CalRecycle

Public Comments Received on The Plastic Pollution Prevention and Packaging Producer Responsibility Act Statewide Needs Assessment

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Appendix B. Public Comments Received

Pursuant to PRC section 42067(d), CalRecycle is required to develop the statewide needs assessment in collaboration with the producer responsibility organization, and a broad diversity of local jurisdictions, recycling service providers, processors, and other entities. As part of needs assessment development, CalRecycle accepted and reviewed public feedback on the needs assessment through public workshops, and through public comments submitted to CalRecycle. This appendix includes public comments received by CalRecycle on needs assessment through the following means:

- Comments submitted to the Needs Assessment SmartComment portal during the open comment period 05/01/2024 to 01/21/2026.
- Emails sent to the CalRecycle Packaging inbox (packaging@calrecycle.ca.gov).
- Comments received as part of public workshops conducted on May 1, 2024, and February 3, 2025.

This document does not include comments on the needs assessment received as part of formal rulemaking, and comments received by the Packaging Producer Responsibility Advisory Board related to the needs assessment.

For accessibility purposes, images, figures, tables, and data (non-text items) have not been included in this Appendix and are denoted as “Nontext item(s) included in body of email are not reproduced here” or “Nontext items incorporated into documents submitted to CalRecycle are not reproduced here.” While CalRecycle has retained the content of the comments, the formatting of the comments may have been slightly changed to make it more readable in this document. To see the original letter, please submit a public records request at the CalRecycle Public Records Center.

May 2024

Comment 1: Felicia Castenada (HF&H Consultants)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

Encourage you in RFP solicitation to be specific about the amount of engagement the consultant is expected to participate in (how many meetings contractor will be expected to attend and other outreach).

Be specific about how much primary data the consultant will be required to do versus using data already available. Primary data gathering is a big limitation and the scope depends on how extensive that is.

Comment 2: John Davis (Rural/Isolated Communities)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

We struggle being left out since there are rural areas in urban counties, don't limit yourself from the rural county area, since the communities with populations under 500,000 are isolated from rural counties.

Draft regs mentioned the link between the NA and certain performance categories (ie. Recycling yield), how do I coordinate the comments on the regs and RFP? Will RFP be available for public comment?

Comment 3: Shira Lane (Atrium 916)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

Will study 2 affect SB 343? Anyone that is working on reuse and refill for the needs assessment, I would like to work with you, we have experience

Comment 4: Chris Piche (RPM Eco)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

HPDE Rigid container, we have 10,000 tons that go to landfill in CA. Want to make sure that is included in the needs assessment and asking for clarity.

Comment 5: Chris Piche (RPM Eco)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

Would like some clarity on the CMC category of HDPE rigid containers. Do you plan to include it, what's the plan for it in the NA?

Comment 6: Dylan de Thomas (The Recycling Partnership)
Date received: May 1, 2024
Source: May 1, 2024 Workshop
Email includes attachments: No
Comment:

Recognized his earlier comments were on the CMC and wants to make comments on the NA. Wants to suggest RFPs go out as soon as possible and expedited. There's a short timeline, particularly for the Source Reduction Baseline study. Six months is not enough or feasible.

Comment 7: John Davis (Mojave Desert and Mountain Recycling Authority)
Date received: May 8, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Topic: Responsible End Markets Permitting and Operating Requirements

The responsible end markets needs assessment should include identification of California's statutory and regulatory requirements addressing environmental benefits and minimizing public health and worker safety risks. This would mean listing the various permit and operating requirements, e.g. air district permits, wastewater discharge, solid waste facility permits, OSHA, Public Health Department microplastic inspections or hazard exposure assessments.

This identification could provide a basis to compare responsible market entities outside California to the state's standards, at least as to the extent of permit and operating requirements. Without that basis the compliance requirements of 18980.4(a)(1) lack comparability and relevance.

Comment 8: Alison Griffith (HF&H Consultants)
Date received: May 17, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Dear CalRecycle SB 54 Team,
HF&H Consultants, LLC (HF&H) appreciates the opportunity to provide comments in response to CalRecycle's May 1, 2024 workshop on the topic of the SB 54 Needs Assessment studies. HF&H is supportive of the goals established by SB 54, and we appreciate the opportunity for stakeholder engagement in the implementation process.

HF&H exclusively represents public sector clients. Over the past three decades, we have assisted over 400 local government agencies in the State of California. Our work is primarily in the areas of strategic planning, local policy development, negotiations with recycling service providers, financing infrastructure, program funding, and rate setting for local government solid waste programs. These services relate to the materials and programs regulated under SB 54, particularly regarding impacts to local jurisdictions and recycling service providers. The following comments and suggestions are based on our experience providing these services to local governments throughout California.

TOPIC 1: NEEDS ASSESSMENT
Part II. Updates on Needs Assessment Development
Needs Assessment Item 3: Collection, Processing, and End Markets Study

- This study will require collaboration with the Producer Responsibility Organization and input from local jurisdictions throughout the state, as well as other stakeholders. We appreciate CalRecycle's additional information provided at the May 1 workshop detailing the types of collaboration and engagement CalRecycle intends to utilize throughout this process. However, it is still unclear how much the awarded contractor will be expected to organize, participate, and/or lead these engagement strategies. This stakeholder engagement alone could require significant resources to ensure it is conducted adequately. CalRecycle will need to establish mechanisms, regulatory or otherwise, to ensure stakeholders are compelled to participate. We recommend CalRecycle identify in the RFP the expected level of effort in stakeholder engagement that will be required by the contractors throughout the study process; and ensure that adequate time and resources are allocated for such efforts. Additionally, we recommend that CalRecycle specify the mechanisms it will use to compel stakeholders to participate and provide data in the process, which will be a crucial part of ensuring the study is representative.
- We understand that CalRecycle will be responsible for providing available data related to the study and conducting additional analyses when data is available. We recommend CalRecycle clarify in the RFP process how much additional data gathering and primary research the awarded contractor will be expected to conduct in order to fill in any data gaps. The specific data needed for the scope of study #2 is not likely to be publicly or readily available, and additional data gathering will likely be needed for an adequately robust study and/or CalRecycle will need to establish and exercise adequate regulatory authority to access the full range of data needed. This data availability and accuracy is crucial, as this study will inform funding mechanisms and equitable reimbursement to local jurisdictions, as intended by the statue. When developing the RFP and scope of work for study #2, we encourage CalRecycle to be specific about how the data made available through the portions of the study conducted by CalRecycle and/or other contractors may pose limitations to the contractor's portions of the study based on the data made available. Should the contractor be required to conduct primary research and additional data gathering to fill in data gaps, we recommend CalRecycle explicitly state this in the RFP and provide adequate budget for conducting this additional research. We also suggest that CalRecycle provide specific expectations for the level of engagement and collaboration CalRecycle expects throughout the process. For example, we recommend that CalRecycle specify which documents or deliverables CalRecycle expects to review, the number of review cycles, and the number of meetings expected.
- It seems likely that multiple studies may require gathering information from the same or similar facilities, producers, and/or other stakeholders. Will contractors who are awarded one study be expected to track and coordinate with the contractors performing the other studies to ensure there are no redundancies or conflicts with the study approaches and requests for information? If conflicting information is

provided by two separate studies, how will CalRecycle determine the best approach or information to use?

- The requirement for the contractor to "estimate litter and leakage of covered material" was added to this discussion document since the December 2023 workshop. Conducting a statewide litter and leakage study may be a significant undertaking. Considering that this is not part of the needs assessment topics outlined in the statute, we request that CalRecycle provide further information on the purpose of adding this requirement on guidance on what CalRecycle's envisions the scope boundaries to be, such that the contractor would be able to complete this within the time and resources available.
- The contractor will be required to "[i]dentify incompatible material and contamination, including factors contributing to contamination." Please clarify specifically what information CalRecycle is seeking when referring to identifying contamination (most common types of contaminants, volume of contaminants, etc.) and the expected level of detail of these findings.
- We request that CalRecycle please confirm whether the allocated budget is just for the contractor portion of the study or if it is meant to also cover the portion of the study conducted internally by CalRecycle. If the latter, please clarify how the funding will be split between the contractor and CalRecycle.

HF&H appreciates the opportunity to provide input into the implementation of this important statute. We hope that our suggestions and recommendations are helpful to you and the process.

Comment 9: Linnea Whitney (The Recycling Partnership)
Date received: May 21, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

NA Item 1: Overview of Needs Assessment Studies
No comments.

NA Item 2: Source Reduction Baseline Study

- To help support timely producer recruitment, we suggest that any communications with producers and prospective producers under this contract should include information on the SB 54 producer definition and obligations and highlight the need to contact CAA immediately to learn about what is required to satisfy the requirement to be part of an approved PRO Plan by January 1, 2027 pursuant to PRC Section 42051(b).
- We suggest CalRecycle and the contractor explore whether data requests to producers under this contract can be structured to pilot reporting guidelines and forms that may later be integrated into the SB 54 producer reporting system pursuant to PRC Section 42052(a).
- We suggest the contractor be asked in the final report to provide any written observations and suggestions that may be useful to CalRecycle when updating the source reduction baseline pursuant to the draft regulations in §18980.9(c).

NA Item 3: Collection, Processing, and End Markets Study

- Given the very broad scope of the study, we suggest priorities be set early in the contract. We suggest as an initial task, the study identify “at risk” CMCs with compliance challenges and ensure that sufficient time and resources are allocated to analyze their needs. This should include the seven “flexible and film items” categories (one for each resin code) and the two clear non-bag film categories (for LDPE and PP), among others that may be identified.
- To complete the “Estimate current costs” task, CalRecycle will need to define the range of existing capital and operational costs to be assessed as well as other characteristics such as whether costs must be estimated by CMC, by generation sector, program type, etc. Given the budget and time constraints, it appears to us that the cost estimation will necessarily need to be high level. For comparison, CalRecycle’s 2023 Processing Fee and Handling Fee Cost Survey RFP (#DRR22033) shows a budget of $2 million to cost estimates covering only redemption value containers in the Beverage Container Recycling Program. We also suggest the study identify and assess alternative methods to estimate and update future costs over time, both investment needs and any ongoing operational costs that may be required.
- We strongly suggest that CalRecycle hold a stakeholder forum focused on informal discussion of SB 54 cost coverage and PRO payment system issues, in addition to other issues, to help target the study.
- Since the “Evaluate improved design for recyclability and compostability” task was moved from Study #3 to this study, we suggest that a portion of the proposed budget also be increased to compensate. While $2.2 million seems like a large budget, we believe it may be very tight for the large scope of work required and may result in necessarily broad findings in some areas that will need to be further litigated during review of the PRO Plan. If possible, CalRecycle should structure the contract to allow for an increase in budget if deemed merited during the study.
- The scope of work should include developing a recommended minimum recycling yield requirement per §18980.4(a)(4) in the draft regulations and, consistent with our SB 54 rulemaking comments, also a compost minimum recycling yield requirement. We suggest the study explore in detail what level of detailed reporting and verification is feasible for intermediate supply chain entities, related to yield rate estimation and management of incompatible materials, including considerations related to reporting such as protecting confidentiality.
- To help inform future identification and verification of responsible end markets, outreach to processors and end market facilities should include a very short, high-level survey to help raise awareness of SB 54 requirements and evaluate challenges and strategies to facilitate timely REM verification.

NA Item 4: Source Reduction and Material Design Study

- As with the Collection, Processing, and End Markets Study, we suggest priorities be established early on to focus time and resources, and we suggest that reuse and refill systems be the top priority. The study should also focus on evaluation of alternatives to the film and flexible CMCs we identify under Item 3 above.

NA Item 5: Consumer Education and Access Study
No comments.

NA Item 6: Current and Needed State of Funding and Statutory Provisions Study
- We suggest this include evaluation of pertinent federal funding programs and other non-state programs, as appropriate, that may contribute to SB 54 goals.

NA Item 7: Contracting Process
- We understand that CalRecycle is working hard to expedite this process. We would like to respectfully reinforce prior comments on the need to swiftly (and judiciously) execute the contracts and deliver results as soon as possible, no later than the January 2026 time frame indicated in the paper since the draft PRO Plan is due by April 1 of that year.

NA Item 8: Goals of Collaboration & Engagement
- We suggest two more specific goals be added to the list in the discussion paper:
  - Receive public input early in the contract on proposed approach and data sources, and anticipated outcomes of each study.
  - Receive public input on preliminary findings of each study early enough for feedback to be considered prior to release of a draft report.
- We believe it is very important for the PRO to be very involved with the contractor and CalRecycle team during the study. CalRecycle should authorize and encourage regular informal communications without imposing any barriers such as the need for prior approval. To address any concerns about data integrity, the public should be provided ample, early opportunities to weigh in as we suggest in comment #1 above on this item. The data and findings in the final needs assessment study reports should stand on their own merits. The study team should have the benefit of full information from the PRO's team that is actively working to develop the program plan, and therefore has a leg up on identifying key issues and options. Given the very short time frame to complete the needs assessment and for the PRO to simultaneously develop a draft plan that integrates findings, close and seamless interactions are absolutely imperative.

