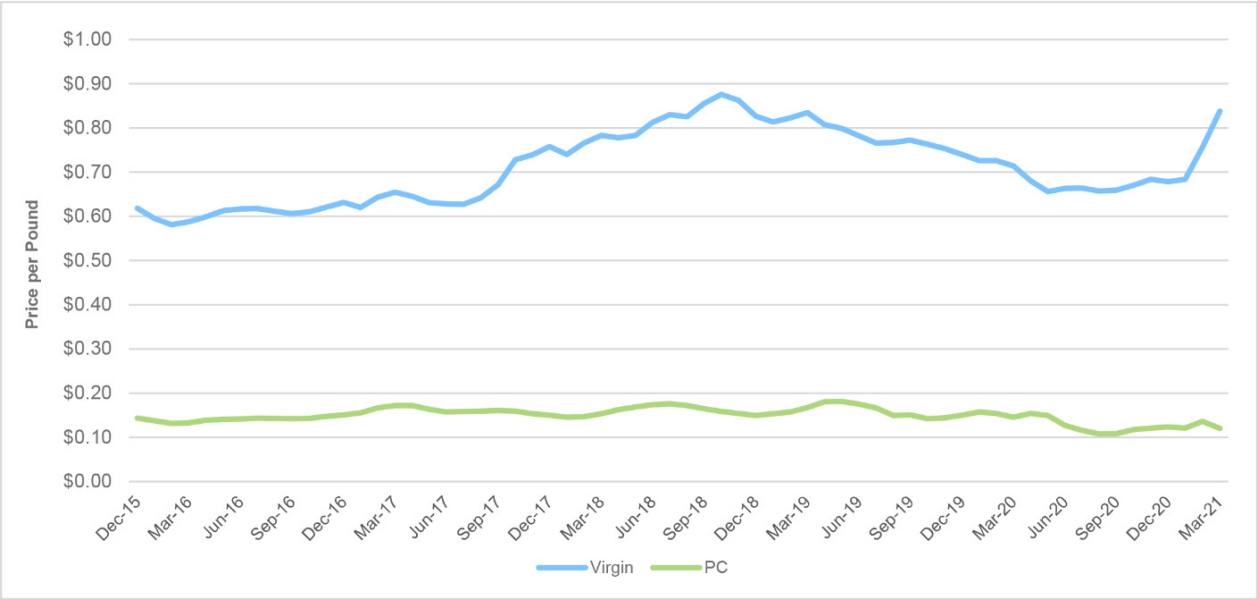
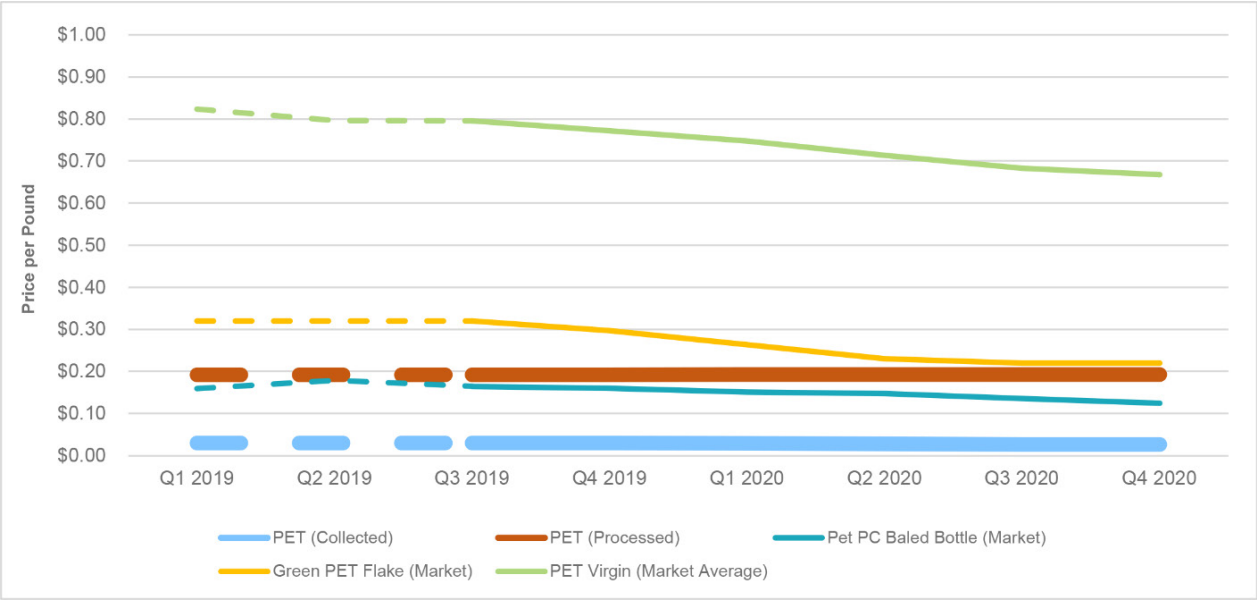


Exhibit 5-9
PET, Three-Quarter Moving Average



Polypropylene (PP) Market Pricing and PCC Pricing

Exhibit 5-10 compares the average spot broad market prices for virgin polypropylene and post-consumer polymers. Similar to the other polymers, post-consumer polypropylene follows the general price trend of similar virgin polymers; however, the price volatility is attenuated in post-consumer prices. Virgin polypropylene has recently exhibited significant price increases due to constrained supply and strong demand in the petrochemical supply chain (Exhibit 5-1).

Exhibit 5-11 shows the "ballpark" prices Crowe collected during our surveys of carpet collectors and processor as thick solid lines and the broad market averages of post-consumer baled polypropylene and post-industrial polypropylene flake as thin solid lines. The dashed lines on the left side of the chart presents price data points and not averages as the data was not available to average. Polypropylene collectors and processors exhibit price stability because of the subsidies while post-consumer baled polypropylene experienced a price decline.

Exhibit 5-10
Polypropylene Price History

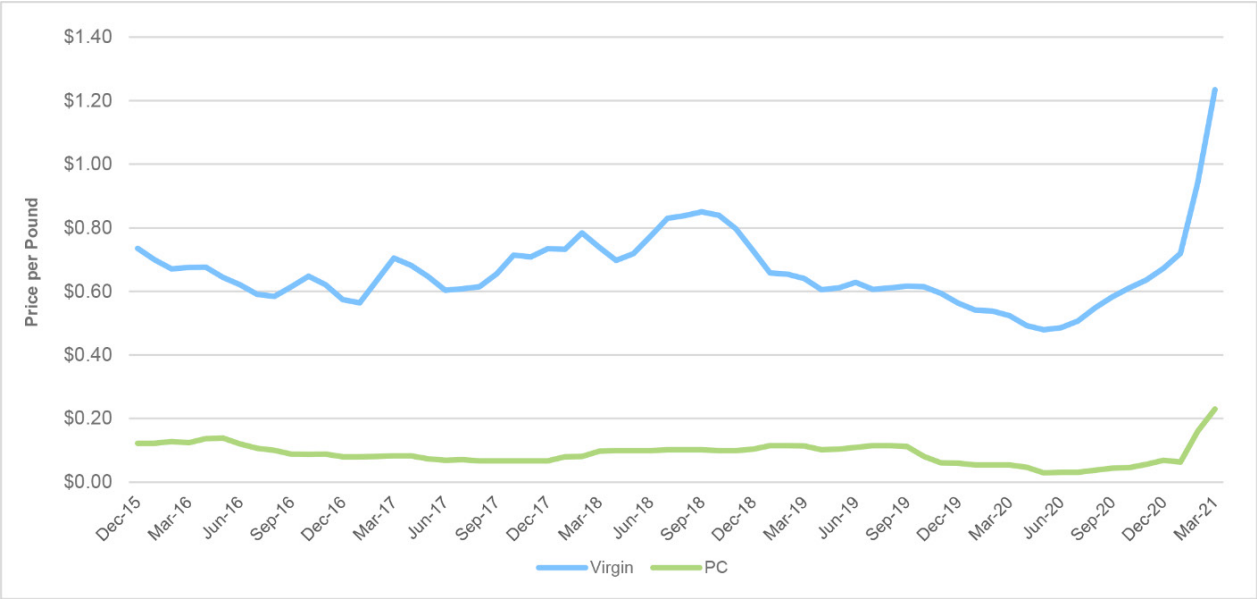
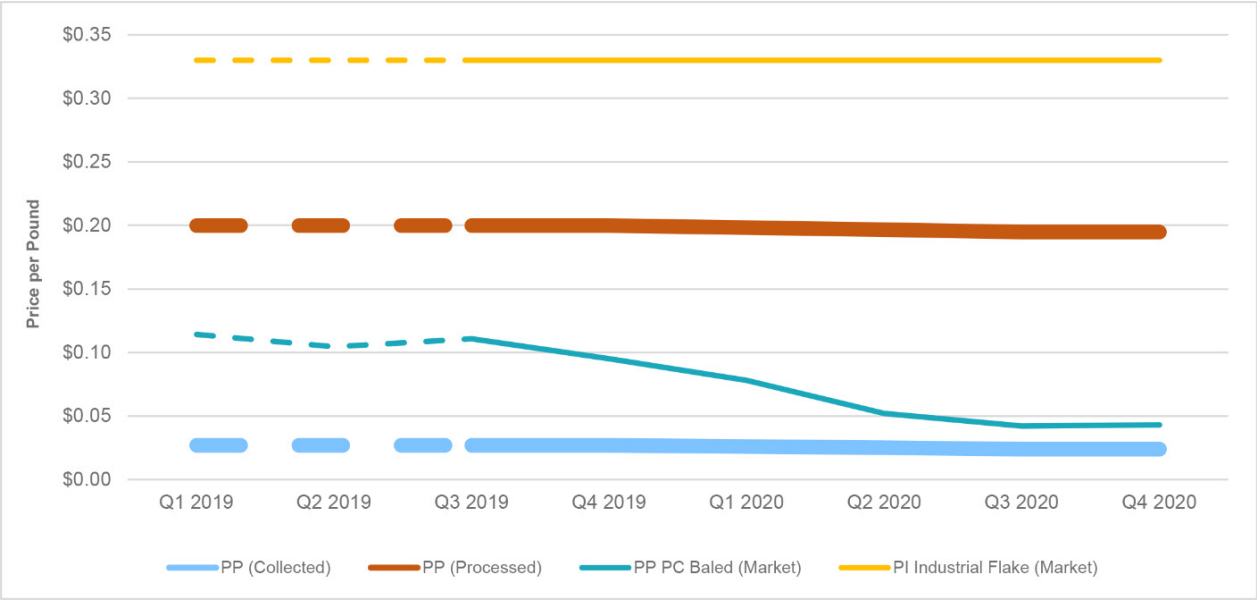