NA Item 9: Proposed Collaboration & Engagement
- We ask that CalRecycle release a process for how the needs assessment will be finalized. For example:
  - What additional research and outcomes is CalRecycle working on, in addition to the studies identified in the discussion paper (if any)?
  - Will CalRecycle prepare a separate needs assessment report that synthesizes findings from the contractor studies and CalRecycle research? Or will the contractor studies stand alone as needs assessment studies?
  - Will there be a separate public review process on the contractor studies and also on CalRecycle's synthesized needs assessment report?
  - When and how will the advisory board weigh in?
  - How long will the public have to review and comment on a final needs assessment study report prior to CalRecycle approval?
  - When is final CalRecycle approval anticipated?

NA Item 10: New SmartComment Portal for Needs Assessment

- We are eager to use this new tool. Thank you to CalRecycle for providing the opportunity for stakeholders to weigh in.
- Please clarify the type of information and feedback CalRecycle is seeking and specifically any timeframes for submittals.

June 2024

Comment 10: Kathleen Rabe
Date received: June 14, 2024
Source: Website (SmartComment)
Email includes attachments: Yes, nontext items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

No text entered. Attachment text provided below.

Attachment text: Policy Brief: California Policy Regarding Planned Obsolescence

EXECUTIVE SUMMARY Countering the strategy of planned obsolescence, which is built into the production of most goods traded globally, is necessary to combat its negative impacts on the environment. This requires involvement from governments, businesses, and consumers. By requiring transparency in planned obsolescence, designing products with durability in mind, and encouraging sustainable consumption practices, we can work towards a more equitable and sustainable system.

INTRODUCTION Planned obsolescence is the common business practice of intentionally limiting a product's useful life. Many manufacturers incorporate planned obsolescence into the production of goods to limit the useful life of their products and increase consumption. This has led to unsustainable levels of consumption of natural resources and waste. The United Nations notes unsustainable consumption and production as the leading cause of a triple planetary crisis (biodiversity loss, pollution, and climate change). Growing concern over sustainability and the environment has caused governments, advocacy groups, and consumers around the world to advocate for more responsible product design. France and Canada are the only countries to have passed legislation banning planned obsolescence.

HISTORY During the 1870s the United States faced a period of overproduction leaving goods sitting unsold in warehouses. This trend continued from 1929-1939 when the world faced the great depression. Unemployment rates soared which drove people in search of a solution that included the ‘industrial machine’ as a way to stimulate consumerism. Although in 1895 technological improvements made it possible for the life of a lightbulb to extend to 2500 h, in 1924 its lifespan was deliberately limited in production to only 1000 h, requiring replacement more frequently. In 1932, Roy Sheldon and Egmont Arens suggested that the United States promote consumerism and utilize its “enormous natural resources”, reasoning, “we still have tree-covered slopes to

deforest and subterranean lakes of oil to tap". It was during that same year (1932), when Bernard London, a real estate broker, coined the term planned obsolescence, officially pinning a name to the practice of designing products not to last. He argued, if consumers weren't willing to increase their consumption voluntarily, they should be pushed or forced to. By the 1950s planned obsolescence had gained significant traction. It became standard practice across industries such as automobiles, appliances, and across a multitude of sectors. Planned obsolescence is common practice today and has led to unsustainable levels of resource consumption and waste. In Consumerist Waste: Looking Beyond Repair (2024), Roy Shapira highlights the alarming statistic, "In the U.S. alone, consumers dispose of 150 million smartphones annually." Our reliance on natural resources is increasing and most of of the world's electronic waste is not being properly managed. The solution to yesterday's problem has become the cause of many today.

GLOBAL France was the first country to pass legislation banning planned obsolescence. In 2015, France made it illegal for manufacturers to intentionally reduce a product's lifespan. The legislation requires products to be designed to last as long as possible and requires parts be made available for repair and maintenance. The law also requires manufacturers to inform consumers of the estimated lifespan of their products and how long parts will be available. Failure to comply can result in fines of up to 5% of the company's annual turnover and two years in prison (LOI n° 2015-992 du 17 août 2015).

In 2023 Canada passed a bill to promote product durability and reduce waste by banning the sale of products with planned obsolescence and requiring repair services and replacement parts be made available. Bill 29 "protects consumers from planned obsolescence" and promotes "the durability of, repairability and maintenance of goods. - (Noah Boudreau and Nicolas-Karl Perrault)

CALIFORNIA Despite the recognition of planned obsolescence as an unsustainable business practice, currently, no legislation exists in California specifically targeting the practice. Existing laws and regulations within the scope of planned obsolescence in California fall mostly under consumer protection and environmental regulations. The Business and Professions Code Section 17200, for example, prohibits unlawful, unfair, and fraudulent business practices. The Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54) addresses waste and promotes a circular economy. Enough plastic is thrown away every day in California to fill 290 Olympic size pools. These resources are not infinite and therefore it is worth considering other methods of production as we move towards a more circular economy. SB 54 shifts the plastic pollution burden from the consumer to the plastics industry and calls on producers to create a Producer Responsibility Organization (PRO), implement an Extended Producer Responsibility (EPR) program to "minimize negative impacts on public health and the environment at every stage of the product's lifecycle", and "cut plastic pollution and support disadvantaged, low-income, and rural communities hurt most by the impacts of plastic waste". The mission of CalRecycle is "Protecting California's environment and climate for the health and prosperity of future generations through the reduction, reuse and recycling of California resources, environmental education, disaster recovery and

the transition from a disposable to a fully circular economy". SB 54 does not explicitly mention planned obsolescence, however, it tells us that California is an advocate for the environment, climate action, and matters relating to waste reduction.

A study focusing on the US market exploring legal actions to increase product lifespans and reduce environmental damage was conducted by White et al. (2021). The authors suggest a path to longevity through the labeling of all hard goods with accurate estimates of average product lifespan and their capacity for repair. They found that mandatory regulations could be an effective means in motivating firms to develop and sell products with longer lifespans that are repairable and propose a framework that pushes producers and consumers to accept more responsibility for the materials and the products they use. The competition stimulated by this transition to product repairability and longevity would lead to a more circular economy and reductions in global warming. The United Nations asks that governments "implement and enforce policies and regulations that include measures such as setting targets for reducing waste generation" and also informs us that, "Transitioning to a circular economy involves designing products for longevity". Although currently, no legislation exists in California specifically addressing planned obsolescence (Bisschop et al., 2022), White et al. suggests that mandatory regulations through labeling of products with their expected lifespan is a viable solution to the problems associated with planned obsolescence.

ENVIRONMENTAL IMPACT Planned obsolescence leads to products being discarded more frequently, contributing to the growing waste problem in the state. Natural resources are being depleted. Landfills are exasperated, requiring more resource management. A literature review conducted by Amrine Lallmahomed and Julio L. Rivera in 2015 explored the effects of planned obsolescence and concluded that the result of products having shorter lifespans is that the more waste that is produced, the more that ends up in landfills. Bedford et al. came to the same conclusion in 2022, noting that "Intentionally shortening the lifespan of products by design or intellectual property stipulations, especially those of electronic and digital devices, has significant environmental impacts because more waste is created and needs to be disposed of." Facilities often operate on expired permits, aren't properly managed, and have a history of health and safety violations.

The State of California's Summary of Projected Climate Change Impacts on California tells us that the anticipated effects of climate change in California include extreme weather, rising sea levels and temperatures, changes in precipitation, increased susceptibility to wildfires, coastal flooding and erosion, acidification, and negative impacts on human health.

STAKEHOLDERS France is a key stakeholder to California. Through a joint declaration, California and France agree to work together to combat the effects of climate change. The agreement between France and California provides California with a strong reason to address the effects of planned obsolescence as it would be in alignment with the goals of the declaration by promoting sustainable consumption, waste reduction, and supporting environmental protection efforts. France, in their own efforts towards

sustainability, has strict measures against planned obsolescence, making the strategy illegal since 2015. Californians Against Waste (CAW), as one of the oldest advocacy groups in the United States, could also be a key stakeholder as their mission is to eliminate pollution and transition California's economy to a circular one. Planned obsolescence is a leading cause of pollution. CAW was founded in 1977 as a non-profit environmental research organization and advocacy group looking to identify, develop, and promote policy solutions to pollution and conservation problems that pose a threat to the environment and public health.

The Climate Action Caucus is composed of senators, assembly speakers, and members who fight for policies that address climate change. These individuals could be considered key stakeholders in addressing planned obsolescence as unsustainable consumption and production is a leading cause of climate change.

POLICY RECOMMENDATION California policy should go beyond the current focus on recycling. Although recycling is beneficial, it is not sufficient in keeping up with the increasing trends in waste production, resource depletion, and global warming. California should consider the following policy recommendation instead:

01 Transparency in planned obsolescence

Implement legislation requiring manufacturers to label products with accurate estimates of their average lifespan and repairability as proposed by White et al. (2021).

CONCLUSION The intentional designing of products not to last is an unsustainable practice. Unsustainable consumption and production are the leading cause of biodiversity loss, climate change, and pollution. If California continues with planned obsolescence, the state could face increasingly severe environmental impacts and economic challenges including resource depletion and rising waste management costs. While California lacks legislation specifically addressing planned obsolescence, the state has expressed support for transitioning to a circular economy. The United Nations Sustainable Development Goal 12 Responsible Consumption and Production emphasizes "transitioning to a circular economy involves designing products for longevity". Research suggests, by motivating firms to develop and sell products with longer lifespans, we can move towards a more circular economy and reduce global warming. Implementing a framework that mandates accurate lifespan labeling of all hardgoods could provide a job-rich economy based on quality rather than quantity. Both France and California have pledged to cooperate in combating global warming through their Joint Declaration. Governments, advocacy groups, and consumers around the world are calling for change in how products are designed, necessitating responsible policies. France and Canada are the only countries in the world with legislation banning planned obsolescence. California, too, can champion similar measures by 1) enacting legislation requiring transparency in planned obsolescence or 2) making planned obsolescence illegal.

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Comment 11: Heriberto Silva Ruelas
Date received: June 14, 2024
Source: Other
Email includes attachments: No
Comment:

Educacion y emprendimiento, con miras aun mejor futuro teniendo como principal objetivo que el reciclaje sea para todos un habito que se haga por amor a la naturaleza.

Translation: Education and entrepreneurship, with a better future in mind by having everyone recycle as a habit for the love of the environment as a primary objective.

July 2024

Comment 12: Christopher Park (Eastern Regional Landfill)
Date received: July 11, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

AREAS OF CONCERN REGARDING SB 54 (Allen, Chapter 75, Statutes of 2022)

Hello,

I'm writing to you on behalf of the Eastern Regional Lanfill located in Truckee, CA regarding my concerns about SB 54 that will impact our Material Recyling Facility. Please consider the following areas of concern.

- We only accept recyclable plastic #1 & #2 on the line. Even then, most food containers may be unrecyclable due to contamination.
- We will need a facility that will accept compostable ware at a reasonable cost.
- Cost of educating customers and enforcing policies.
- Funding for expanding infrastructure: Increasing diversion rates and expanding types of materials recycled requires more hands-on deck, space, and storage. Our ERMRF has limited indoor space. Indoor space is necessary given our climate and need to protect recyclable from degrading and storm water runoff from contaminating our lakes and rivers.

Conclusion: Our facility greatly wants to help improve the environmental health of our community; however, I hope you will take these concerns into considerations

Thank you,

Chris Park
Safety & Compliance Coordinator
Eastern Regional MRF

October 2024

Comment 13: Tom Anderson
Date received: October 24, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Lake county ca needs support and funding. Robinson Rancheria tribe operates local recycling funded by cal recycle for the count of lake

Comment 14: Karina Coronado
Date received: October 24, 2024
Source: Website (SmartComment)
Email includes attachments: No
Comment:

We need to cut plastic use starting at the producer level.

November 2024

Comment 15: Sheng Su (Sustain You)
Date received: November 27, 2024
Source: Website (Smart Comment)
Email includes attachments: No
Comment:

Subject: Comments on Draft PEIR for Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54)

Dear CalRecycle Team,

Sustain You is a dedicated zero-waste management organization committed to reducing plastic pollution and promoting sustainable alternatives to single-use plastic products. We appreciate the opportunity to provide comments on the Draft Program Environmental Impact Report (PEIR) for the Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54).

Our organization actively develops and manufactures biodegradable and compostable products to address the environmental challenges posed by disposable plastic tableware and food packaging. Our innovative solutions include:

- Compostable Straws: Made from rice and corn plant fibers.
- Plant-Based Tableware: Utilizing sugarcane or plant fibers to create biodegradable lunch boxes, plates, and bowls.
- Compostable Bags: Trash and plastic bags composed of 60% corn-based materials.
- Biodegradable Textiles: Fabrics made from natural plant fibers that can be composted, along with innovative processes to recycle plastic bottles into textiles (e.g., converting five plastic bottles into one T-shirt).

We believe these alternatives align with the goals of SB 54 by reducing reliance on single-use plastics and minimizing the environmental impacts of packaging waste. In addition to our innovative technologies, we prioritize affordability and value, ensuring that our solutions are commercially viable and accessible to end users and businesses.

We would be honored to contribute our expertise and solutions to support the implementation of this program and help California lead the way in sustainable packaging practices. Please feel free to reach out if additional information about our technologies or products would be helpful.

Thank you for your commitment to addressing plastic pollution, and we look forward to further collaboration.

January 2025

Comment 16: Clare Swithenbank-Bowman (Trash4tokens.org)
Date received: January 21, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, nontext items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

Dear Advisory Committee,
Thank you for the informative meeting and for the incredible work you've undertaken to make such progress. Your dedication is truly inspiring, and I'm grateful for the opportunity to engage with you on these critical environmental issues.

I'd like to share insights from our work in South Africa since 2015 when I created Litter4tokens.org. It may offer valuable learnings as we explore solutions here in the USA. From my experience, leveraging global best practices can significantly enhance our collective impact.

Compostable Plastics and Waste Management
As you mentioned, compostable plastics pose a unique challenge, often adding to pollution and consumer confusion. To address this, I recommend:

- Mandatory bio-digesters at all MRFs to process these materials effectively.
- Clear labeling on compostable plastics, directing consumers to dispose of them in green bins only.
- Banning compostable plastics until cradle-to-grave solutions are in place, as they are currently just as detrimental as traditional plastics when mishandled.
- Litter4Tokens South Africa: A Proven Circular Economy Model
  Our Litter4Tokens program has achieved measurable impact:
  - 2.8 million bags of waste collected since 2015, preventing significant environmental harm.
  - Over 3,200 jobs were created and 980,879 individuals empowered through food tokens.
  - 2,457 metric tons of CO_2 diverted, with all waste types (LDPE, MLP, PET, K4, Tin etc.) repurposed equally.

Our app-based system tracks every step of the waste collection and recycling process, ensuring transparency and accountability. This model could be adapted to support

underserved communities in the USA, offering both environmental and social benefits. We plan to launch our app, branded TrashTalk, in the USA in January 2025. It will provide comprehensive data on waste collection, CO_2 reduction, and repurposing metrics aligned with EPA standards for all businesses, events and governments so that we have a central database for all to see.Making MRF accountable and showing real time data of landfill or repurposing of materials.

I've attached a proposal outlining our app's functionality and its potential role in the USA. This system could be mandated for MRFs and PROs to create a centralized database, enhancing transparency and accountability in waste management.

South Africa app - www.litter4tokens.com

South Africa charity - www.litter4tokens.org

Watch our video. We were nominated for the Earthshot prize in Capetown 2024 - https://youtu.be/qaVqAoFXsgw?si=3GjKloe-cA0A3ztk

USA - www.trash4tokens.org

Nurdle Pollution and Legal Advocacy
Nurdle pollution is a production problem that requires urgent systemic intervention. While we've taken significant legal steps against BNSF Railway and other polluters in California, broader regulatory changes are critical. Specifically:

Amending the International Maritime Dangerous Goods (IMDG) Code: Reclassifying nurdles as hazardous material will make spill prevention legally enforceable. This change would also increase the cost of virgin plastics, helping to close the price gap with recycled plastics, thereby stimulating the recycling industry. Addressing this disparity should have been a global priority decades ago, as it would have prevented trillions of nurdles from polluting the environment.

Producer Responsibility: Requiring manufacturers to fund cleanup and prevention measures ensures accountability at the source.

Since uncovering the nurdle crisis in 2016 in South Africa, we've documented spills, conducted extensive cleanups, and educated communities. However, systemic changes remain imperative to prevent further damage.

Call to Action
I'd love to explore collaboration opportunities and discuss how we can implement these solutions in California. Your guidance on funding avenues and regulatory pathways would be invaluable as we work to expand these proven models in the USA.

Thank you for your time and consideration. I'm happy to provide further details or arrange a follow-up discussion.

Warm regards,

Links to press and tv coverage over the past year for the Nurdle Issue in San Diego.

South Africa - Nurdle video - https://youtu.be/7olrc4_RwhE?si=YSWmrsL1lFLih49X

https://youtu.be/pD4_gd_tRqw

https://www.cbs8.com/article/news/local/outreach/earth8/nurdles-tiny-causing-big-problems/509-7fcf6608-e1cd-4cf2-8667-86f8077cf31e

https://www.nbcsandiego.com/videos/nurdles-washing-up-on-san-diego-county-beaches-are-causing-big-problems/3653605/

https://youtu.be/kHXEz54-iso

https://www.sandiegouniontribune.com/2024/06/03/the-trouble-with-nurdles-the-plastic-pollution-you-may-not-know-about/

https://sandiego-surfrider-org.cdn.ampproject.org/c/s/sandiego.surfrider.org/news/help-us-prevent-nurdle-spills-and-hold-polluters-accountable?hs_amp=true

Clare Swithenbank-Bowman
Founder & CEO
+650 421 3893 | ✉ clare@litter4tokens.co.za
Founder & CEO (SA): www.litter4tokens.co.za
Founder & CEO (USA & Mexico): www.trash4tokens.org
Litter4Tokens App: www.litter4tokens.com
Manufacturer: Nurdle SA
Inventor: @MermaidTearCatcher
Advisor: www.seahugger.org

Watch our video:Litter4Tokens - United Nations SEED WINNER! (youtube.com)
Litter4Tokens YouTube Channel: Litter4Tokens YouTube

Attachment text 1: April 2, 2024

VIA CERTIFIED MAIL-RETURN RECEIPT REQUESTED

BNSF Railway Company ATTN: Managing Agent 740 E Carnegie Dr San Bernardino CA, 92408

BNSF Railway Company Jill Mulligan Chief Legal Officer 2650 Lou Menk Drive, Fort Worth, TX, 76131

BNSF Railway Company CA Registered Corporate Agent 330 N Brand Blvd, Glendale, CA, 91203

Re: Clean Water Act Notice of Intent to Sue/60-Day Notice Letter

To the Above-Listed Recipients:

Please accept this letter on behalf of the Coastal Environmental Rights Foundation ("CERF") and San Diego Coastkeeper ("Coastkeeper") regarding the BNSF Railway Company's ("BNSF") violations of the Clean Water Act ("CWA").1 The purpose of this letter is to put BNSF on notice of the violations of the CWA, for which CERF and Coastkeeper intend to file suit. As explained below, BNSF continues to discharge pollutants into a water of the United States ("WOTUS") without a permit, in violation of the CWA.

Section 505(b) of the CWA requires that sixty (60) days prior to the initiation of a citizen's civil lawsuit in Federal District Court under Section 505(a) of the Act, a citizen must give notice of the violations and the intent to sue to the violator, the Administrator of the U.S. Environmental Protection Agency, the Regional Administrator of the U.S. Environmental Protection Agency for the region in which the violations have occurred, the U.S. Attorney General, and the Chief Administrative Officer for the State in which the violations have occurred [33 U.S.C. § 1365(b)(1)(A)]. This notice letter ("Notice Letter") is being sent to you as a Responsible Party for the unlawful discharges. This Notice Letter is issued pursuant to 33 U.S.C. §§ 1365(a) and (b) of the Clean Water Act as notice of CERF and Coastkeeper's intention to file a federal enforcement action against the BNSF for violations of the Clean Water Act sixty (60) days from the date of this Notice Letter.

1. Background

1.1 CERF and Coastkeeper

CERF is a non-profit public benefit corporation organized under the laws of the State of California with its main office in Encinitas, CA. CERF is dedicated to the preservation, protection, and defense of the environment, the wildlife, and the natural resources of the California Coast. CERF's mailing address is 1140 S. Coast Highway 101, Encinitas, CA 92024, and telephone number is 760-942-8505.

San Diego Coastkeeper is a non-profit public benefit corporation organized under the laws of the State of California with its office at 8305 Vickers Street, Suite 209, San Diego, CA 92111. Its telephone number is 619-609-0860. Founded in 1995, San Diego

Coastkeeper is dedicated to the preservation, protection, and defense of the environment, wildlife, and natural resources of San Diego County watersheds.

To further these goals, Coastkeeper and CERF actively seek federal and state agency implementation of the CWA, and, where necessary, directly initiate enforcement actions on behalf of themselves and their members.

CERF's and Coastkeeper's members live, work, recreate, and/or otherwise use and enjoy the areas in and around the waters into which BNSF discharges, including but not limited to, Buena Vista, Agua Hedionda, Batiquitos, San Elijo, San Dieguito, and Los Penasquitos Lagoons which empty into the Pacific Ocean (collectively "Receiving Waters"). Members of CERF and Coastkeeper use the Receiving Waters to swim, boat, kayak, surf, bird watch, view wildlife, fish, hike, bike, walk, run, general aesthetic enjoyment, and/or for educational opportunities or developing educational tools. Additionally, members of CERF and Coastkeeper use the Receiving Waters to engage in scientific study through pollution and habitat monitoring and restoration activities. The discharges of pollutants from BNSF impair each of these uses. Discharges of plastic nurdles from BNSF rolling stock are ongoing and continuous. Thus, the interests of CERF's and Coastkeeper's members have been, are being, and will continue to be adversely affected by the Responsible Party's failure to comply with the Clean Water Act.

1.2 BNSF

BNSF is a railway company headquartered at 2650 Lou Menk Drive, Fort Worth, TX, 76131. Within California, BNSF's main operations occur at 740 E Carnegie Dr., San Bernardino, California, 92408. BNSF has over 50 locations throughout California that engage in industrial activities related to the shipping and transportation of materials. In San Diego County, BNSF trains travel on tracks that cross Buena Vista, Agua Hedionda, San Elijo, Los Penasquitos, and Batiquitos Lagoons – often carrying nurdles.

Information available to CERF and Coastkeeper indicates BNSF is the sole transporter of nurdles along this rail corridor. BNSF specifically advertises its plastic transportation capacities.2 BNSF transports plastic nurdles in private equipment, through transloaders, either in covered or uncovered hoppers. While uncovered hoppers are the most likely to spill nurdles from rolling stock, experienced train operators routinely concede that covered hoppers also frequently leak small materials like plastic nurdles.3

The North County Transit District ("NCTD") owns approximately 62 miles of mainline railroad track from the Orange County/San Diego County line to the Santa Fe Depot in downtown San Diego. These tracks bisect and cross over each of the Receiving Waters. BNSF operates freight shipping trains along these tracks pursuant to a shared use agreement. After nurdles were discovered along this rail corridor, NCTD assessed the nurdle spills and determined BNSF the responsible party. Paul Ballard, Executive Director of NCTD, wrote to Tracey Foster, Chief Development Officer for NCTD, on October 30, 2023, that "[t]his is a product that BNSF would transport. I don't believe we carry them on the Coaster." BNSF then assumed responsibility for the cleanup. Thomas

Jones, Manager of Environmental Remediation for BNSF, emailed NCTD on December 4, 2023, claiming to tentatively schedule cleanup on December 5, 2023. However, as discussed infra section 1.4, CERF and Coastkeeper representatives continue to find nurdles along the tracks.

1.3 Plastic Nurdles and Impacts on Coastal Ecosystems

Plastic nurdles are small plastic pieces measuring 1-5mm in diameter. These nurdles are the raw materials used for manufacturing plastic bottles and other plastic items. Annually, over 230,000 tons of these nurdles enter the marine environment.4 BNSF and other railroad companies discharge these nurdles into water bodies through hopper leaks, spills during loading and unloading, and train derailments. Nurdles routinely escape the plastic transport process, including spilling from cargo containers while being transported by trains and ships. When nurdles are being loaded into trains, for example, they are often blown into rail cars using large hoses.5 The beads can leak around the edges of hoses at factories and out the sides of rail cars as they travel to distribution centers.6 Researchers such as Mark Benfield, an oceanographer at Louisiana State University who studies microplastics, have found nurdles lining the sides of tracks used by nurdle carrying trains.7 The California State Water Resources Control Board's ("State Board") website for the Preproduction Plastic Debris Program includes a photographic example of "preproduction plastic pellets spilled during rail car loading."8 These spills have devasting effects on aquatic and marine environments.

Once in the environment, nurdles' "small size allows the material to widely disperse and become embedded in natural elements such as sediments and plant matter, making clean-up efforts costly and labor intensive."9 Like most plastics, nurdles do not biodegrade, but slowly deteriorate over decades or centuries, forming the second-largest source of ocean microplastics behind only tire dust.10 Ocean currents, wind, waves, and sea life transport nurdles to ocean waters throughout the globe. Additionally, plastic harbors biofouling species. Thus, when nurdles disperse, they can introduce devastating invasive species to an ecosystem. There have been 32 reports of transporting 270 different species via plastic to new ecosystems.11

Nurdles also absorb toxic chemicals found in the ocean, like DDT, PCBs, and mercury, and therefore nurdles act as vectors for these toxic pollutants as they disperse throughout our oceans.12 Plastic nurdles look like fish eggs, and thus sea turtles, fish, and birds often mistake nurdles for food.13 As these animals cannot digest plastic, this results in digestive system blockages, starvation, and death. Less than five millimeters in diameter, plastic nurdles are also considered microplastics – the most consumed plastic by marine life.14 Ingestion of microplastic particles also exposes organisms to the chemicals used to produce the plastic material itself, as well as persistent organic pollutants ("POPs") in the environment that tend to accumulate on plastic particles.15 Notably, scientists have documented plastic's adverse impacts on at least 663 marine species.16 For these reasons, California law specifically classifies nurdles as pollutants to be regulated under the Clean Water Act.17

Thus, discharging plastic nurdles into aquatic environments (1) devastates food webs through animal consumption; (2) threatens biodiversity through introducing invasive species; and (3) harms water quality and ecosystem health by spreading toxic chemicals. Therefore, such nurdle discharges harm the “chemical, physical, and biological integrity” of our waters, the precise harms the CWA was enacted to prevent.18

1.4 Plastic Nurdles Discharged by BNSF Along Railroad Tracks and in the Receiving Waters

BNSF has discharged, and continues to discharge, plastic nurdles along the north San Diego County train tracks, which travel through and over Buena Vista, Agua Hedionda, Batiquitos San Elijo, San Dieguito, and Los Penasquitos Lagoons. When transported over water, nurdles have spilled and continue to spill from trains, and directly enter surface waters.