Exhibit 5-11
Polypropylene Three-Quarter Moving Average



6. Subsidy Justification Model Validation Results

In this section, we provide relevant results of validating the Subsidy Justification Model (SJM). The results presented in this section support the integrated results of PCC recycling presenting in *Section 3*. This section is organized as follows:

A. Approach and Assumptions
B. Comparison of Study Results with the Subsidy Justification Model
C. Implications.

A. Approach and Assumptions

The SJM was developed to ensure subsidies are structured to properly incentivize the recycling of PCC materials. Ultimately, the SJM is a tool to help adjust subsidy levels to reflect costs and revenues and therefore the actual subsidy levels represent the outcome of the SJM process. We performed the validation of the Subsidy Justification Model (SJM) in two areas:

1. Results of the modeling as compared to our study results
2. Structure and format.

Overall, our approach to validating the results of the SJM was informed by performing an evaluation of subsidies as presented in both *Sections 3 and 4* of this report.

B. Comparison of Study Results with the Subsidy Justification Model

Results of the Modeling as Compared to Our Study Results

We are providing these results as an extension of the *Phase I Report*, in which we addressed actions described in Chapter 0 of the 2018-2022 California Carpet Stewardship Plan (CCSP) related to validating the accuracy of the SJM. Our validation includes the costs and revenues related to collection, processing, and manufacturing of PCC. We believe that our results presented in this section satisfy Chapter 0 requirements related to the SJM. Below we provide a summary of our comparison of results:

- Crowe's methodology and the SJM's methodology are different. As a result, it is not appropriate to evaluate the SJM based on a direct comparison of numerical results, but rather focus on what the SJM was designed to accomplish—ensuring proper subsidy levels
- Crowe's results generally triangulate with the SJM, providing corroboration across the two methods, refer to **Exhibit 6-1** for a comparison of results

- Both Crowe's methodology and the SJM's methodology indicate there is not one number (i.e., subsidy) that fits all recyclers at all points in time; however, our data validates that the subsidies determined by the SJM are at appropriate levels. In addition, the SJM informs changes over time that reflect market activity.

The results presented in Exhibit 6-1 are a roll-up summary of what was presented in *Section 4 (CSE, Processor, and Manufacturer Results)* of this report. From this perspective, the combination of sales and CARE subsidy revenue generally provides adequate coverage of costs. However, it is important to note that these direct comparisons of recycler phases should be used to support the overall, integrated analysis presented in *Section 3 (An Integrated View of Results)*.

Exhibit 6-1
Comparison of Vertical Results: Costs and Revenues by Recycler Type

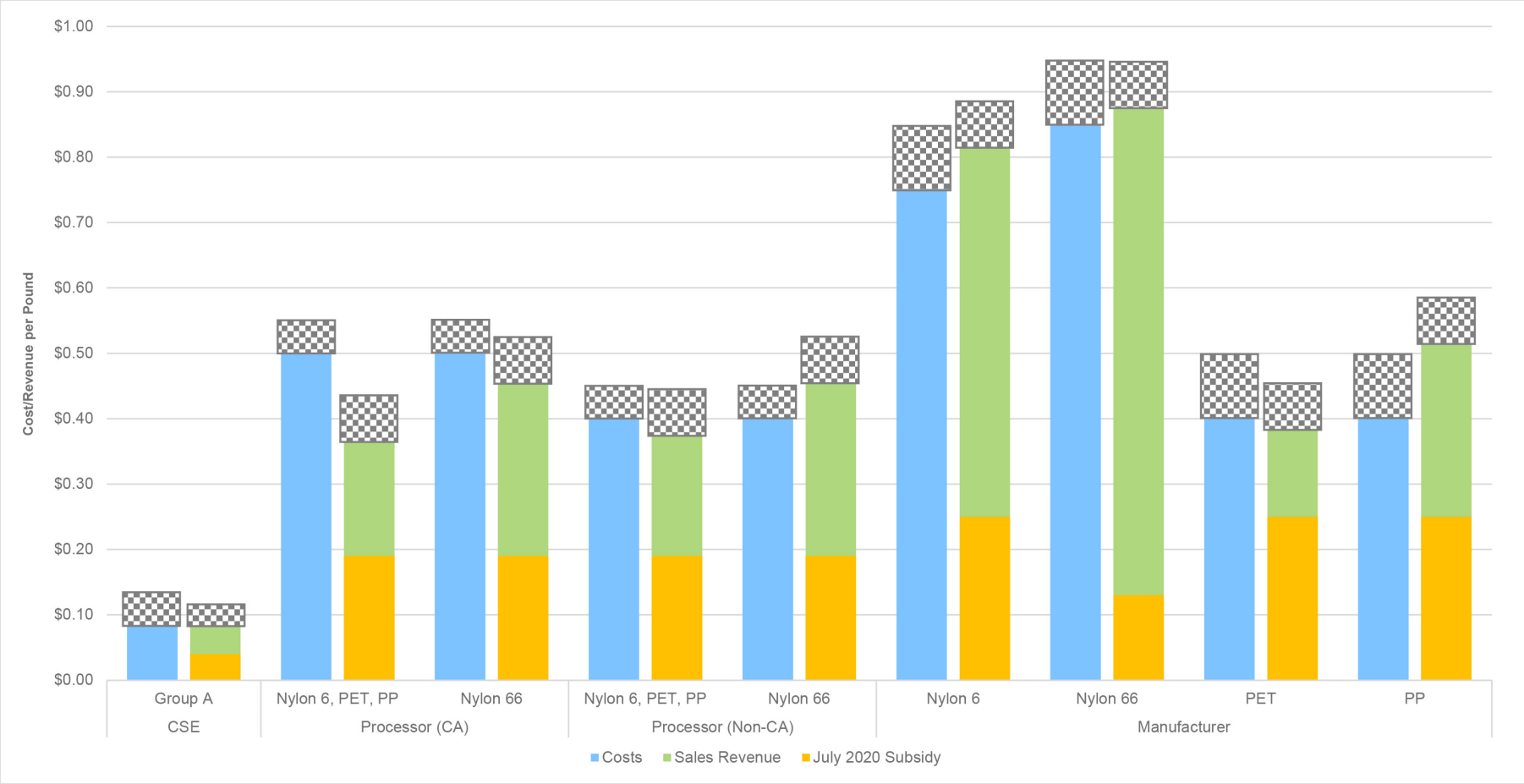


Exhibit 6-2, and the descriptions below, provide a summary of the fundamental differences in methodologies between Crowe and the SJM:

1. **Overall Costs –** The SJM uses a combination of modeled, estimated, and actual costs, while Crowe used actual costs provided by recyclers. The SJM relies on the Cost Conversion Model (CCM) to model estimated costs using a combination of estimated and actual costs. These depend on key assumptions such as processing and/or manufacturing facility capacity, throughput, as well as region. Through our survey, we found there is high variation in facility operations and regions. There are no recyclers with identical operations and recyclers are in different parts of U.S.
2. **Shipping –** The SJM does not include shipping as part of recycling costs, while Crowe included shipping. As recyclers are in different regions throughout the nation, shipping can be a large part of a recycler's operation (and costs) and be significant for a recycler's decision to use PCC. Therefore, Crowe included shipping as part of the costs to recycle PCC.
3. **Sales Revenue –** The SJM uses anecdotal market-based point-in-time sales revenue, while Crowe used anecdotal sales revenue across two years. The SJM is typically updated twice a year, about six months apart, to reflect market pricing of various recyclers during two separate points in time annually. Crowe collected sales revenue data for collected and processed PCC, as well as manufactured Nylon pellets, from recyclers during 2019 and 2020 and averaged the prices across the two years. We believe it was important to average data across two years as it provides an overall impact of pricing over time across both a pandemic and non-pandemic year.
4. **Reasonable Financial Return –** SJM incorporates a 15 percent reasonable financial return (RFR) as part of recycling costs, while Crowe does not incorporate an RFR.

Exhibit 6-2
Fundamental Differences

Category	Crowe	SJM
Overall Costs	Surveyed costs across 2 years (includes investments)	Modeled/ Estimated/ Actual
Shipping Costs	Included	Not Included
Sales Revenue	Anecdotal across 2 years	Anecdotal point-in-time
Reasonable Financial Return	Not Included	Included

SJM Structure and Format

The current structure and format of the SJM is adequate for its intended purpose, however, the model can benefit from simplification to improving readability. Recommendations are summarized in **Exhibit 6-3.**

Exhibit 6-3
SJM Structure and Format Recommendations

Recommendation	Description	Benefits
Convert Tier 2 calculations to reflect manufacturing only	Convert Tier 2 Nylon 6, Nylon 66, PET, and PP calculations to show manufacturing costs to use/purchase PCC separately from processing costs.	Since the SJM already provides calculations for Tier 1 Nylon 6, Nylon 66, PET, and PP, showing Tier 2 alone and separate will provide more transparency as well as flexibility with how the SJM calculations can be used.
Provide more visual separation of different recycling phases	Dedicate a section with its own title or entirely separate the different recycling phases (i.e. manufacturing, processing) to provide more visual separation of subsidies at each recycling phase.	To reduce confusion of which subsidies are for what phase of recycling.

C. Implications

The SJM is a valuable tool, supporting decisions and allowing CARE to iteratively update subsidies to reflect present conditions, refinements, and confirming levels that subsidies should be set at. Our results showed that there is a limitation to the method by which we can compare our results to the SJM due to fundamental differences; however, despite the differences, our results generally triangulate with the results of the SJM, providing corroboration across the two methods. Below we provide our implications of our validation of the SJM:

- The SJM methodology has been an important tool to inform program subsidies. The SJM allows CARE to conduct ongoing evaluations of subsidy levels and provide a mechanism to adjust subsidies to ensure continued program success. The continued and increasing participation of recyclers in the CARE program provides further evidence that the SJM is fulfilling its purpose
- A direct comparison of results between the SJM, subsidy levels, and our results alone are not enough to determine the sustainability of the program
- In the end, we must consider how the program is operating overall and from the recycler's perspective, which we presented in *Section 3 (An Integrated View of Results)* of this report.

7. Assessment Evaluation Results

In this section, we provide the results of our evaluation of the current assessment[32] charged to carpet mills to support CARE's PCC recycling goals. **The results presented in this section demonstrate that the current assessment provides adequate funding for CARE to meet its recycling goals through the end of 2022**. We first describe our approach to demonstrate that the current assessment is sufficient to financially support CARE's recycling goals – 26% PCC recycling rate in 2021 and 28% PCC recycling rate in 2022[33]. We then provide the results of our sensitivity analysis, which indicates the current assessment can cover CARE's expenditures under different recycling, subsidy, and carpet sales scenarios through 2022. Finally, we summarize the results of this section by describing the implications of our assessment evaluation results. The remainder of this section is organized as follows:

A. Assumptions and Methodology

B. Sensitivity Analysis Results

C. Implications.

A. Assumptions and Methodology

Our approach to demonstrate that the current assessment will provide adequate funding to support CARE's recycling goals through 2022 consists of the following three (3) components:

1. Assess CARE's financial model results[34] to determine CARE's "baseline" funding needs to cover subsidy payments and program administrative costs to support planned recycling goals – 26% PCC recycling rate in 2021 and 28% PCC recycling rate in 2022. Our analysis assumes CARE's 2021 beginning balance equates to 2020's ending fund balance of roughly $18.2 million. We also assume CARE's projected carpet sales of 68 million square yards in 2021 and 2022, which equates to assessment revenue of $23.8 million in 2021 and 2022. For contextual purposes, we provide CARE's historical fund activity from 2018 to 2020 in **Exhibit 7-1.**

[32] Effective in 2019, CARE's current financing mechanism was set at $0.35 per square yard of carpet sales.

[33] Per the Plan, CARE's recycling rate goal is 27% by December 31, 2022.

[34] CARE's financial model results provide a detailed breakdown of the program's actual and projected revenues from the assessment based on carpet sales and actual and projected expenditures to cover subsidy payments to recyclers and program administrative costs. Crowe assessed CARE's 2018-2020 actual revenues and expenditures and 2021-2022 projected revenues and expenditures.

2. Conduct sensitivity analysis to project CARE's funding needs and financial performance under different recycling, subsidy, and carpet sales scenarios through 2022. We describe each scenario and the fiscal impact to CARE's funding status, including the projected recycling rates for 2021 and 2022 in **Exhibit 7-2.**

3. Calculate fund coverage ratios for each scenario to determine whether the assessment (and reserve) adequately cover CARE's projected funding needs under different scenarios through 2022. The fund coverage ratio is a comparative metric to determine if the assessment can fund CARE's planned recycling goals through 2022 under each scenario. The fund coverage ratio provides an assurance that CARE has the necessary funds on hand to weather any short-term economic volatility. For example, if the CARE's fund has a fund coverage ratio of 1.5, then this means the fund has 150 percent of the necessary funds to cover its expenditures. Conversely, if CARE's fund has a fund coverage ratio of 0.9, then this means the fund has only 90 percent of the necessary funds to cover its expenditures. The fund coverage ratio is calculated as follows:

$$\textit{Fund Coverage Ratio} = \frac{\text{Fund Beginning Balance + Revenues}}{\text{Expenditures}}$$

Exhibit 7-1
CARE's Historical Fund Activity – 2018, 2019 and 2020

	2018	2019	2020
Beginning Balance	**$12,244,159**	**$15,204,605**	**$19,133,260**
Revenues	**$21,511,507**	**$28,204,184**	**$23,344,120**
Expenditures	**$18,551,061**	**$24,275,529**	**$24,227,866**
Subsidy Payments	12,933,096	14,557,201	16,811,262
Program Administration	5,617,965	9,718,328	7,416,605
Net	**$2,960,446**	**$3,928,655**	**$(883,747)**
Ending Balance	**$15,204,605**	**$19,133,260**	**$18,249,514**

Exhibit 7-2
Overview of Scenarios

Scenario Name	Description	Projected Recycling Rate(s)
Baseline	The "baseline" scenario assumes CARE's 2021 and 2022 subsidy payment and program administrative cost projections derived from the Financial Model. Crowe utilized this "baseline" scenario as a foundation to develop the other scenarios.	• 2021: 26% • 2022: 28%
Recycling Rate Above 28%	This scenario assumes an increase in carpet recycling levels in 2021 and 2022, which translates to an increase in subsidy payments compared to the "baseline" scenario. Specifically, this scenario assumes roughly a 25 percent increase in recycling levels compared to CARE's baseline projections within the Financial Model.	• 2021: 32% • 2022: 33%
Increase All Subsidies by 10%	This scenario assumes a 10% increase to each subsidy type at the collection, processing, and manufacturing level. The intent of this scenario was to identify whether CARE could fiscally support an increase to subsidy payments to all participants.	• FY21: 26% • FY22: 28%
Decrease Carpet Sales by 10%	This scenario assumes a 10% decrease to CARE's "baseline" projected carpet sale projections in 2021 and 2022. A decrease in carpet sales would decrease CARE's available funding to cover its annual expenditures.	• 2021: 26% • 2022: 28%
Decrease Carpet Sales by 15%	This scenario assumes a 15% decrease to CARE's "baseline" projected carpet sale projections in 2021 and 2022. A decrease in carpet sales would decrease CARE's available funding to cover its annual expenditures	• 2021: 26% • 2022: 28%
Increase Carpet Sales by 10%	This scenario assumes a 10% increase to CARE's "baseline" projected carpet sale projections in 2021 and 2022. An increase in carpet sales would increase CARE's available funding to cover its annual expenditures.	• 2021: 26% • 2022: 28%

B. Sensitivity Analysis Results

Our sensitivity analysis results indicate the current assessment provides adequate funding for CARE to meet its recycling goals through the end of 2022 under a range of difference scenarios, as described in Exhibit 7-2. CARE's fund maintained a positive ending balance and a fund coverage ratio of above 1.0 through 2022 in all scenarios, indicating the assessment is adequate to cover CARE's expenditures (i.e., recycler subsidy payments and program administrative costs) to meet its projected recycling goals through 2022. This analysis does not extend beyond the current planning period. The ability of the current assessment to sustain recycling goals, subsidies and operating costs beyond 2022 will be addressed in CARE's next Plan. Below we provide highlights from our results:

- **Baseline:** CARE's "baseline" projected 2022 ending balance is approximately $10.4 million, which equates to roughly 1.4 times the amount needed to cover its expenditures at the end of 2022.
- **Recycling Rate Above 28%:** Under this scenario, CARE's projected 2022 ending balance is approximately $7.3 million, which equates to roughly 1.3 times the amount needed to cover its expenditures at the end of 2022.
- **Increase All Subsidies by 10%:** Under this scenario, CARE's projected 2022 ending balance is approximately $7.5 million, which equates to roughly 1.3 times the amount needed to cover its expenditures at the end of 2022.
- **Decrease Carpet Sales by 10%:** Under this scenario, CARE's projected 2022 ending balance is approximately $5.6 million, which equates to roughly 1.2 times the amount needed to cover its expenditures at the end of 2022.
- **Decrease Carpet Sales by 15%:** Under this scenario, CARE's projected 2022 ending balance is approximately $3.2 million, which equates to roughly 1.2 times the amount needed to cover its expenditures at the end of 2022.
- **Increase Carpet Sales by 10%:** Under this scenario, CARE's projected ending balance is approximately $15.1 million, which equates to roughly 1.6 times the amount needed to cover its expenditures at the end of 2022.