The train tracks from downtown San Diego to and through northern San Diego County travel directly over and across many lagoons and estuaries that empty into the ocean. Additionally, NCTD has replaced older railroad tracks that previously crossed berms, with bridges, such as the tracks over San Elijo Lagoon and Batiquitos.19 Although better for the lagoons because of increased tidal flow, the bridges have the unintended consequence of also increasing direct nurdle deposition into the waters.

In addition to these direct deposits into the Receiving Water, the nurdles also enter the Receiving Waters through storm water conveyance structures that line the tracks. Map 1 below shows the numerous inlets, outfalls, drains, and channels that convey storm water from the railroad tracks into the Receiving Waters. When it rains, spilled nurdles are thus conveyed into the Receiving Waters through these structures. For example, Batiquitos Lagoon has two storm drains along the tracks that empty into the Lagoon. (See Map 2).

Map 1: Displays the drainage structures that convey stormwater from the railroad tracks into the Receiving Waters.

Map 2: Displays the storm drains along the tracks emptying into Batiquitos Lagoon.

CERF and Coastkeeper representatives have observed at least thousands, if not hundreds of thousands of plastic nurdles alongside the tracks and in and around the Receiving Waters. Further, CERF and Coastkeeper members have photographic and video evidence of such nurdle deposition See Photographs 1-3 below. CERF and Coastkeeper representatives have found nurdles in and along storm water conveyance infrastructure that discharges into Receiving Waters, strongly indicating that nurdles spilled onto land are conveyed via storm water into local waterbodies. Specifically, CERF and Coastkeeper have evidence of plastic nurdle spills that occurred on or shortly before: February 15, 2023; March 9 and 29, 2023; April 10, 18, and 27, 2023; May 7, 23, and 30, 2023; June 4, 17, and 29, 2023; July 9 and 28, 2023; August 14 and 27, 2023; September 1, 15, 19, and 28, 2023; October 23, 2023; November 4, 9, and

22, 2023; December 12, 21, and 29, 2023; and January 15, 18, 23, and 24; and February 12, 2024.

Photograph 1: Shows the stretch of train tracks over Batiquitos Lagoon, one location where spilled nurdles were discovered on multiple occasions. Taken on September 19, 2023.

Photograph 2: Shows a closeup image of spilled nurdles adjacent to Batiquitos Lagoon, in the same location as Photograph 1. Taken on February 12, 2024.

Photograph 3: Shows a nurdle floating in San Elijo Lagoon, one lagoon where BNSF discharges the nurdles. Taken on January 15, 2023.

1.5 The Receiving Waters and Their Beneficial Uses

The rail lines operated by BNSF bisect nearly every coastal wetland in San Diego County. Dynamic waterbodies adjacent to the ocean, coastal wetlands encompass an extraordinary range of habitats of critical importance. These waterbodies, and the ecosystems they support, provide an invaluable array of benefits including filtering pollution from urban runoff, buffering from storms and protecting infrastructure, habitats for birds, fish, invertebrates, and plants, carbon sequestration, and natural spaces for aesthetic and recreational enjoyment. Tragically, California has lost more than 95% of its coastal wetlands, further underscoring the importance of protecting these waterbodies and ecosystems from further degradation.20 Accordingly, each of the Receiving Waters are protected with special status under California state law. Buena Vista,21 Agua Hedionda,22 Batiquitos,23 San Elijo,24 and San Dieguito25 Lagoons are each State Ecological Reserves. San Dieguito Lagoon is also a State Marine Conservation Area. Los Penasquitos Marsh is a Natural Preserve within Torrey Pines State Reserve.26

The Water Quality Control Plan for the San Diego Basin (“San Diego Basin Plan” or “Basin Plan”) identifies the “Beneficial Uses” of water bodies in the region. The Beneficial Uses for all Receiving Water Lagoons include contact water recreation; non-contact water recreation; preservation of biological habitats of special significance; estuarine habitat; wildlife habitat; rare, threatened, or endangered species; marine habitat; migration of aquatic organisms; and spawning, reproduction, and/or early development. 27 Agua Hedionda Lagoon also includes industrial service supply; commercial and sports fishing; aquaculture; and shellfish harvesting. Buena Vista Lagoon also includes warm-freshwater habitat. The Beneficial Uses for the Pacific Ocean include industrial service supply; navigation; contact water recreation; non-contact water recreation, commercial and sport fishing; wildlife habitat; preservation of biological habitats of special significance; marine habitat; migration of aquatic organism; spawning, reproduction, and/or early development; shell harvesting; aquaculture; and rare, threatened, or endangered species.28

According to the current 303(d) List of Impaired Water Bodies, South Carlsbad Beach State Park, adjacent to the mouth of Agua Hedionda Lagoon, is impaired for trash; the

mouth of Agua Hedionda Lagoon is impaired for toxicity; Batiquitos Lagoon is impaired for toxicity; San Elijo Lagoon is impaired for eutrophic conditions, indicator bacteria, dissolved oxygen, phosphorous, sedimentation/siltation, toxicity, and turbidity; Buena Vista Lagoon is impaired for indicator bacteria, nutrients, sedimentation/siltation, and toxicity; Pacific Ocean Shoreline at the mouth of San Dieguito Lagoon is impaired for indicator bacteria; and Los Penasquitos Lagoon is impaired for sedimentation/siltation and toxicity.29

The discharges of pollutants from the BNSF railway and trains in violation of the CWA impairs each of the beneficial uses of the Receiving Waters. As discussed supra section 1.4, plastic is a floating material that causes a nuisance in each of the Receiving Waters. For example, Agua Hedionda Lagoon empties into the Pacific Ocean at the edge of Carlsbad Beach State Park at Tamarack Avenue. Thus, trash deposited into Agua Hedionda is of special concern because it empties into a beach impaired for trash. CERF and Coastkeeper representatives have swallowed nurdles while enjoying Carlsbad Beach State Park, emphasizing the pollution spill severity and beach impact.

The unpermitted discharges of nurdles from BNSF also harms the special aesthetic and recreational significance of the Receiving Waters, adversely impacting the public's ability, as well as that of Coastkeeper's and CERF's members, to use and enjoy these unique waterbodies. For example, at every one of the Receiving Waters there are trails and observation points, which are frequently used for jogging, hiking, birdwatching, photography, general aesthetic enjoyment, scientific study, and data collection, among other things. At the mouth of each of these lagoons are popular beaches, surfing, and swimming locations.

BNSF's illicit discharges degrade the Receiving Waters. Public concern regarding elevated pollutant levels in the Receiving Waters, and damage to the surrounding natural habitats, and thus the flora and fauna within them, harms the ability of the public, including Coastkeeper's and CERF's members' ability, to use and enjoy these unique recreational opportunities. Further, Coastkeeper's and CERF's members are less likely to recreate in and around such waters that are known to be polluted with plastics laden with toxic pollutants.

2. Violations of the Clean Water Act

The CWA prohibits the "discharge of any pollutant," unless otherwise allowed by permit.30 A National Pollutant Discharge Elimination System ("NPDES") permit must be issued before any pollutant is discharged into Waters of the United States ("WOTUS") from a point source.31 "Any discharge of pollutants not allowed by a NPDES permit is illegal."32 Thus, under the Act, a NPDES permit is required when a discharger proposes to (1) discharge (2) a pollutant (3) to waters of the United States (4) from a point source.33

A central provision of the Clean Water Act is that NPDES permits be secured before pollutants are discharged from any point source into the navigable waters of the United States.34 BNSF has violated and will continue to violate section 1342(1) of the Clean

Water Act unless and until it obtains an NPDES permit for its rolling stock discharges. Because the Responsible Party's railroad operations have been and will continue to be a point source of pollution to Receiving Waters and the Pacific Ocean, BNSF is required to obtain a NPDES permit pursuant to the CWA.35

2.1 BNSF is a person under the CWA and Plastic is a Pollutant.

A person, which includes a corporation,36 who is in control of the pollutant source is the Responsible Party within the meaning of the CWA.37 Here, BNSF owns, operates, and otherwise controls the trains and rolling stocks that carry the plastic nurdles along the railroad tracks through southern California. Thus, BNSF is the Responsible Party for the plastic nurdle discharge.

The "discharge of a pollutant" means, among other things, "any addition of any pollutant to navigable waters from any point source." 33 U.S.C. § 1362(12). "Pollutant" is defined in the CWA as:

[D]redged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water…38

"The discharge of a pollutant" and "pollutant" are "defined broadly."39 As a solid waste, garbage, and industrial waste, plastic is a pollutant under the CWA.40

California specifically classifies and regulates "preproduction plastic," which includes "plastic resin pellets," as a pollutant under the CWA.41 Section 13367 of the California Water Code requires NPDES permit coverage for plastic manufacturing, handling, and transportation facilities, to ensure these facilities "implement best management practices to control discharges of preproduction plastics."42

2.2 Addition of Pollutant from a Point Source

Discharge is defined in the Act as "any addition of any pollutant to navigable waters from any point source." A permit is required "when there is a direct discharge from a point source into navigable waters or when there is the functional equivalent of a direct discharge."43 A point source "means any discernible, confined and discrete conveyance, including . . . rolling stock."44 A point source discharge may include gravity and storm water conveyances.45 Additionally, a point source discharge occurs when a system designed to prevent pollutants from discharging fails, and storm water carries that pollutant into the receiving water.46

Furthermore, as "[s]tormwater discharges containing preproduction plastic are a significant contributor of pollutants to waters of the state," the California legislature required the State Board to "designate, as appropriate, stormwater discharges of preproduction plastic from plastic manufacturing, handling, and transportation facilities as contributors of pollutants pursuant to Section 1342(p)(2)(E) of Title 33 of the United States Code of the federal Clean Water Act."47

To determine whether a discharge is a “functional equivalent” to a point source discharge, the court will consider numerous factors.48 Of those, transit time and distance traveled are the most cogent,49 while the cardinal objective is “to advance, in a manner consistent with the statute's language, the statutory purposes that Congress sought to achieve.”50 The Supreme Court in County of Maui, Hawaii v. Hawaii Wildlife Fund determined that “[w]here a pipe ends a few feet from navigable waters and the pipe emits pollutants that travel those few feet through groundwater (or over the beach), the permitting requirement clearly applies.”51

Accordingly, BNSF has discharged and continues to discharge plastic into the Receiving Waters through a point source or the functional equivalent of a direct discharge. BNSF has released plastic (a pollutant) from rolling stock into the receiving waters. Rolling stock is a discernable, confined, and discrete conveyance and is expressly enumerated in the CWA “point source” definition.

BNSF discharged plastic via either a malfunctioning covered hopper or an uncovered hopper. BNSF’s leaking hoppers discharge nurdles (1) directly into the Receiving Waters; (2) onto land and thereafter into Receiving Waters via discrete stormwater conveyance; and (3) and onto land up gradient and immediately adjacent to Receiving Waters, a mere few feet from the water. Whether via direct discharge or the functional equivalent, BNSF’s discharge of nurdles constitutes a CWA violation.

2.3 to the Waters of the United States

WOTUS are “[w]aters which are: (i) [c]urrently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.” The definition also includes any tributaries of that water.52

All Receiving Water Lagoons are WOTUS. The Pacific Ocean is used for interstate and foreign commerce, and each of the aforementioned lagoons are tributaries of the Pacific Ocean and subject to the ebb and flow of the tide. Therefore, the Receiving Waters are WOTUS. The train tracks travel directly over the Receiving Waters. Information available to CERF and Coastkeeper indicates that BNSF rolling stock discharge nurdles directly into the Receiving Waters and onto land immediately adjacent to Receiving waters, which are thereafter mobilized by gravity and/or storm water into Receiving Waters constituting functional equivalent to a direct discharge. Thus, BNSF discharges pollutants into WOTUS.

2.4 BNSF is Subject to the CWA and Does Not Have a Permit for this Discharge.

There are no exceptions to the CWA applicable to BNSF.53 BNSF has not obtained a permit for this discharge. Thus, BNSF has been in daily violation of the CWA since at least February 15, 2023. A discharger “that violates the Act by discharging without a permit…remains in a continuing state of violation until it either obtains a permit or no longer meets the definition of a point source.”54 BNSF’s unlawful discharges of nurdles

are ongoing and continuous, subjecting it to daily penalties since at least February 15, 2023.

3. Relief Sought for Violations of the CWA

In light of the Facility's continuing, egregious CWA violations, CERF and Coastkeeper will seek injunctive relief preventing further violations pursuant to Sections 505(a) and (d), 33 U.S.C. § 1365(a) and (d), declaratory relief, civil penalties, and such other relief as permitted by law. Pursuant to Section 505(d) of the Clean Water Act, 33 U.S.C. § 1365(d), CERF and Coastkeeper will seek to recover their litigation costs, including attorneys' and experts' fees.