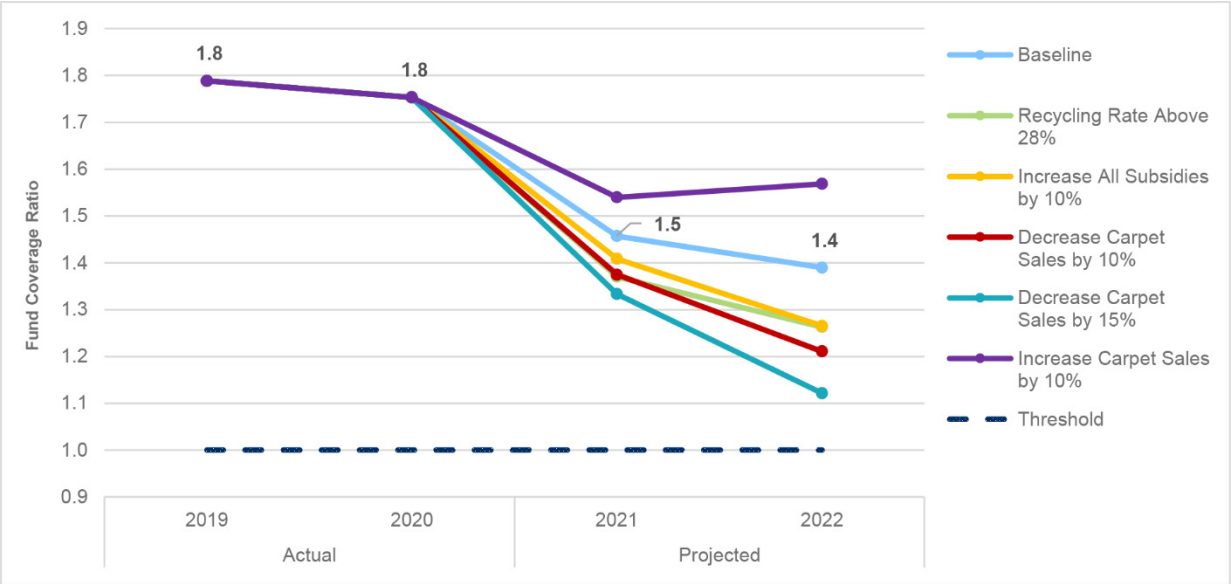
CARE maintains, on average, an ending balance of approximately $8.2 million through 2022. In all scenarios, CARE's coverage ratio is above the 1.0 threshold through 2022. This indicates that CARE has more than 100 percent of the necessary funds through the assessment to cover its expenditures even under "stressed" conditions through 2022.

Exhibit 7-3 provides a summary comparison of CARE's projected ending balances by scenario through 2022. We also include 2019 and 2020 actual ending balances for comparison purposes. The projected ending balance trends downward under all scenarios because the scenarios project for an increase in subsidy payments as a result of progressive increases to CARE's recycling rate in 2021 and 2022.

Exhibit 7-3
Comparison of Projected Fund Ending Balance by Scenario

Exhibit 7-4 provides a summary comparison of the CARE's projected fund coverage ratio under each scenario through 2022. We also include 2019 and 2020 actual fund coverage ratios for comparison purposes. If the fund coverage ratio is above 1.0, then this signifies CARE can cover its expenditures. If the fund coverage ratio is below 1.0, then this signifies the CARE cannot cover its expenditures.

Exhibit 7-4
Comparison of Projected Fund Coverage Ratio by Scenario



C. *Implications*

Overall, the analysis presented in this section demonstrates how the assessment will provide funding for CARE to meet its 2018-2022 Plan. Our evaluation of the current assessment indicates the following:

1. **The current assessment supports CARE's recycling goals through 2022.** In particular, our evaluation demonstrates that the assessment provides sufficient funding coverage even under "stressed" conditions (e.g., an increase in planned recycling rates or a decrease in carpet sales) ensuring that CARE can financially meet its targeted recycling goals through 2022.
2. **The current assessment supports CARE's reserve needs through 2022.** Our evaluation also demonstrates that CARE will likely maintain a sufficient reserve to mitigate potential funding risks through 2022 should carpet sales remain at or above the 2020 levels (approximately 68 million square yards) or if recycling rates increase and increases in subsidy payments are needed.

8. Summary of Findings

CARE has been responsive to many moving targets, including an evolving, diverse, and complex industry, dynamic fiber markets, and the unprecedented economic impacts of COVID-19. Over the last several years CARE has continuously evaluated and adjusted subsidies and grants to subsidize recyclers at levels that support the goals of the program. This high degree of flexibility and willingness to adjust subsidies and subsidy mechanisms will remain critical going forward as this relatively new and nuanced industry continues to evolve. We also note that CARE's ongoing adjustment and refinement of subsidies has led to an increasingly complex program structure that could likely be simplified without harming incentives to further increase recycled output.

To conclude this report, we provide a summary of our findings that represent the culmination of our results. We circle back to the four (4) study objectives of this Phase 2 Economic Analysis. Following the exhibits below, we provide a summary of key findings for each objective.

Exhibit 8-1 provides a summary of results for each task for Objective #1.

Exhibit 8-2 provides a summary of results for each task for Objective #2.

Exhibit 8-3 provides a summary of results for each task for Objective #3.

Exhibit 8-4 provides a summary of results for each task for Objective #4.

Exhibit 8-1
Completion Status of Study Objective #1 – Conduct an independent economic analysis with commodity revenues and subsidy justification

Task	Summary of Results
A. Average cost per pound by recycler type for CSEs and Processors	**Section 4** • Collection: 8 to 20 cents per pound to collect PCC broadloom and tile. • Processing: 50 to 55 cents for California (CA) and 40 to 45 cents for non-CA per pound to process PCC fiber. This reflects regionally adjusted costs using economic adjustment factors.
B. Cost to use PCC versus other inputs for Manufacturers	**Section 4** • Manufacturing: Differential ranges between 10 to 30 cents for the cost to use PCC versus the purchase price of the PI alternative (Nylon 6, Nylon 66, PET, PP) (point-in-time)
C. Market prices and anecdotal price data for sales revenue per pound	**Sections 4 and 5** • Market Prices: Provided a multi-year history of virgin, post-industrial, and post-consumer spot pricing for Nylon 6 pellets, Nylon 66 pellets, PET flake, and PP polymers to show fluctuations over time. Broad market prices provided validation for the range of anecdotal prices. Anecdotal pricing levels for each fiber type were within an appropriate range compared to the broad market. • Anecdotal Prices: Collected average sales prices per pound for whole carpet, processed fiber, and manufactured pellets. Utilized anecdotal prices, as validated, to estimate revenue per pound ranging from roughly 4 to 7 cents for collected whole carpet and roughly 18 to 33 cents for processed fiber.

Exhibit 8-2
Completion Status of Study Objective #2 – Demonstrate how assessment will provide funding to meet the Plan

Task	Summary of Results
A. Confirm subsidy levels for remainder of the Plan	**Section 3** • Our integrated results showed that for over 80% of subsidized volume, the CSE-Processor-Manufacturer recycler category has roughly 94% of costs covered without factoring in manufacturer sales revenue. Adding in a conservative figure for manufacturing sales revenue results in 105 percent coverage of costs. Thus, a significant majority of the PCC volume being recycled into RO is profitable (and thus adequately incentivized). • For the remaining 20% of subsidized volume, standalone CSEs costs are fully covered by a mix of revenue sources (e.g., subsidies, carpet and padding sales). Standalone manufacturers' shipping costs are covered by the CARE's subsidy. • **These results provide robust confirmation of the current subsidy levels for the remainder of the Plan.**
B. Use CARE's Financial Model to determine sales projections	**Section 7** • Assessed and confirmed CARE's financial model results for 2021 and 2022 to reasonably project for carpet sales projections
C. Evaluate coverage at different carpet sales and recycling rates	**Section 7** • **The current assessment adequately covers CARE's baseline funding needs to pay for subsidies, program costs, and maintain a reserve through 2022.** • CARE can cover approximately 1.5 times its expenditures through 2022 based on projected carpet sales and funding needs. • CARE will maintain a positive fund balance through 2022 even under stressed conditions (e.g., carpet sales decrease 10, 15, and 20 percent, recycling rate of up to 33%) signaling the current 35-cent assessment per square yard is sufficient to meet the Plan.

Exhibit 8-3
Completion Status of Study Objective #3 – Validate Subsidy Justification Model (SJM)

Task	Summary of Results
A. Calculate subsidies needed to incentivize PCC use based on #1	**Section 6** • **The current subsidy levels are where they need to be to continue to incentivize the use of PCC.** Our results reflect a balance between actual recycler costs and the fluctuations in sales revenue over the most recent two-year period. We modeled costs, revenues, and differentials on a per pound basis and an overall cost basis to validate the current subsidy levels.
B. Compare to existing subsidies and SJM	**Section 6** • Although Crowe's and the SJM methodologies are different, our results showed similar conclusions as the SJM, confirming that the SJM represents a valuable tool in setting proper levels.
C. Evaluate structure and assumptions in SJM	**Section 6** • The current structure and format of the SJM is adequate for its intended purpose, however, the model can benefit from simplification to improving readability, for example, converting Tier 2 calculations to reflect manufacturing only and providing more visual separation of different recycling phases.