4. Conclusion

CERF and Coastkeeper are willing to discuss effective remedies for the violations described in this Notice Letter. However, upon expiration of the 60-day notice period, CERF and Coastkeeper intend to file a citizen suit under Section 505(a) of the Clean Water Act for BNSF's violations of the CWA. CERF and Coastkeeper have retained legal counsel to represent them in this matter. Please direct all communications to CERF's and Coastkeeper's legal counsel:

San Diego Coastkeeper

Patrick McDonough patrick@sdcoastkeeper.org San Diego Coastkeeper 8305 Vickers Street, Suite 209 San Diego, CA 92111 Tel: 619-609-0860

Coastal Environmental Rights Foundation

Marco Gonzalez Livia Borak Beaudin Natalie Clagett livia@coastlawgroup.com Coast Law Group, LLP 1140 South Coast Highway 101 Encinitas, California 92024 Tel: 760-942-8505

If you wish to pursue settlement discussions in the absence of litigation, please contact Coast Law Group LLP immediately.

Attachment Text 2: TrashTalk Proposal: Revolutionizing Waste Management in the USA

Overview

TrashTalk, our innovative app-based system, is designed to transform the way waste is managed by creating a centralized, transparent database. By leveraging data-driven insights, TrashTalk enhances the accountability of Material Recovery Facilities (MRFs) and Producer Responsibility Organizations (PROs), ensuring every step of the waste collection and recycling process is traceable and sustainable.

Litter4Tokens South Africa: A Proven Circular Economy Model

Since its inception in 2015, Litter4Tokens has demonstrated measurable success in South Africa, setting the benchmark for scalable and sustainable waste management.

Key Achievements:

- Environmental Impact: Over 2.8 million bags of waste collected, preventing substantial environmental harm.
- Social Impact: Created over 3,200 jobs and empowered 980,879 individuals through food tokens.
- Carbon Reduction: Diverted 2,457 metric tons of CO_2 from landfills and incineration.
- Circular Economy: Repurposed all types of waste—LDPE, MLP, PET, K4, Tin, and more—ensuring equal value for every material.

The success of this model is driven by an app-based system that ensures transparency, accountability, and traceability, making it adaptable to underserved communities in the USA.

Introducing TrashTalk in the USA

TrashTalk is set to launch in January 2025, bringing cutting-edge functionality and measurable benefits to businesses, events, and governments. By aligning with EPA standards, the app will provide comprehensive data on:

- Waste collection by type and volume.
- CO_2 reduction metrics.
- Repurposing and recycling progress.

Functionality

- Centralized Database: TrashTalk creates a unified platform where MRFs and PROs can log data on waste collection, recycling, and disposal. This real-time information will:
  - Show the flow of materials to landfills or repurposing facilities.
  - Highlight inefficiencies in waste management.
  - Provide stakeholders with actionable insights.

- Transparency & Accountability: The app will mandate MRFs and PROs to report waste processing details, enabling:
  - Full traceability from collection to repurposing.
  - Verification of compliance with recycling targets.
  - Public visibility of waste management performance.

- Empowering Communities: TrashTalk incorporates elements of the Litter4Tokens model to support disadvantaged and marginalized communities in the USA. Key features include:
  - Stipends for waste collection with payment integrated system, incentivizing participation.

    - Equal value assigned to all waste types, ensuring nothing is discarded or incinerated.
    - Data on community impact, showcasing social and environmental benefits.

- Integration with Circular Economy Goals: By transforming collected waste into new products, TrashTalk facilitates:
    - Reduced reliance on virgin materials.
    - Enhanced demand for recycled content.
    - Opportunities for innovation in repurposed materials.

Potential Mandate for MRFs and PROs

- TrashTalk has the potential to become a mandated system for MRFs and PROs across the USA. With its robust tracking and reporting capabilities, the app will:
    - Ensure compliance with national waste management and recycling standards.
    - Provide a transparent mechanism for monitoring recycling rates and landfill diversion.
    - Help bridge the cost gap between virgin and recycled plastics by showcasing the value of repurposed materials.

Conclusion

The TrashTalk app represents a unique opportunity to revolutionize waste management in the USA. By combining technological innovation with a proven circular economy model, it addresses critical environmental and social challenges while empowering communities and creating a transparent system for all stakeholders.

We invite you to discussTrashTalk's functionality and its potential to reshape waste management in the USA. Together, we can build a sustainable, equitable, and accountable future for waste management.

February 2025

Comment 17: Shira Lane (Atrium 916)
Date received: February 3, 2025
Source: February 3, 2025 Workshop
Email includes attachments: No
Comment:

Were the models matched to the product "end of life" such as the material characterization studies? Do they match? Was there interaction with the consultant? It would be nice to have consultants involved in these studies. Were assumption models matched? Suggests more local jurisdiction collaboration – board of supervisor meeting, local task force as an example.

Comment 18: Doug Kobold (California Product Stewardship Council)
Date received: February 3, 2025

Source: February 3, 2025 Workshop
Email includes attachments: No
Comment:

On second to last slide, 210 tons statewide – seemed awfully small.

Comment 19: Nancy Bernard (Cascade Packaging)
Date received: February 3, 2025
Source: February 3, 2025 Workshop
Email includes attachments: No
Comment:

In the source reduction baseline study, are containers used to sell raw meat in grocery stores, considered food service ware?

Comment 20: Anja Brandon (Ocean Conservancy)
Date received: February 3, 2025
Source: February 3, 2025 Workshop
Email includes attachments: No
Comment:

How model was ground truthed – waste characterization studies are imperfect. Look back at 2018, plastic disposed was 2.9 million tons, which is the same as this baseline report. If you assume the CAGR looking to see how, if at all, this model was kind of ground truthed - How was this ground truthed with other studies out there?

Comment 21: Chris van Rossem (Circular Action Alliance)
Date received: February 3, 2025
Source: February 3, 2025 Workshop
Email includes attachments: No
Comment:

Given draft regulations say the source reduction baseline will be updated based on producer data included in the PRO plan and 2023 data reported to CalRecycle on July 2027, will the source reduction baseline produced through the study actually be used to determine compliance with source reduction targets, pursuant to PRC 42057? Also, given that SB 54 allows PRO to develop an alternative compliance formula that allows for postconsumer resin (PCR) to account for a maximum of 8% of the 25% source reduction target, I'm wondering if you could comment on the statement in the study that the PRO reduce single use plastic? By the precise number 725,000 tons of plastic and 43 billion components, which is representing that a full 25% source reduction. Just wondering if you might comment on that.

Comment 22: Peter Bierbaum (One World Resource)
Date received: February 3, 2025
Source: February 3, 2025 Workshop
Email includes attachments: No

Comment:

To echo comment for CalRecycle to ask Advisory Board to comment on the source reduction baseline. It would be an excellent opportunity to get feedback from a diverse group. Difficult on a timeline and had to make assumptions. I want to point out, when we talk millions and billions, when we look at the source reduction baseline and California population of 38.97 million in 2023, it averages out to 12 plastic items per day per person and 0.4 pounds per person. To give you an idea on scale. Just wanted to share.

March 2025

Comment 23: David Lewis
Date received: March 12, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Topic: Other considerations, concerns:
Per 42057
(i) Producers of expanded polystyrene food service ware shall not sell, offer for sale, distribute, or import in or into the state expanded polystyrene food service ware unless the producer demonstrates to the department that all expanded polystyrene meets the following recycling rates:
(A) Not less than 25 percent on and after January 1, 2025.

I cannot find any evidence that polystyrene has met the 25% recycle rate, yet as of March 12, 2025 in Placer county many restaurants are still using polystyrene food service ware for take home food. Is there an enforcement group within CalRecycle that contacts the PRO about not compying with the continued use of polystyrene within Placer County?

April 2025

Comment 24: Kathryn Walsh (City of San Jose)
Date received: April 30, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Topic: Consumer Education and Access Study

The City of San José (City) appreciates the opportunity to submit comments on the Consumer Education and Access Needs Assessment Study Request for Proposal, developed by CalRecycle for the implementation of Senate Bill (SB) 54.

With regard to the Section 3.5 (Methodology) of the Request for Proposal for the

Consumer Education and Access Study, the City appreciates the requirement to include interactive elements in the surveys. However, the City requests that CalRecycle re-consider the example given in Section 1, the Minimum Criteria For Study Design, subsection (b)(1)(a) of "an interactive material sorting quiz where respondents can drag and drop select items into their respective waste bins (trash, recycling, green waste)." The City believes that this type of quiz would create unintentional confusion for some survey participants, since several local jurisdictions' waste management systems differ from a three-bin system. In San José, residents sort food waste and related organic waste into the garbage stream, and the resulting waste is sent to an SB 1383-compliant High Diversion Organic Processing Facility to be sorted using back-end processing. There are also some jurisdictions that have split carts and therefore more than three options for sorting. The City requests that the complexities of local jurisdictions' waste management systems be accounted for throughout the two surveys that will be conducted for the Consumer Education and Access Needs Assessment Study. This is necessary to correctly capture relevant data on residents' understanding of waste-related practices.

Additionally, the City requests that the survey results be available for local jurisdictions to view once the study is complete. It would be incredibly useful for jurisdictions to have access to the regionally-specific data required to be collected through the study. If it is not possible for CalRecycle to provide the survey response data in its entirety, the City requests that the final report be made publicly available on CalRecycle's website.

Thank you for your consideration of these comments. The City looks forward to working with CalRecycle on effective implementation of SB 54.

Comment 25: Patrick Keenan
Date received: April 30, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, Non-text items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

Hi- Per the request to Advisory Board, I am providing comments on the 2 Needs Assessment Consumer Education and Access study questionnaires.

Thanks for letting me review and provide feedback. I am looking forward to the results of the surveys.

Overall I think its very important that the questions relate back to the mechanisms CalRecycle & CAA have control over within the statute and regulations. Some of the options for consumers are mechanisms that we don't have control over.

Please reach out if you have any additional questions or follow ups.

Attachment text: Comments submitted were in the form of Microsoft Word comments adjacent to the CEA surveys.

Recycling Composting Survey Comments

Question 1.a.vii., Comment text: 2 additions:

- Too Hard to sort materials into different bins. This will help us understand if the effort is the gap.
- I am unaware if I have access to these bins

Question 3, Comment text: To avoid survey fatigue could we eliminate this question? Don't we already have access to this data based on the address/zip code provided?

Question 4, Comment text: Can we add:

- A subscription program (e.g. you pay a monthly fee and a company picks up hard to recycle material)

Question 4.a., Comment text: A better example could be -like plastic bag recycling at grocery stores

Question 4.g.i.6., Comment text: Recommend adding- I often forget alternate programs exist.

Question 5.a.ii., Comment text: We should avoid questions that could challenge FTC Green Guides for environmental claims.

Question 5.b., Comment text: Can we add:

- I read the label if it has disposal instructions

Question 5.c., Comment text: Can we add:

- Standardization

Question 7, Comment text: Can we add a column:

- Alternative collection scheme

Question 7 Item "LDPE#4", Comment text: This is confusing to the consumer as Resin ID Codes are not used on flexible packages. A better example for this plastic type would be a rigid plastic lid

Question 7 Item "PS#6", Comment text: A better example Cookie tray

Question 7 Item "plastic cling film wrap", Comment text: A better example: Plastic film (grocery bag)

Question 8, Comment text: Can we add column: Alternative collection scheme

Question 9 Column "Communication Method", Comment text: My research suggests most households get their recycling information from a Local jurisdiction website. Can we add?

Question 10 Column “Informational Source”, Comment text: can we add brands I purchase / trust or something to that effect?

Question 10 Column “Informational Source”, Comment text: Can we add:

- Google search
- Brands I purchase/trust

Question 11, Comment text: Can we add:

- Alternative collection schemes for hard to recycle material to prevent it from going to the landfill

Source Reduction Survey Comments

Source Reduction Title, Comment text: In this section can we add a write-in option for respondents who say 'yes' to share an example of products they buy with these attributes? It would be interesting to see what they are buying in bulk, which types of containers they're returning for reuse, which products they are buying that they believe reduces single-use plastic, etc.

Source Reduction Intro, Comment text: the way this is worded is leading. It gets the respondent in the mindset of reducing single use plastic (which most people likely want to do) so may make them respond more favorably. Instead, it could say 'we will ask some questions related to your use of single-use plastic and food service ware'. Cut 'reduce your use' and 'help cut the production'. We know that's our objective but we want respondents to answer honestly.

Source Reduction Intro, Comment text: Also a leading question

Question 1, Comment text: Should we say returnable/refillable?

Question 1.b., Comment text: should we ask a question between a and b that is 'if no, why not?' Answers could be things like 'I wasn't aware of this option', 'I don't purchase these types of products', 'it's too hard / too much effort', 'not worth it', 'not top of mind / I forget', etc.

Question 5, Comment text: Whats the intent of this question? If its to identify ways to accelerate a transition away from plastic, I think we need to identify motivators within the context of SB54. Examples of options:

- The store or brand advertises as plastic free,
- I heard about it through a campagin,
- Its only offered in a non-plastic format,
- I am not able to recycle in my current community collection program,

Overall I worry that asking environmental related questions will limit the E&O for CAA as environmental claims are regulated by FTC.

Question 5.b., Comment text: See above comment. I think we need to ask this question under the guardrails allowed within SB54.

Question 8, Comment text: Many households use Local jurisdiction website for information. I'd also recommend including: Friends and Family, Brands I trust

Question 9 Column "Informational Source", Comment text: Can we add: From Brands I trust

Question 10.c., Comment text: I worry that CAA won't be able to make any environmental claims as they are regulated by the FTC and would need substantiation that could be costly. I am cautious on asking environmental claims questions that we wont be able to use.

Comment 26: Michelle Fay (StopWaste)
Date received: April 30, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, Non-text items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

On behalf of the StopWaste team, attached please find suggested edits and comments on the draft SB 54 Needs Assessment Consumer Education and Access study surveys. Thank you for the opportunity to review and provide feedback.

Attachment text: Comments submitted were in the form of Microsoft Word comments adjacent to the CEA surveys.

Recycling/Composting Survey Comments

Recycling/Composting Intro, Comment text: Many people put their beverage containers in their residential curbside containers, so why exclude them from this survey? Most people will not know that they are excluded from SB 54. It may be confusing to also have it listed upfront here because what if some people only recycle their beverage containers.

Recycling/Composting Intro, Comment text: Including cardboard to describe organics collection may be confusing (I think most people associate cardboard with recycling, not compost collection). Suggest ending sentence after "...some soiled paper."

Question 1, Comment text: Add "cart" as a commonly used term.

Question 1, Comment text: Not available to me implies the respondent is unable to order the service (e.g. multifamily resident), however, there could be a 4th option where respondents have not subscribed to the service (it's technically available but they choose not to add it). Consider reframing as two categories: "Do not have - not available" and "Do not have - have not ordered"

Question 1.a.i., Comment text: Suggest randomizing the order of response options to account for potential skewing where respondents select the first option.

Question 1.a.vi., Comment text: Add “cart”

Question 1.a.vii., Comment text: : Consider adding:

- I don’t trust that it will actually be recycled/composted
- Too much effort to sort materials (or: I don’t have time to sort materials)

Question 2.a. and 2.b., Comment text: Consider allowing multiple responses to account for situations where recycling might be shared but trash is own service, etc.

Question 3, Comment text: “green materials” used above. Update for consistency. Also, green waste might exclude food scraps in some people’s minds.

Question 3, Comment text: This question might be confusing for people that don’t recycle / compost, but have the service. Consider revising to clarify the intent. For example, they might select “a.” below if they don’t sort, but I think you’re trying to get at the type of service that is offered in their city. In that case, consider omitting this question (better answered by local jurisdiction staff).

Question 3, Comment text: confused by the question specifically the word placed--is it asking the person to recall how stuff is sorted? or how the bins are organized? might be helpful to have an unsure option for those who don't recycle/compost or aren't familiar with sorting

Question 3.b., Comment text: Suggest adding "other" because there are other models e.g split cart trash/organics (wet/dry) for example in City of Milpitas

Question 4.a., Comment text: Opening statement notes this survey does not apply to CRV containers, however, I’d imagine most respondents that take materials to a drop-off center are taking bottles and cans. May be okay, depending on intent – if trying to capture use of drop-off systems.

Question 4.b., Comment text: It might be helpful to get more nuanced responses for this question – e.g. someone might select this but may have only ever used the option once. It would be helpful to know how often these alternative methods are used. If they select one of the options, it would also be helpful to know what type of product/material they use the alt recycling for to inform uptake (which might inform successful marketing strategies, etc.).

Question 4.e., Comment text: Consider clarifying (do people know what “self-haul” is?). Also, I don’t think it’s common to recover/divert residential recyclables from self-hauled loads (may be misleading to call this “recycling”)

Question 4.e., Comment text: Add "Other Subscription collection service e.g. Ridwell"

Transition statement to recycling habits questions, Comment text: Ask similar set of questions about green materials (composting) habits?

Question 5, Comment text: Randomize response options

Question 5.a.i. and 5.a.ii., Comment text: wondering if there's space for options like "care for environment" or "keep community clean" or could serve as alts for 1 & 2

Question 5.a.i., Comment text: "Civic responsibility" is another response I have heard

Question 5.a.vii., Comment text: Add:
- Saves me money
- I don't have space for everything in my trash can
- I could be fined if I don't

Question 5.b.iii., Comment text: Scrape "or wipe" … Add option: Empty/dump contents of container, but don't wipe or rinse out

Question 6.a. and 6.b., Comment text: Add: put some plastic items in the trash, and some in the recycling.

Question 7 Column "Item", Comment text: Add plastic bubble wrap envelope/packaging

Question 7, Comment text: Add drop-off / take-back option

Question 7 Item "PET #1", Comment text: reverse the order to start with the commonly known item followed by the material type

Question 7 Item "PET #1", Comment text: I agree

Question 8 Column "Item", Comment text: Include thermoform - like clamshell container for berries

Question 8 Item "Aseptic carton", Comment text: Shelf-stable non-dairy milk product, broth or soup

Question 8 Item "Wooden box", Comment text: This item doesn't fit on this list since wooden boxes are not commonly disposed of curbside.

Question 8 Item "Wooden chopsticks", Comment text: Add:
- Paper plates and cups
- Paper takeout containers (e.g. Chinese food)
- Food scraps (for reference / comparison to responses about recyclables)

Question 9 Item "Other", Comment text: add sms/text message as option

Question 9 Column "Communication Method", Comment text: Garbage bill insert - paper or digital

Question 11, Comment text: Add something about reuse of materials

Question 11.d., Comment text: Suggest removing “and cleaning” as this could mislead respondents to think materials must be clean to be recycled.

Question 11.d., Comment text: However, with this edit, not sure the question works (how is properly sorting recyclables good for recycling?)

Question 11.d., Comment text: I think this is a good comment, maybe: Why is proper sorting important for effective recycling?

Source Reduction Survey Comments

Demographic Question 10, Comment text: Would it be helpful to specify "that live in your home?" or similar so people don't respond yes if they have children that are adults/independent?

Demographic Question 11, Comment text: Are these categories important? Seems like partnered or single might be the main info needed.

Question 1.a.b., Comment text: observation: unsure how these surveys are tied but noting that in the source reduction (assuming folks have more awareness about env impacts) this que only includes a broad option for "good for environment" and doesn't include "fight for climate change" while the other survey doesn't include this option but does include climate change

Question 1.a.c., Comment text: would "waste" be a better term here? the packaging might be recyclable and not considered trash by the respondent.

Question 1.b.iii., Comment text: Or something around “more products offered in reusables” to get at the issue that the specific products they purchase may not be available in reusables.

Language pulled from question below: More preferred brands and/or products offered

Question 2, Comment text: people may interpret this as bulk goods by weight which is covered in a later question. Could clarify by saying "large quantity packages" instead of bulk

Question 2.a.c., Comment text: same comment as above

Question 4.b.i., Comment text: the "less packaging trash/waste" option is gone. Should this series of questions all have the same answer options for consistency?

Question 5.b.ii., Comment text: This response is a little confusing in relation to the question … consider revising.

Question 6, Comment text: Pare down / simplify list of examples

Question 6.a.e., Comment text: Add something like “because I get a discount”

Question 8 Column “Communication Method”, Comment text: Some haulers communicate about reuse/reduction in bill inserts or newsletters, so it would be good to add those.

Question 8 Item “Infographic on waste bin”, Comment text: This might be more appropriate as something like: infographic or information at the store

Question 8 Item “Other”, Comment text: add sms

June 2025

Comment 27: Sheng Su (Sustain You)
Date received: June 13, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Re: Comments on Covered Material Categories (CMC) & Source Reduction Baseline (SRB)

Dear CalRecycle Packaging EPR Team,

Thank you for the opportunity to provide input on the draft guidance for the Covered Material Categories (CMC) and the Source Reduction Baseline (SRB) under SB 54. We appreciate CalRecycle's leadership in promoting a circular economy and reducing plastic waste across California.

Topic I: Covered Material Categories (CMC)
We respectfully recommend that CalRecycle clearly distinguish compostable, plant-based, and agricultural-waste-based products from traditional fossil-fuel-based plastics within the Covered Material Categories.

At Sustain You, we manufacture 100% compostable straws using agricultural waste—including almond shells, rice, dumu,cassava, and corn by products. These materials are non-edible, regionally available, and globally abundant, ensuring a sustainable and scalable solution. Our straws are:

- Non-toxic, chemical-free, and fully plant-derived
- Designed to reduce microplastic pollution by replacing conventional plastic and paper straws

We request that CalRecycle:

- Classify these products under a new "Compostable Fiber-Based Products" category
- Recognize their contribution to source reduction and their positive environmental impact at end-of-life

Topic II: Source Reduction Baseline (SRB)
We encourage CalRecycle to offer incentives or baseline credits to companies already reducing material use or offering regenerative packaging alternatives.

For example:
- Our facility processes up to 1,000 tons of agricultural waste daily, including 70 tons/day of almond shells from California's Central Valley
- We produce up to 0.5–0.6 billion compostable straws per day to meet North America's demand for sustainable drinking solutions
- Our process reduces landfill burden, eliminates fossil plastic use, and establishes a localized, circular supply chain that cleans up agri-waste across multiple states

We ask that CalRecycle include such innovative efforts in the SRB framework and recognize early adopters who are already delivering measurable results through material innovation.

Final Note
We are excited to collaborate with CalRecycle, regional agencies, and initiatives like BEAM Circular to scale access to compost alternatives. Our work is also supported through partnerships with the Lawrence Berkeley National Laboratory and NASA Ames Research Center, and we're grateful for the economic development support received from Opportunity Stanislaus in the Central Valley.

Thank you again for your leadership and for the opportunity to contribute to California's sustainable future.

Warm regards,
Sheng Su
CEO, Sustain You

July 2025

Comment 28: Patrick Owens (Recirculated)
Date received: July 1, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Subject: Technical Feedback on SB 54 Covered Materials – Inclusion of Pallets

To Whom It May Concern,

In response to CalRecycle's request for stakeholder input on the implementation of SB 54, I respectfully submit the following technical recommendation for consideration:

It is critically important that both wood and plastic pallets be included in the list of

covered materials, even if assigned a de minimis fee or modulation factor. Pallets serve as a fundamental proxy indicator for the flow and scale of material movement across supply chains, and their presence offers a unique and practical opportunity for enterprise-level material accountability.

Nearly all consumer and non-consumer packaging materials transported into, within, and out of California move on pallets. As such, PAL (Pallet Account Log or equivalent tracking mechanisms) can serve as a valuable data signal for CalRecycle and the Circular Action Alliance (CAA) to:

- Identify discrepancies in reporting of covered materials.
- Highlight potential underreporting by producers or importers.
- Quantify cross-border movements of packaging materials.
- Improve the accuracy and traceability of reported data under the producer responsibility framework.

Excluding pallets would omit a critical point of reference for systemic material flow analysis and may hinder the state's ability to assess the completeness and integrity of EPR reporting. Including them, even with nominal financial impact, would provide essential transparency and enforcement alignment across sectors.

Thank you for your consideration of this recommendation.

Respectfully,
Patrick J. Owens Jr.
Head of Sustainability and Innovation

Comment 29: Colleen Devlin
Date received: July 31, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Topic: Source Reduction and Material Design

I realize there are products which are best packaged using plastics, but my suggestion is that we mandate that the packaging is restricted to possibly 3 distinct recycling numbers and that they must be non-colored so they can be repurposed most efficiently.

Also, there are so many products currently packaged in plastic that do not require it. I believe it's necessary to have the manufacturer pay a fee to cover the cost of recycling the packaging they produce. I do understand the fees would likely be passed on to the consumer, but this can also help alter behavior which would reduce overall plastic usage. Until the unessential uses of plastic are eliminated, we don't stand a chance of meeting the statewide recycling goals.

August 2025

Comment 30: Ann Folsom
Date received: August 4, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

People get bags at grocery stores for free. I think if bags cost something, people might bring their own. Several years ago, single use bags were discontinued, and heavier ones brought in. Now people discard these after a single use.

Comment 31: Jennifer Engel
Date received: August 13, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

I participated thru the Growing Modoc program.

Comment 32: Janine Rands
Date received: August 15, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

I am involved in Food Rescue/Recovery. The amount of some food products packaged in plastics is really inexcusable. Example: Whole Foods has about 2 oz herbs in a plastic that is not breathable. Herbs mold quickly. I end up sometimes getting 50 'packages' in a week. Time to open each one, dispose, all this plastic - is it really recycled?

Comment 33: Salina Galindo
Date received: August 18, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Thank you

Comment 34: Ethan Young (Growing Modoc)
Date received: August 19, 2025
Source: Website (SmartComment)
Email includes attachments: No
Comment:

Fort Bidwell is a remote, neighborhood-sized community of 180 people that does not have access to many services that other communities take for granted, including recycling and composting. However, there is general community support to participate in programs if they become available, and several individuals willing and able to provide these services with financial/logistical support to make them possible and sustainable, such as wages and associated equipment and training.

October 2025

Comment 35: Emily Rooney
Date received: October 31, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, nontext items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

Re: Input on the SB 54 Needs Assessment – Food Packaging and Agricultural Sector Considerations

Dear Mr. Brown,

On behalf of the undersigned organizations, we submit these comments regarding the Statewide Needs Assessment being conducted in accordance with the Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54). Collectively, we represent a broad coalition of food and agricultural associations whose members may be directly or indirectly impacted by this regulation. We appreciate the opportunity to provide input to ensure that the Statewide Needs Assessment accurately reflects the unique needs and challenges of California's food and agricultural sector.