Exhibit 8-4
Completion Status of Study Objective #4 – Define "critical mass" to provide actual cost data

Task	Summary of Results
A. Provide numerical results	**All Sections** • Crowe provided numerical results throughout the confidential report and numerical ranges in this redacted version.
B. Simple average costs per pound and regional adjustments maintaining confidentiality	**Section 4** • Our results reflect a simple average cost per pound, and we performed a regional adjustment to account for cost differences between California and other states, see Exhibit 8-1, 1A above. Our results in range format protect recycler confidentiality.
C. Revenue per pound ranges maintaining confidentiality and reflect market variability	**Sections 4 and 5** • Our results utilized a range in revenue per pound based on grade and fiber type, see Exhibit 8-1, 1C above. Our results in range format protect recycler confidentiality.

Study Objective #1 Findings: Conduct an independent economic analysis with commodity revenues and subsidy justification

Current subsidies in combination with PCC sales and other revenue sources adequately cover relevant collection and processing costs and incentivize PCC recycling, production of RO, and use of RO in manufactured products. Specifically, the current subsidy structure adequately incentivizes increases in RO to meet a 27 percent recycling rate goal by December 31, 2022. As a result, PCC fiber types are competitively priced with PI alternatives providing an adequate incentive for manufacturers to utilize PCC versus alternative inputs (see *Section 4* for results by recycler vertical). Our analyses further confirm that CARE's subsidies are necessary to incentivize PCC recycling in California; without incentives, PCC recycling would not be economically viable or sustainable.

An integrated view of recycler types (e.g., CSE/Processor/Manufacturers) provides further and overall substantiation of CARE's current subsidy structure based on the participants' exhibited behavior to sustain their collection, processing, and manufacturing activities and corresponding output levels (see *Section 3* for integrated results). Even under volatile market conditions, participants' behavior in combination with actual cost and revenue data indicates CARE's recycling rate goals are in reach.

Study Objective #2 Findings: Demonstrate how the assessment will provide funding to meet the Plan

Crowe provides results of the assessment evaluation in *Section 7* of this report. **The current assessment adequately covers CARE's baseline funding needs to pay for subsidies, program costs, and maintain a reserve through 2022**. CARE can cover approximately 1.5 times its expenditures through 2022 based on projected carpet sales and funding needs. In summary, CARE will maintain a positive fund balance through 2022 even under stressed conditions (e.g., carpet sales decrease 10, 15, and 20 percent; recycling rate of up to 33%) signaling the current 35-cent assessment per square yard is sufficient to meet the Plan.

Study Objective #3 Findings: Validate Subsidy Justification Model (SJM)

Crowe provides results for SJM validation in *Section 6* of this report. Crowe's methodology and the SJM methodology are different, see Exhibit 6-2 for a comparison. As a result, it is not appropriate to evaluate the SJM based on a direct comparison of numerical results. Despite differences, Crowe and the SJM methodologies came to similar conclusions, providing validation across the two methods (see Exhibit 6-1 for a summary). Both methodologies indicate there is not one number (i.e., subsidy) that fits all recyclers at all points in time; however, our data validates that the subsidies determined by the SJM are at appropriate levels. In addition, the SJM informs changes over time that reflect market activity.

The SJM is a valuable tool, supporting decisions and allowing CARE to iteratively update subsidies to reflect present conditions, refinements, and confirming levels that subsidies should be set at. The SJM was necessary to get to where CARE is now through ongoing evaluation of subsidy levels and providing a mechanism to adjust subsidies to ensure continued program success. The ongoing and increasing participation of recyclers in the CARE program provides further evidence that the SJM is fulfilling its purpose.

Study Objective #4 Findings: Define "critical mass" to allow Crowe to provide actual cost data

We utilized two years of financial data (calendar years 2019 and 2020), a range of simple averages, and a range of regional adjustment for processors to provide actual cost data for Phase 2 results. During this study, we were able to group recyclers together, allowing us to perform comparisons and present results without diluting the value of the analysis and without exposing confidential information. We strongly believe that the results we were able to provide in this Phase 2 Economic Study are dependable and actionable, while protecting confidential business information.

Appendix A:
Program Participant Considerations and Objectives

In this Appendix, we provide a summary of program participant considerations and objectives for broadloom recyclers in **Exhibit A-1** and tile recyclers in **Exhibit A-2** below.

Exhibit A-1
Summary of Program Participant Considerations and Objectives – Broadloom Recyclers

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
CSE: All Materials	• Standalone CSEs primarily collect PCC as a supplement to their other business operations – carpet pad, tile, material recovery facility (MRF) • Dependent on carpet pad and a mixture of public funds (i.e., CARE Collection Subsidy + DoS Hauling and Tipping Fees charged to CARE) to cover collection costs • Must cover all/ high percentage of collection costs • Collection sales to Processors generate profit • Focused solely on collecting and shipping material, without regard to overall efficiency to RO • Can potentially hold / not sell material if prices are not profitable • Does not directly generate RO	• Highly incentivized by public funds • Profit from carpet pad collection supports PCC collection (and vice versa) • Driven by profit at the collection level only • Less competitive attitude for specific fiber types given not competing for PCC as an input to processing and manufacturing • Less sensitive to quality issues than processor or manufacturers, if the carpet is not too contaminated for recycling

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
CSE-Processor-Manufacturer	• Recyclers in this category produce a diverse array of low to high-end products or feedstock, operations vary depending on quality of product • Dependent on cost savings/ scalability derived from overall recycling activities (i.e., processing and manufacturing) • Focuses on maximizing capacity and throughput, and unlocking as many subsidy levels as possible, which results in maximizing RO • Focus on PCC as input to product line • Can take a loss at the collection level if profitability at processing and/or manufacturing levels are high enough • Processor component generates RO for the program • Two (now three) largest producers of RO in this category • CARE subsidies allow to use and/or sell processed fiber for less than costs to process	• Less incentivized by public funds at the collection level • Incentivized by overall cost savings/scalability generated from integrated collection/processing/ manufacturing activities • Driven by profit at the both processing and manufacturing levels • More competitive attitude given competing for PCC inputs needed for processing and manufacturing levels • Manufacturing end products is essential driver push/ pull to system

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
Processor-Manufacturer	• Processing is to provide input for manufacturing • These entities typically produce pellets, which are feedstock for end product (i.e. automotive parts) • Sources material either from a CSE for baled PCC, or a processor for separated fiber. Therefore, these recyclers can act as a processor-manufacturer or just a manufacturer • PCC is a suitable input for product • PCC is less costly than other inputs, or if the recycler's demand is sustainability-driven, the cost of PCC can be higher than other inputs due to hitting environmental objectives • Subsidy provides necessary incentive • Combining processing with manufacturing is an efficiency factor, reducing the need for additional processing when processed by a different processor. This is more apparent with high-quality, high-value end product manufacturers	• Processing is a means to an end; they care about producing pellets, which they use to produce end products such as automotive parts (or in some cases padding products) • Subsidies provide a nice boost and make it worthwhile to use PCC versus another post-consumer content material • PCC may the preferred or potentially the required input for product (recycled content/ sustainability focused)

Carpet America Recovery Effort

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
Manufacturer only: Pellets	• PCC is a suitable input for product • PCC is less costly than alternative inputs (PI material) • Subsidy provides necessary incentive • Manufactured pellets are feedstock for end products	• Shipping from CA offset by subsidy; wouldn't ship without subsidy since other materials are nearby • Additional cost to use PCC due to contamination that results in discounted product price, availability, and timing constraints (risk factors)
Manufacturer only: Primary Fiber	• This category consists of the manufacturers using PCC as a large or entire portion of the product • PCC is a suitable input for product • PCC is less costly than other inputs • Subsidy provides necessary incentive • Can generally use as much volume as they can get	• Shipping from CA offset by subsidy; wouldn't ship without subsidy since other materials are nearby • Additional cost to use PCC due to contamination that results in discounted product price, availability and timing constraints (risk factors)
Manufacturer only: Minority Fiber	• This category consists of the manufacturers using PCC as a small portion of the product • PCC is a suitable input for product • PCC is less costly than other inputs • Subsidy provides necessary incentive	• Shipping from CA offset by subsidy; wouldn't ship without subsidy since other materials are nearby • Additional cost to use PCC due to contamination that results in discounted product price, availability and timing constraints (risk factors) • PCC content may have a limited impact to marketability of end product as it makes up a small portion of inputs

Exhibit A-2
Summary of Program Participant Considerations and Objectives – Tile Recyclers