Our coalition supports California's commitment to environmental sustainability and waste reduction. However, these goals must be balanced with various guidances and requirements for food safety, consumer protection, and environmental health. Packaging in the food and agricultural sector is an essential tool necessary to ensure food security, maintain product integrity, and prevent the spread of pests and diseases.

As described in the comments below, food and agricultural products face specific challenges that impact both public health and consumer prices. Our coalition continues to support the existing categorical exclusion in the draft regulation due to these outstanding risks and gaps in packaging alternatives for food and agricultural products as a means to achieving compliance under SB 54.

- Assessment of Food Waste Risks Associated with Non-Plastic Packaging:
    - Plastic remains a critical material for food packaging, particularly within the fresh food and produce sector. The lightweight, moisture-resistant, and breathable properties of plastic provide controlled gas exchange that slows spoilage and reduces microbial growth.

- Additionally, plastics can protect all foods within differing types of packaging, preventing contamination from external impurities or toxins. No current alternative material matches plastic's ability to maintain food safety and quality of commodities while extending shelf life.

Transitioning away from plastic packaging without viable, food-safe alternatives could increase spoilage, contamination risk, and food waste, resulting in higher greenhouse gas emissions and increased consumer and producer costs. To comply with food safety protocols, commodities used in packaging tests must be purchased, pasteurized, tested, validated, and ultimately discarded, representing substantial food waste and economic loss. Therefore, the Needs Assessment should consider the food waste generated during testing and validation of new packaging materials. The Needs Assessment should also consider "the amount of organic waste and analyze the greenhouse gas emissions associated with that organic waste" per SB 54 statutes.

International experience reinforces this concern. France and Canada, for example, have both reversed or modified packaging restrictions after recognizing that the alternatives created unintended consequences. California should carefully consider these lessons to avoid similar outcomes.

- Identify Gaps in Funding the Research, Development, and Scaling of Recyclable Packaging Alternatives:

  While industry continues to explore and invest in new packaging innovations, there remain significant gaps in funding and research to develop scalable, recyclable, or compostable materials that meet stringent USDA, FDA, food safety and other industry standards. Paper- and fiber-based alternatives lack the structural integrity, moisture tolerance, and cold-chain stability required for many food and agricultural products (e.g., fresh fruit, leafy greens, horticulture/nursery products, dairy products, and other cooked or processed foods) In addition, fiber materials weigh more and can cost up to two to three times as much as plastic, creating inefficiencies and higher costs throughout the supply chain.

  The Needs Assessment should identify and quantify:
  - Funding mechanisms to accelerate innovation in recyclable, compostable, and biodegradable materials suitable for food-contact applications.
  - Research needs to validate the performance of alternative materials for perishable, highmoisture, and temperature-sensitive products.
  - Barriers to scale, including retrofitting existing machinery, production lines and limited availability of approved alternative materials.

  Without targeted investment and coordination between CalRecycle, state and federal agencies, and the private sector, compliance with SB 54 will remain technologically and economically unfeasible for large portions of the food and agricultural sectors.

- Cost Assessment of Increased Consumer Food Prices:

  Packaging transitions required under SB 54 will have direct cost implications for both producers and consumers. New materials and necessary machinery retrofits could significantly increase operational costs across the food and agricultural supply chain. Replacement of a single processing line can range from $30 million to $130 million, depending on scale and volume of a producer. Attempts to retrofit existing equipment can often slow production and increase spoilage or product implications, both adding additional costs to consumers and/or producers.

  According to the U.S. Department of Agriculture's Economic Research Service, food-at-home prices have already increased by approximately 22.3 percent since 2021. Additional cost pressures associated with SB 54 compliance will further exacerbate affordability challenges.

- Identify Gaps in R&D for Recycling Infrastructure, Supply Chains, and EndMarkets: California's recycling infrastructure is not yet equipped to achieve the full circular recycling economy envisioned under SB 54. Therefore, the Needs Assessment should evaluate:
  - Collection, sorting, and processing gaps across recycling facilities for all covered material categories (CMCs) throughout the state.
  - End-market deficiencies that limit demand for recycled materials, undermining thresholds for recyclability designations.
  - The impact of these deficiencies on compliance under SB 343 and the ability of producers to meet statutory obligations.

  A functional recycling economy is essential to SB 54's programmatic success. Without coordinated investment in infrastructure and end-market development, compliance efforts will yield limited results while increasing costs to producers and consumers.

- Assess Risk of Refill/Reuse Programs to Food and Agricultural Products and the Spread of Food/Plant-Borne Pests and Diseases:
  Reusable consumer packaging, such as refillable food and beverage containers, reusable horticulture containers, bulk packaging for business-to-business transactions, pose unique risks for food and agricultural systems. These systems rely on complex and geographically dispersed collection, cleaning, and redistribution networks that increase opportunities for cross-contamination, sanitation failure, and tracing challenges.

  A 2020 report by Professor David McDowell (Ulster University), commissioned by the European Paper Packaging Alliance, concluded that reusable food service systems significantly increase the risk of foodborne illness due to structural and operational challenges. 3 Key findings include:
  - Reuse systems amplify cross-contamination through cleaning and transport processes.

- Consumers and small retailers are often unable to meet required sanitation standards.
- Single-use packaging remains essential for ready-to-eat and perishable foods to prevent contamination.
- Reuse systems complicate traceability and outbreak response, increasing exposure to pathogens and allergens.

These findings are particularly relevant in California, where reusable packaging could facilitate the spread of plant-borne pathogens, fungal spores, and invasive pests, threatening both crop health and compliance with CDFA quarantine programs.

Accordingly, the Needs Assessment should:

- Conduct a comprehensive risk analysis for refill and reuse models specific to food and agriculture and identify gaps.
- Analyze “reusable consumer packaging” packaging definitions suitable for protecting food safety and achieving compliance with SB 54.

Conclusion:

California’s agricultural community supports the intent of SB 54 to reduce plastic waste and improve recycling outcomes. However, implementation must be guided by science-based analysis and an understanding of the critical role that packaging plays in food safety, waste prevention, and price stability. We respectfully urge the Needs Assessment team to consider the issues outlined above to inform the rulemaking process with practical, balanced recommendations that safeguard both the environment and the state’s food system.

We appreciate the opportunity to provide these comments and look forward to continued collaboration throughout the regulatory process.

Sincerely,

Emily Rooney, President, Executive Director Agricultural Council of California Plant California Alliance

Katie Davey, Executive Director Dairy Institute of California

Gail Delihant, Sr. Director of Governmental Affairs Western Growers Association

Anna Ferrera, Director of Legislative and Regulatory Affairs Wine Institute

Daniel Hartwig, President California Fresh Fruit Association

Mike Montna, President/CEO California Tomato Growers Association

Rick Tomlinson, President California Strawberry Commission

Robert Verloop, Executive Director/CEO California Walnut Commission

November 2025

Comment 36: Jordan Fengel (The Carton Council)
Date received: November 10, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, nontext items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

Topic: Consumer Education and Access response to October 17, 2025, Travis Research presentation to the Advisory Board.

Travis Research presented draft results to the Advisory Board and its slide #19 (attached and uploaded with this comment) contained a mistake. In the slide Travis Research used green shading to indicate that the proper stream for aseptic cartons is trash whereas the proper stream for paper milk cartons is recycling. The slide is not correct. The correct stream for both types of cartons is recycling and the cell in the table where 44% of California consumers believed trash was correct should have been shaded red instead of green. In an update to the SB 343 Final Findings Report (DRRR-2025-1750) issued on August 8, 2025, CalRecycle published new information confirming that both carton types are sorted for recycling in 68% of California counties. The final SB 343 report correctly indicated that 72% of Californians have recycling collection access for aseptic cartons and 74% of California's population has collection access for gable top cartons. Both types of cartons are recyclable and should be placed by California consumers in their recycling stream. Please ensure this is corrected in the final report.

Attachment text: August 8, 2025

Senate Bill 343 (SB 343, Allen, Chapter 507, Statutes of 2021) directed the Department of Resources Recycling and Recovery (CalRecycle) to conduct a material characterization study of the material types and forms that are collected and sorted by large volume transfer/processing facilities (LVTPs) in California. The SB 343 Final Findings Report (DRRR-2025-1750) (Final Report) was published on April 4, 2025.

CalRecycle has since evaluated new information submitted to the department relating to the collection and sortation of Gable-Top Cartons – Non-CRV and Aseptic Containers – Non-CRV, identified by material type and form (MT&F) codes X02 and X03 (collectively referred to as “cartons”).

Under Public Resources Code (PRC) section 42355.51(d)(1)(B)(iii), CalRecycle may publish additional information that was not available during the most recent periodic characterization study conducted under PRC section 42355.51(d)(1)(B)(ii). This letter serves as an official update under that section, adding new information to Table 2 of the SB 343 Final Report.

Based on the evaluation of additional information, CalRecycle has determined:

Two additional counties are now served by facilities that sort cartons into Grade 52 bales (or equivalent). Following the same methodology used in the Final Report, these counties have been added to the results initially presented in Table 2 of that report. The facilities with updated sortation practices are:

- Alameda County Industries Direct Transfer Facility - 610 Aladdin Ave, San Leandro
- Athens Sun Valley Material Recovery & Transfer Station - 14048 Valley Blvd, City of Industry

In addition, the Sacramento Recycling & Transfer Station (8491 Fruitridge Road, Sacramento) has upgraded its sorting technology and processes. It now positively sorts cartons and aggregates them into Grade 54 (mixed paper) bales. As a result, the five counties served by this facility also have been added to Table 2 of the Final Report, based on the following:

- The facility has invested in technology that improves the reliable recovery of cartons during sortation.
- Education and outreach efforts have informed the counties served that cartons are accepted in curbside recycling.
- There are end markets purchasing Grade 54 bales that accept and recycle cartons from this facility.

Therefore, in addition to those identified in the Final Report, seven more counties are now considered to be served. Accordingly, CalRecycle has updated the SB 343 findings for Material Type and Form (MT&F) codes X02 and X03, presented in Table 2 of the Final Report, as shown below:

MT&F Code	MT&F Name	MT&F Class	Previous Counties Served	Updated Counties Served	Previous Percent of Counties Served	Updated Percent of Counties Served
X02	Gable-Top Cartons – Non-CRV	Fiber	16	23	47%	68%
X03	Aseptic Containers – Non-CRV	Fiber	16	23	47%	68%

The entire contents of the updated Table 2 are provided as Attachment 1 to this letter. Please note the following:

- CalRecycle does not, at this time, include any other counties served by LVTPs sorting cartons into Grade 54 bales in the amendments to Table 2 of the Final Report.
- CalRecycle is not making any determination of recyclability with this finding, nor is CalRecycle making any characterization or determination of the recycling rate for cartons.

- This publication updates the results published in Table 2 of the SB 343 Final Findings Report (DRRR-2025-1750). CalRecycle does not anticipate publishing a new version of the complete report until the required update in 2027.

Comment 37: Karla Garibay Garcia (Monterey Bay Aquarium)
Date received: November 14, 2025
Source: Website (SmartComment)
Email includes attachments: Yes, nontext items incorporated into documents submitted to CalRecycle are not reproduced here.
Comment:

Topic: Other/General Needs Assessment
Per CalRecycle's Packaging EPR Team recommendation, I am sharing a new report from Duke that may be very relevant to the statewide Needs Assessment studies being conducted by the Department pursuant to Public Resources Code section 42067. The report is a collaboration by Duke's Environmental Law and Policy Clinic, Nicholas Institute, and Medical Center/Cancer Institute, and is titled: "The Social Cost of Plastic to the United States."

Key stats:
- Annual social cost of plastic is estimated to be $436 billion to $1.109 trillion per year. This figure is a conservative estimate and reflects both the limited availability of cost estimates as of July 2025 across the entire plastics life cycle
- Greenhouse gas emissions ($6.4 billion–$15.9 billion annually)
- Increased disease and mortality from oil and gas extraction ($2.9 billion–$31.9 billion annually)
- Increased disease and mortality from plastics use ($410 billion– $930 billion annually)
- Landfilling ($2.9 billion annually)
- Plastic litter clean-up ($9.8 billion–$13.3 billion annually)
- Damage to fisheries, marine shipping hazards, and loss of tourism ($3.0 billion annually)
- Loss of marine ecosystem services ($1.4 billion–$112 billion annually)

Attachment text: The Social Cost of Plastic to the United States

EXECUTIVE SUMMARY

Plastic is ubiquitous in daily life in the United States, but its widespread use comes at steep costs to human health, ecosystems, and the economy. Likewise, plastic's market cost is artificially low due to fossil fuel subsidies. Its true cost—paid by those not producing the plastic— is far greater.

This report provides the most comprehensive analysis to date of the documented economic costs of plastic to the United States. We find that the annual social cost of plastic is estimated to be $436 billion to $1.109 trillion per year. This figure is a

conservative estimate and reflects both the limited availability of cost estimates as of July 2025 across the entire plastics life cycle—from fossil fuel extraction and production to use, disposal, and mismanagement— and the uncertainty embedded in the studies that informed this analysis.