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
CSE: Primarily tile/tile only	• Standalone CSEs primarily collect PCC tile from C&D projects as a supplement to their other business operations, primarily carpet pad • Dependent on separate carpet pad business to cover collection costs and/or public funds (i.e., CARE Collection Subsidy, specifically reuse) • Must cover all/ high percentage of collection costs • Most collected tile is sold for reuse, therefore, a significant portion of revenue is generated from the CARE Collection Subsidy for reuse • Small amounts of collected tile are sold to processors • Focuses solely on collecting and shipping material, without regard to overall efficiency to RO • Can potentially hold / not sell material if prices are not profitable • Does not directly generate RO	• Highly incentivized by public funds for tile reuse • Profit from carpet pad collection supports PCC collection (and vice versa) • Driven by profit at the collection level only • Only compete for tile volume • Less competitive attitude for specific fiber types given not competing for PCC as an input to processing and manufacturing • Less sensitive to quality issues than processor or manufacturers, can donate for reuse to generate revenue

Recycler Category	Overall Operations and Considerations (or observed behavior)	Objectives and Motivations
CSE-Processor: tile only	• Collect carpet tile only, for tile processing • All are shipping tile out-of-state to their processing facility • Most/all tile volume are sourced from C&D projects • One major player in this group is focused only on collecting their own branded carpet tile • Shipping costs is the biggest factor in whether or not to collect and ship material from CA for processing • Increases to shipping costs may cause a recycler to not accept PCC above a certain shipping price threshold	• Collect carpet tile in order to separate and recover backing (separate face fiber/ backing) • Backing is used to produce new carpet tile • Limited to non-existent use of face fiber (high contamination) • Overall, PCC tile is a minor component of new tile production; PI tile is a major component • Shipping from CA offset by subsidy; wouldn't ship without subsidy since other materials are nearby • Some CSE-Processors have a commitment to tile customers to recycle product at end of life/replacement of new tile • Little motivation to collect when shipping costs increase without a matching increase to subsidies

Appendix B: Accessibility Additional Information

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

Exhibit ES-8
Comparison of Vertical Results: Costs and Revenues by Recycler Type

Business Model Type	Category	Costs	Sales Revenue	July 2020 Subsidy
CSE	Group A	$0.08 to $0.13	~$0.04–$0.07	$0.03
Processor (CA)	Nylon 6, PET, PP	$0.50 to $0.55	~$0.18–$0.25	$0.19
Processor (CA)	Nylon 66	$0.50 to $0.55	~$0.27–$0.33	$0.19
Processor (non-CA)	Nylon 6, PET, PP	$0.40 to $0.45	~$0.18–$0.25	$0.19
Processor (non-CA)	Nylon 66	$0.40 to $0.45	~$0.27–$0.33	$0.19

Business Model Type	Category	Costs	Price of PI	July 2020 Subsidy
Manufacturer	Nylon 6	$0.75 to $0.85	~$0.60	$0.25
Manufacturer	Nylon 66	$0.85 to $0.95	~$0.78	$0.13
Manufacturer	PET	$0.40 to $0.50	~$0.17	$0.25
Manufacturer	PP	$0.40 to $0.50	~$0.30	$0.25

Exhibit 2-2
Sample Cost Build Up form

Graphic of the sample Cost Build Up form used as a template to record expenses from recycler site during field surveys.

Exhibit 2-6
Mock Processor Regional Adjustment Calculation (Mock Cost Numbers)

Graphic of the Processor regional adjustment calculation is provided with mock cost numbers to demonstrate the adjustment process.

Exhibit 3-2
Breakdown of Total Subsidized Volumes Across Business Model Categories

Business Model Category Type	Total Subsidized Volume
CSE Only	~5%
CSE-Processor	~1%
CSE-Processor-Manufacturer	~80%
Processor-Manufacturer	~5%
Manufacturer Only	~10%
Total	**100%**

Exhibit 3-3
PCC Recycling Integration – Broadloom Carpet

This graphic illustrates the integrated view of broadloom carpet recyclers from each business model category in 2019 and 2020. This graphic demonstrates the subsidies that companies receive across phases and fiber types.

Exhibit 3-4
PCC Recycling Integration – Carpet Tile

This graphic illustrates the integrated view of carpet tile recyclers from each business model category in 2019 and 2020. This graphic demonstrates the subsidies that companies receive across phases and fiber types.

Exhibit 4-2
PCC Collection Cost per Pound Results by Group

Recycler Group	PCC Collection Cost per Pound
Group A	$0.08 to $0.13
Group B	$0.15 to $0.20
Group C	$0.10 to $0.15

Exhibit 4-3
PCC Collection Cost Differential per Pound Results

Recycler Group	PCC Collection Cost per Pound	Sales Revenue per Pound	Pad Revenue per Pound	CARE Revenue per Pound
Group A	$0.08 to $0.13	~$0.04 to $0.07	~$0.17	$0.03
Group B	$0.15 to $0.20	~$0.04 to $0.07	~$0.06	$0.09
Group C	$0.10 to $0.15	~$0.04 to $0.07	NA	$0.05

Exhibit 4-4
PCC Collection Cost Category Results by Group

Cost Category	Group A	Group B	Group C
Labor	39%	26%	NA
Benefits	11%	4%	NA
Transportation	25%	21%	100%
Rent	6%	26%	NA
Depreciation	~0%	10%	NA
Utilities	12%	2%	NA
Maintenance	2%	2%	NA
Miscellaneous	5%	9%	NA
Total	**100%**	**100%**	**100%**

Exhibit 4-6
Processor Regional Adjustment Calculation

Group	With PC4	Without PC4
California	$0.40 to $0.45	$0.50 to $0.55
Non-California	$0.30 to $0.35	$0.40 to $0.45

Exhibit 4-8
Nylon 6, PET, and PP Cost per Pound versus Revenue per Pound

Division	California	Non-California
Cost per Pound	$0.50 to $0.55	$0.40 to $0.45
Sales Revenue per Pound	~$0.18 to $0.25	~$0.18 to $0.25
Nylon 6/PET / PP Subsidy	$0.15	$0.15
PC4 Subsidy	$0.04	$0.04

Exhibit 4-9
Nylon 66 Cost per Pound versus Revenue per Pound

Division	California	Non-California
Cost per Pound	$0.50 to $0.55	$0.40 to $0.45
Sales Revenue per Pound	~$0.27 to $0.33	~$0.27 to $0.33
Nylon 66 Subsidy	$0.15	$0.15
PC4 Subsidy	$0.04	$0.04

Exhibit 4-10
Processor Cost Category Allocation

Cost Category	California	Non-California
Labor	24%	16%
Benefits	7%	12%
Transportation	3%	11%
Rent	5%	8%
Depreciation	4%	19%
Utilities	9%	7%
Maintenance	11%	2%
Miscellaneous – Raw Materials	24%	15%
Miscellaneous – Other	14%	10%

Exhibit 4-11
PCC Purchase Price Results by Fiber Type

Fiber Type	Price Range
Collected and Processed Costs	~$0.58 to $0.68
N66	~$0.27 to $0.33
N6	~$0.20 to $0.25
PET/PP	~$0.18 to $0.22

Exhibit 4-12
Manufacturer Pricing Trade-Off Results by Fiber Type

Fiber	Category	PCC Price (with Risk Factor)	Transportation Costs	Centrifuge Costs	Pelletization Costs
N6	PCC	~$0.35 to ~$0.45	~$0.05 to ~$0.15	~$0.15 to ~$0.25	~$0.05 to ~$0.15
N6	PI	~$0.60	NA	NA	NA
N66	PCC	~$0.45 to ~$0.55	~$0.05 to ~$0.15	~$0.15 to ~$0.25	~$0.05 to ~$0.15
N66	PI	~$0.78	NA	NA	NA
PET	PCC	~$0.30 to ~$0.40	~$0.05 to ~$0.15	NA	NA
PET	PI	~$0.17	NA	NA	NA
PP	PCC	~$0.30 to ~$0.40	~$0.05 to ~$0.15	NA	NA
PP	PI	~$0.30	NA	NA	NA

Exhibit 5-4
Nylon 6 Price History

The data table below depicts the historical average price trends for Nylon 6 prices by category: virgin, post-industrial and post-consumer. The three price categories exhibit price correlation with virgin polymers demonstrating greater price volatility than post-industrial or post-consumer polymer prices.

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
12/2015	$1.18	$0.65	$0.62
01/2016	$1.16	$0.62	$0.55
02/2016	$1.15	$0.58	$0.49
03/2016	$1.13	$0.55	$0.42
04/2016	$1.11	$0.55	$0.41
05/2016	$1.10	$0.54	$0.41
06/2016	$1.09	$0.53	$0.40
07/2016	$1.10	$0.53	$0.39
08/2016	$1.10	$0.52	$0.38
09/2016	$1.10	$0.50	$0.37
10/2016	$1.10	$0.51	$0.38
11/2016	$1.12	$0.52	$0.39
12/2016	$1.19	$0.53	$0.40
01/2017	$1.23	$0.56	$0.41
02/2017	$1.27	$0.60	$0.42
03/2017	$1.35	$0.60	$0.42
04/2017	$1.33	$0.61	$0.45
05/2017	$1.32	$0.62	$0.49
06/2017	$1.33	$0.64	$0.52
07/2017	$1.31	$0.65	$0.55
08/2017	$1.30	$0.64	$0.52
09/2017	$1.30	$0.64	$0.60
10/2017	$1.30	$0.66	$0.60
11/2017	$1.31	$0.67	$0.60

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
12/2017	$1.35	$0.69	$0.58
01/2018	$1.35	$0.69	$0.61
02/2018	$1.35	$0.70	$0.62
03/2018	$1.35	$0.71	$0.62
04/2018	$1.37	$0.72	$0.61
05/2018	$1.37	$0.74	$0.61
06/2018	$1.38	$0.74	$0.60
07/2018	$1.38	$0.74	$0.60
08/2018	$1.39	$0.75	$0.60
09/2018	$1.40	$0.75	$0.60
10/2018	$1.39	$0.75	$0.60
11/2018	$1.38	$0.74	$0.59
12/2018	$1.35	$0.73	$0.59
01/2019	$1.33	$0.71	$0.58
02/2019	$1.33	$0.71	$0.58
03/2019	$1.34	$0.71	$0.58
04/2019	$1.30	$0.68	$0.58
05/2019	$1.30	$0.67	$0.58
06/2019	$1.27	$0.66	$0.58
07/2019	$1.27	$0.67	$0.57
08/2019	$1.27	$0.67	$0.56
09/2019	$1.26	$0.66	$0.55
10/2019	$1.25	$0.65	$0.55
11/2019	$1.21	$0.62	$0.55
12/2019	$1.23	$0.64	$0.55
01/2020	$1.24	$0.64	$0.55
02/2020	$1.23	$0.64	$0.55
03/2020	$1.20	$0.63	$0.53
04/2020	$1.12	$0.54	$0.45
05/2020	$1.11	$0.51	$0.40

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
06/2020	$1.08	$0.53	$0.38
07/2020	$1.10	$0.55	$0.38
08/2020	$1.11	$0.57	$0.38
09/2020	$1.12	$0.62	$0.44
10/2020	$1.13	$0.67	$0.49
11/2020	$1.14	$0.71	$0.55
12/2020	$1.17	$0.76	$0.60
01/2021	$1.17	$0.79	$0.60
02/2021	$1.29	$0.85	$0.70
03/2021	$1.39	$0.88	$0.74

Exhibit 5-5
Nylon 6 – Three-Quarter Moving Average

The data table below depicts the three-quarter moving average price trends for Nylon 6 with the exception on Q1 2019, Q2 2019 and Q3 2019. The 2019 data reflect point-in-time prices observed rather than an average as the past data was not available for averaging.

Quarter	N6 (Collected)	N6 (Processed)	N6 (Manufactured Pellets)	N6 PC Pellets (Market)	N6 PI Pellets (Market)
Q1 2019	~$0.05 to $0.07	~$0.20 to $0.25	~$0.43 to $0.47	$0.58	$0.70
Q2 2019	~$0.05 to $0.07	~$0.20 to $0.25	~$0.43 to $0.47	$0.58	$0.68
Q3 2019	~$0.05 to $0.07	~$0.20 to $0.25	~$0.43 to $0.47	$0.57	$0.68
Q4 2019	~$0.05 to $0.07	~$0.20 to $0.25	~$0.43 to $0.47	$0.56	$0.66
Q1 2020	~$0.05 to $0.07	~$0.19 to $0.22	~$0.40 to $0.44	$0.55	$0.65
Q2 2020	~$0.05 to $0.07	~$0.19 to $0.22	~$0.35 to $0.39	$0.50	$0.60
Q3 2020	~$0.05 to $0.08	~$0.19 to $0.22	~$0.32 to $0.36	$0.45	$0.57
Q4 2020	~$0.05 to $0.08	~$0.19 to $0.22	~$0.32 to $0.36	$0.45	$0.59

Exhibit 5-6
Nylon 66 Price History

The data table below depicts the historical average price trends for Nylon 66 prices by category: virgin, post-industrial and post-consumer. The three price categories exhibit price correlation with virgin polymers demonstrating greater price volatility than post-industrial or post-consumer polymer prices.

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
12/2015	$1.41	$0.90	$0.69
01/2016	$1.40	$0.89	$0.70
02/2016	$1.39	$0.88	$0.71
03/2016	$1.38	$0.88	$0.72
04/2016	$1.37	$0.90	$0.72
05/2016	$1.37	$0.89	$0.73
06/2016	$1.36	$0.88	$0.73
07/2016	$1.37	$0.88	$0.72
08/2016	$1.37	$0.88	$0.72
09/2016	$1.37	$0.89	$0.71
10/2016	$1.37	$0.88	$0.72
11/2016	$1.38	$0.88	$0.72
12/2016	$1.38	$0.90	$0.73
01/2017	$1.43	$0.93	$0.73
02/2017	$1.50	$0.97	$0.74
03/2017	$1.56	$0.97	$0.75
04/2017	$1.58	$0.94	$0.76
05/2017	$1.58	$0.94	$0.77
06/2017	$1.59	$0.95	$0.78
07/2017	$1.57	$0.93	$0.75
08/2017	$1.55	$0.92	$0.75
09/2017	$1.54	$0.94	$0.75
10/2017	$1.57	$0.95	$0.75
11/2017	$1.57	$0.96	$0.76

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
12/2017	$1.62	$1.01	$0.77
01/2018	$1.62	$1.01	$0.78
02/2018	$1.67	$1.01	$0.80
03/2018	$1.71	$1.02	$0.82
04/2018	$1.78	$1.02	$0.83
05/2018	$1.84	$1.03	$0.84
06/2018	$1.92	$1.04	$0.85
07/2018	$1.99	$1.06	$0.88
08/2018	$2.04	$1.09	$0.92
09/2018	$2.10	$1.12	$0.95
10/2018	$2.09	$1.09	$0.91
11/2018	$2.09	$1.07	$0.88
12/2018	$2.05	$1.00	$0.84
01/2019	$2.03	$0.96	$0.80
02/2019	$1.92	$0.95	$0.78
03/2019	$1.87	$0.93	$0.75
04/2019	$1.82	$0.93	$0.73
05/2019	$1.76	$0.93	$0.72
06/2019	$1.75	$0.92	$0.70
07/2019	$1.74	$0.95	$0.70
08/2019	$1.71	$0.94	$0.70
09/2019	$1.68	$0.94	$0.70
10/2019	$1.67	$0.93	$0.69
11/2019	$1.62	$0.90	$0.68
12/2019	$1.61	$0.90	$0.66
01/2020	$1.64	$0.91	$0.65
02/2020	$1.64	$0.92	$0.65
03/2020	$1.62	$0.89	$0.62
04/2020	$1.51	$0.75	$0.53
05/2020	$1.47	$0.73	$0.53

Date	Virgin Avg. Price	Post-Industrial Avg. Price	Post-Consumer Avg. Price
06/2020	$1.42	$0.74	$0.53
07/2020	$1.42	$0.76	$0.54
08/2020	$1.43	$0.77	$0.54
09/2020	$1.45	$0.81	$0.63
10/2020	$1.47	$0.85	$0.72
11/2020	$1.49	$0.90	$0.81
12/2020	$1.53	$0.98	$0.90
01/2021	$1.53	$0.97	$0.93
02/2021	$1.62	$1.00	$1.00
03/2021	$1.73	$1.05	$1.04

Exhibit 5-7
Nylon 66, Three-Quarter Moving Average

The data table below depicts the three-quarter moving average price trends for Nylon 66 with the exception on Q1 2019, Q2 2019 and Q3 2019. The 2019 data reflect point-in-time prices observed rather than an average as the past data was not available for averaging.

Quarter	N66 (Collected)	N66 (Processed)	N66 (Manufactured Pellets)	N66 PC Pellets (Market)	N66 PI Pellets (Market)
Q1 2019	~$0.06 to $0.09	~$0.30 to $0.33	~$0.62 to $0.66	$0.78	$0.95
Q2 2019	~$0.06 to $0.09	~$0.30 to $0.33	~$0.62 to $0.66	$0.72	$0.87
Q3 2019	~$0.06 to $0.09	~$0.30 to $0.33	~$0.62 to $0.66	$0.73	$0.89
Q4 2019	~$0.06 to $0.09	~$0.30 to $0.33	~$0.62 to $0.66	$0.70	$0.85
Q1 2020	~$0.06 to $0.09	~$0.27 to $0.32	~$0.57 to $0.61	$0.67	$0.83
Q2 2020	~$0.06 to $0.09	~$0.27 to $0.32	~$0.50 to $0.54	$0.62	$0.76
Q3 2020	~$0.06 to $0.09	~$0.27 to $0.32	~$0.43 to $0.47	$0.58	$0.73
Q4 2020	~$0.06 to $0.09	~$0.27 to $0.32	~$0.43 to $0.47	$0.64	$0.77

Exhibit 5-8
PET Price History

The data table below depicts the historical average price trends for PET prices by category: virgin and post-consumer. The two price categories exhibit price correlation with virgin polymers demonstrating greater price volatility than post-consumer polymer prices.

Date	Virgin Avg. Price	Post-Consumer Avg. Price
12/2015	$0.62	$0.14
01/2016	$0.60	$0.14
02/2016	$0.58	$0.13
03/2016	$0.59	$0.13
04/2016	$0.60	$0.14
05/2016	$0.61	$0.14
06/2016	$0.62	$0.14
07/2016	$0.62	$0.14
08/2016	$0.61	$0.14
09/2016	$0.61	$0.14
10/2016	$0.61	$0.14
11/2016	$0.62	$0.15
12/2016	$0.63	$0.15
01/2017	$0.62	$0.16
02/2017	$0.64	$0.17
03/2017	$0.65	$0.17
04/2017	$0.65	$0.17
05/2017	$0.63	$0.16
06/2017	$0.63	$0.16
07/2017	$0.63	$0.16
08/2017	$0.64	$0.16
09/2017	$0.67	$0.16
10/2017	$0.73	$0.16
11/2017	$0.74	$0.15
12/2017	$0.76	$0.15
01/2018	$0.74	$0.15

Date	Virgin Avg. Price	Post-Consumer Avg. Price
02/2018	$0.77	$0.15
03/2018	$0.78	$0.15
04/2018	$0.78	$0.16
05/2018	$0.78	$0.17
06/2018	$0.81	$0.17
07/2018	$0.83	$0.18
08/2018	$0.83	$0.17
09/2018	$0.86	$0.17
10/2018	$0.88	$0.16
11/2018	$0.86	$0.15
12/2018	$0.83	$0.15
01/2019	$0.81	$0.15
02/2019	$0.82	$0.16
03/2019	$0.83	$0.17
04/2019	$0.81	$0.18
05/2019	$0.80	$0.18
06/2019	$0.78	$0.18
07/2019	$0.77	$0.17
08/2019	$0.77	$0.15
09/2019	$0.77	$0.15
10/2019	$0.76	$0.14
11/2019	$0.75	$0.14
12/2019	$0.74	$0.15
01/2020	$0.73	$0.16
02/2020	$0.73	$0.16
03/2020	$0.71	$0.15
04/2020	$0.68	$0.15
05/2020	$0.66	$0.15
06/2020	$0.66	$0.13
07/2020	$0.66	$0.12

Date	Virgin Avg. Price	Post-Consumer Avg. Price
08/2020	$0.66	$0.11
09/2020	$0.66	$0.11
10/2020	$0.67	$0.12
11/2020	$0.68	$0.12
12/2020	$0.68	$0.12
01/2021	$0.68	$0.12
02/2021	$0.76	$0.14
03/2021	$0.84	$0.12

Exhibit 5-9
PET, Three-Quarter Moving Average

The data table below depicts the three-quarter moving average price trends for PET with the exception on Q1 2019, Q2 2019 and Q3 2019. The 2019 data reflect point-in-time prices observed rather than an average as the past data was not available for averaging.

Quarter	PET (Collected)	PET (Processed)	PET PC Baled Bottle (Pellets)	Green PET Flake (Market)	PET Virgin (Market)
Q1 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.16	$0.32	$0.82
Q2 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.18	$0.32	$0.80
Q3 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.16	$0.32	$0.77
Q4 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.16	$0.30	$0.77
Q1 2020	~$0.03 to $0.04	~$0.18 to $0.22	$0.15	$0.26	$0.75
Q2 2020	~$0.03 to $0.04	~$0.18 to $0.22	$0.15	$0.23	$0.71
Q3 2020	~$0.03 to $0.04	~$0.18 to $0.22	$0.14	$0.22	$0.68
Q4 2020	~$0.03 to $0.04	~$0.18 to $0.22	$0.13	$0.22	$0.67

Exhibit 5-10
Polypropylene Price History

The data table below depicts the historical average price trends for PP prices by category: virgin and post-consumer. The two price categories exhibit price correlation with virgin polymers demonstrating greater price volatility than post-consumer polymer prices.

Date	Virgin Avg. Price	Post-Consumer Avg. Price
12/2015	$0.73	$0.12
01/2016	$0.70	$0.12
02/2016	$0.67	$0.13
03/2016	$0.68	$0.12
04/2016	$0.68	$0.14
05/2016	$0.64	$0.14
06/2016	$0.62	$0.12
07/2016	$0.59	$0.11
08/2016	$0.58	$0.10
09/2016	$0.61	$0.09
10/2016	$0.65	$0.09
11/2016	$0.62	$0.09
12/2016	$0.57	$0.08
01/2017	$0.56	$0.08
02/2017	$0.64	$0.08
03/2017	$0.70	$0.08
04/2017	$0.68	$0.08
05/2017	$0.65	$0.07
06/2017	$0.60	$0.07
07/2017	$0.61	$0.07
08/2017	$0.61	$0.07
09/2017	$0.65	$0.07
10/2017	$0.71	$0.07
11/2017	$0.71	$0.07
12/2017	$0.73	$0.07
01/2018	$0.73	$0.08

Date	Virgin Avg. Price	Post-Consumer Avg. Price
02/2018	$0.78	$0.08
03/2018	$0.74	$0.10
04/2018	$0.70	$0.10
05/2018	$0.72	$0.10
06/2018	$0.77	$0.10
07/2018	$0.83	$0.10
08/2018	$0.84	$0.10
09/2018	$0.85	$0.10
10/2018	$0.84	$0.10
11/2018	$0.80	$0.10
12/2018	$0.73	$0.10
01/2019	$0.66	$0.11
02/2019	$0.65	$0.11
03/2019	$0.64	$0.11
04/2019	$0.61	$0.10
05/2019	$0.61	$0.10
06/2019	$0.63	$0.11
07/2019	$0.61	$0.10
08/2019	$0.61	$0.11
09/2019	$0.61	$0.11
10/2019	$0.62	$0.11
11/2019	$0.59	$0.06
12/2019	$0.56	$0.06
01/2020	$0.54	$0.05
02/2020	$0.54	$0.05
03/2020	$0.52	$0.05
04/2020	$0.49	$0.05
05/2020	$0.48	$0.03
06/2020	$0.49	$0.03
07/2020	$0.51	$0.03

Date	Virgin Avg. Price	Post-Consumer Avg. Price
08/2020	$0.55	$0.04
09/2020	$0.58	$0.04
10/2020	$0.61	$0.05
11/2020	$0.64	$0.06
12/2020	$0.67	$0.07
01/2021	$0.72	$0.06
02/2021	$0.94	$0.16
03/2021	$1.24	$0.23

Exhibit 5-11
Polypropylene Three-Quarter Moving Average

The data table below depicts the three-quarter moving average price trends for PET with the exception on Q1 2019, Q2 2019 and Q3 2019. The 2019 data reflect point-in-time prices observed rather than an average as the past data was not available for averaging.

Quarter	PP (Collected)	PP (Processed)	PP PC Baled (Pellets)	PI Industrial Flake (Market)
Q1 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.11	$0.33
Q2 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.10	$0.33
Q3 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.11	$0.33
Q4 2019	~$0.03 to $0.04	~$0.18 to $0.22	$0.10	$0.33
Q1 2020	~$0.03 to $0.04	~$0.18 to $0.22	$0.08	$0.33
Q2 2020	~$0.03 to $0.04	~$0.17 to $0.20	$0.05	$0.33
Q3 2020	~$0.02 to $0.03	~$0.17 to $0.20	$0.04	$0.33
Q4 2020	~$0.02 to $0.03	~$0.17 to $0.20	$0.04	$0.33

Exhibit 6-1
Comparison of Vertical Results: Costs and Revenues by Recycler Type

Business Model Type	Category	Costs	Sales Revenue	July 2020 Subsidy
CSE	Group A	$0.08 to $0.13	~$0.04 to $0.07	$0.03
Processor (CA)	Nylon 6, PET, PP	$0.50 to $0.55	~$0.18 to $0.25	$0.19
Processor (CA)	Nylon 66	$0.50 to $0.55	~$0.27 to $0.33	$0.19
Processor (non-CA)	Nylon 6, PET, PP	$0.40 to $0.45	~$0.18 to $0.25	$0.19
Processor (non-CA)	Nylon 66	$0.40 to $0.45	~$0.27 to $0.33	$0.19

Business Model Type	Category	Costs	Price of PI	July 2020 Subsidy
Manufacturer	Nylon 6	$0.75 to $0.85	~$0.60	$0.25
Manufacturer	Nylon 66	$0.85 to $0.95	~$0.78	$0.13
Manufacturer	PET	$0.40 to $0.50	~$0.17	$0.25
Manufacturer	PP	$0.40 to $0.50	~$0.30	$0.25

Exhibit 7-3
Comparison of Projected Fund Ending Balance by Scenario

Scenario	2019 Actual	2020 Actual	2021 Projected	2022 Projected
Baseline	19,133,259	18,249,512	13,190,567	10,372,384
Recycling Rate Above 28%	19,133,259	18,249,512	11,355,866	7,315,515
Increase All Subsidies by 10%	19,133,259	18,249,512	12,195,120	7,545,119
Decrease Carpet Sales by 10%	19,133,259	18,249,512	10,810,567	5,612,384
Decrease Carpet Sales by 15%	19,133,259	18,249,512	9,620,567	3,232,384
Increase Carpet Sales by 10%	19,133,259	18,249,512	15,570,567	15,132,384
Average	19,133,259	18,249,512	12,123,876	8,201,695

Exhibit 7-4
Comparison of Projected Fund Coverage Ratio by Scenario

Scenario	2019 Actual	2020 Actual	2021 Projected	2022 Projected
Baseline	1.8	1.8	1.5	1.4
Recycling Rate Above 28%	1.8	1.8	1.4	1.3
Increase All Subsidies by 10%	1.8	1.8	1.4	1.3
Decrease Carpet Sales by 10%	1.8	1.8	1.4	1.2
Decrease Carpet Sales by 15%	1.8	1.8	1.3	1.1
Increase Carpet Sales by 10%	1.8	1.8	1.5	1.6
Average	1.0	1.0	1.0	1.0