To develop this estimate, we reviewed and extracted secondary cost data from the environmental, economic, and health literature. In a few instances, we supplemented extracted values with new calculations. The following categories represent the key components of the total annual estimated social cost. All figures have been adjusted to 2025 US dollars:

- Greenhouse gas emissions ($6.4 billion–$15.9 billion annually): Plastic's life cycle produces significant greenhouse gas emissions, especially during fossil fuel extraction and manufacturing. These emissions contribute to climate-related harms, such as extreme weather, rising healthcare costs, and reduced agricultural productivity.
- Increased disease and mortality from oil and gas extraction ($2.9 billion–$31.9 billion annually): Plastic production begins with the extraction of oil and gas, often through fracking. These operations emit toxic air pollutants like nitrogen dioxide and PM2.5, contributing to asthma and mortality, especially in nearby low-income and marginalized communities.
- Increased disease and mortality from plastics use ($410 billion– $930 billion annually): Exposure to toxic chemicals in plastics—such as phthalates, PFAS (per- and polyfluoroalkyl substances), BPA (bisphenol A), and flame retardants— is linked to adverse health outcomes, including cancer, cardiovascular disease, reproductive disorders, and neurological harm. These exposures are associated with healthcare expenses, lost productivity, and premature mortality. As a result of limited data on many of plastic's chemicals and the potential cumulative effects from multiple exposures, this cost estimate has high levels of uncertainty and is likely a significant underestimate of the full cost.
- Landfilling ($2.9 billion annually): Most plastic waste in the United States is disposed of in landfills. Local governments bear the brunt of the direct costs by paying tipping fees—the charge for disposing of waste at a landfill—to landfill plastic waste. Broader harms, such as lowered property values and environmental degradation near landfills, remain unquantified in the literature reviewed.
- Plastic litter clean-up ($9.8 billion–$13.3 billion annually): Removing plastic litter from roadsides, waterways, and public spaces poses costs to state and local governments, nonprofits, and businesses who are largely responsible for cleaning up mismanaged waste in support of public health and community aesthetics.
- Damage to fisheries, marine shipping hazards, and loss of tourism ($3.0 billion annually): Mismanaged plastic waste in the marine environment damages boats, deters visitors from polluted beaches, and reduces fishery yields. Estimated losses to marine industries from these harms include $2.0 billion to tourism, $88 million to fisheries, and $909 million to marine shipping.
- Loss of marine ecosystem services ($1.4 billion–$112 billion annually): Marine plastic pollution degrades ecosystem services. While specific estimates for the

United States are lacking, scaled global assessments suggest the United States may incur billions in losses annually.

The cost of plastic to the United States—$436 billion to $1.109 trillion per year—is likely an underestimate, as not all harms observed from plastic had documented costs in the literature at the time of this analysis in July 2025. Notably, we identified critical data gaps for costs related to human health impacts, loss of terrestrial ecosystem services, cost of recycling and incinerating plastic waste, and lowered property values. Filling these data gaps will bring us closer to quantifying the true social cost of plastic to the United States.

INTRODUCTION Plastics are ubiquitous in our daily lives, making up everything from the carpets on which we walk to the clothes we wear. Since 1950, global annual plastics production has increased nearly 230-fold, from 2 million metric tons in 1950 to 460 million metric tons in 2019 (OECD 2022a). Production is expected to continue to rise in the coming years, potentially tripling by 2060 (OECD 2022b). This proliferation of plastic stems in part from its useful qualities, such as durability and water-resistance, that make it practical for a wide range of products (Andrady and Neal 2009). Plastic's artificially low market cost also facilitates its proliferation. Plastic is made from oil and natural gas, and is cheap to produce largely thanks to fossil fuel subsidies. As a result, it maintains an economic advantage over other materials such as paper and aluminum (Telesetsky 2020).

However, as plastic production increases, so does understanding of its harms. Numerous studies have highlighted the harms associated with mismanaged plastics that escape the use-disposal stream to the environment, particularly when they end up as debris in the ocean. An estimated 11 million metric tons of plastic waste enter oceans every year, where it injures and kills wildlife who ingest or become entangled in the plastic and contaminates the food chain (Pew Charitable Trusts and Systemiq 2020; Gall and Thompson 2015; Nicole 2021). However, recent studies demonstrate that plastic is much more than an ocean conservation problem. Throughout its entire life cycle—from oil and gas extraction to manufacturing to waste management—plastic threatens human health, ecosystems, and economies by contributing to climate change, exposing humans to air pollution and toxic chemical additives, and taking up limited landfill space (Hamilton et al. 2019; Terrell and St. Julien 2022; Trasande, Krithivasan et al. 2024; Landrigan et al. 2023, 2025; Wagner et al. 2024; Symeonides et al. 2024; Milbrandt et al. 2022).

These harms from plastic throughout its life cycle have real and growing economic costs, not accounted for in plastic's low market price and often borne by those not manufacturing the plastic (Committee on the United States Contributions to Global Ocean Plastic Waste et al. 2021; Karasik et al. 2023). Such costs are referred to as externalities in the literature (Pigou 1920). For example, the healthcare system incurs costs to treat patients suffering from diseases attributable to exposure to pollution from plastics manufacturing and the chemicals that make up and are added to plastic (Terrell and St. Julien 2022; Trasande, Krithivasan et al. 2024). Local governments use taxpayer dollars to clean up and landfill plastic trash (Stickel et al. 2012).The fishing and

aquaculture industry must spend money to repair plastic-damaged gear and boats and loses revenue from reduced harvests caused by plastic debris (Mittempergher et al. 2022).

These costs are not currently—and may never be—fully known. Still, developing a more comprehensive understanding of the economic costs of plastic that includes these externalities is essential for assessing how plastic's benefits weigh against its true costs and, ultimately, for developing policies that effectively address and mitigate the harms posed by plastic. One way to do this is by estimating the social cost of plastic.

Social costs are defined as the sum of private costs (those borne by the producer or consumer directly) and (negative) externalities. Here, we focus on the externalities associated with plastic throughout its life cycle. Of course, plastic materials provide a range of benefits to society, but informed policymaking requires consideration of the benefits of production and use against the costs. Because the latter component is often underestimated, this research focuses on trying to understand the state of the knowledge on these costs to support informed decision-making.

An existing example of a social cost measure is the social cost of carbon. The social cost of carbon is the dollar value of the social costs imposed by each additional ton of carbon emitted. This value has been used to inform climate policies, such as power plant regulations, energy efficiency requirements for appliances, and fuel economy standards (Prest et al. 2022). Applying the social cost framework to plastics to quantify the costs to society from the harms of the plastics life cycle could similarly inform the design of effective plastic policies.

Two recent reports have attempted to quantify the global economic costs to society resulting from plastic. Their findings indicate that the global costs of plastic's harms add up to a significant amount. The Minderoo Foundation valued the global cost from all forms of plastic-related pollution at hundreds of billions of dollars every year (Merkl and Charles 2022). The World Wildlife Fund estimated that the lifetime cost of the plastic produced globally in 2019 was valued at $3.7 trillion. Plastic can be costly for individual countries, too. For example, the lifetime cost of the plastic produced in 2019 imposed an estimated $60.72 billion on South Africa and $108.69 billion on Japan (DeWit et al. 2021).

The United States ranks among the world's top plastic producers, plastic consumers, and plastic waste generators. In 2019 (the most recent year for which data are available), the United States was responsible for 18% of global plastics demand, second to only China (20%). The United States generated 487 pounds of plastic waste per person, more than any other country (OECD 2022a). Despite this outsized role, the economic cost of plastic to society in the United States has not been quantified.

This report provides the most comprehensive synthesis to date of the documented or estimated costs of plastic borne by society in the United States. To conduct this synthesis, we reviewed existing environmental, economic, and health literature documenting plastic's harms and economic costs to the United States throughout its life

cycle. From this literature, we extracted quantified cost estimates and noted where critical gaps and limitations in data exist. While these data are likely an underestimate, they bring us closer to understanding the true cost of plastic to the United States and offer insights on how to respond to this growing crisis in the years ahead.

THE PLASTICS LIFE CYCLE While a plastic product such as a grocery bag or utensil may be used for only a few minutes, it has an entire life before and after those minutes. This section provides an overview of the common stages of the plastics life cycle—fossil fuel extraction, production, use, waste management, and mismanagement—as well as notable harms that impose tangible costs on society that have been documented at each of these stages.

Fossil Fuel Extraction

The plastics life cycle begins with the extraction of fossil fuels, typically crude oil and natural gas. More than 99% of plastics are made from fossil fuels and it is expected that by 2050, plastics production will account for 20% of oil consumption, up from 6% in 2016 (Hamilton et al. 2019; World Economic Forum 2016).

In the United States, plastic's growing share of fossil fuel consumption is inextricably linked to the rapid development and expansion of hydraulic fracturing (or fracking) technologies over the last two decades (CIEL n.d.). Fracking is the process of injecting water, sand, and chemicals at a high pressure, often into horizontally drilled wells, to fracture rock formations and enable oil and gas to flow more freely into wells. Fracking has expanded the oil and gas industry's reach and production, making it profitable for the industry to tap into previously unexploited basins in numerous states—including West Virginia, Pennsylvania, California, Texas, Oklahoma, Colorado, and North Dakota—and providing the excess raw materials to stimulate the plastic industry's growth.

This expanded reach and production comes with costs to both the local and global community. At the local scale, fracking pollutes nearby soil, water, and air in various ways. For example, faulty casing and cement in wells has led to elevated concentrations of methane in groundwater (Ingraffea 2014). Pipeline failures, storage container leaks, and well pad explosions frequently result in spilled flowback fluids that contaminate surface waters and soils with salts, radioactive materials, and heavy metals (Maloney et al. 2017; Cozzarelli et al. 2017; Lauer et al. 2016). Studies have also documented elevated levels of air pollutants near well sites, including diesel emissions, silica, hydrogen sulfide, benzene, and toluene, resulting from the operations of trucks and machinery and the flaring of natural gas, among other sources (Srebotnjak and Rotkin-Ellman 2014). This pollution from fracking, along with high water use and land clearing, reduces and degrades ecosystem services such as food production, biodiversity, and wildlife habitat (Allred et al. 2015)

The process of fracking and its associated pollution also pose both occupational and nonoccupational health and safety risks. Workers involved in fracking operations have a fatality rate 2.5 times higher than the construction industry and face increased

exposures to silica dust and diesel fumes (Witter et al. 2014; Esswein et al. 2013; Wingate et al. 2022). Communities living near oil and gas extraction infrastructure, who are more likely to be low-income communities and communities of color, experience disproportionate health impacts, including increased risk of asthma, increased risk of adverse birth outcomes and defects, and mental health ramifications (Proville et al. 2022; Rasmussen et al. 2016; Casey et al. 2016; Hirsch et al. 2018). These communities also experience lowered property values following spill incidents and increased rates of violent crime (Cheng et al. 2024; Komarek 2018).

In addition to these harms to local communities, emissions of greenhouse gases from fossil fuel extraction contribute significantly to global climate change. In the United States in 2015, activities associated with fossil fuel extraction, such as flaring, drilling, and land disturbance, attributed to plastics production emitted 9.5 to 10.5 million metric tons of CO2 equivalents (CO2 e) (Hamilton et al. 2019).

Production

Following extraction, oil and gas is transported via pipelines, railway, and trucks to refining and manufacturing facilities. These facilities convert raw fossil fuels into petrochemicals— the building blocks of plastics—and subsequently into various plastic products: packaging, foodware, car parts, electronics, textiles, and more (Geyer et al. 2017).

In the United States, 84% of this manufacturing takes place along the Gulf Coast in Texas and Louisiana (Responsible Alpha 2023). A heavily industrialized 85-mile stretch along the Mississippi River between Baton Rouge and New Orleans, LA, is home to more than 200 refineries and petrochemical facilities and is often referred to as “Cancer Alley” due to the high cancer rates among the fenceline communities along the corridor (Terrell and St. Julien 2022). A high concentration of refineries and petrochemical facilities is also found in the 50-mile stretch of the Houston Ship Channel, the passageway connecting the Gulf of Mexico and the Port of Houston (Lam et al. 2021).

These industrial facilities have significant environmental and human health consequences. Fossil fuel refining and petrochemical facilities emit toxic air pollution, including particulate matter, metals, volatile organic compounds (VOCs), and nitrogen dioxide, which has been linked to higher levels of asthma and cancer (Terrell and St. Julien 2022; Terrell et al. 2024; Bhattarai et al. 2024; Bozlaker et al. 2013; Wallace et al. 2018). Low-income communities and communities of color shoulder the greatest burden of cumulative exposures from petrochemical facilities (Terrell and St. Julien 2022; Sustainable Systems Research 2020). In Houston, for instance, people living below the poverty line are exposed to about 50% more PM2.5, PM10, and VOC pollution than wealthier Houston residents; people of color are exposed to 100% more PM2.5, PM10, and VOC pollution than white residents (Sustainable Systems Research 2020).

While these production facilities emit pollution during their routine operations, they also pose additional health and safety risks during catastrophic failures and other emergency situations. For example, in 2019, a three-day fire at the Intercontinental Terminals

Company facility in Deer Park, TX, led to a shelter-in-place order for the surrounding community due to concerns about the release of toxic pollution (CSB 2023a). Just a few weeks later, an explosion at the KMCO production facility in Crosby, TX, killed one employee and injured several more (CSB 2023b). One report documented that there have been 344 hazardous chemical incidents (i.e., fires, explosions, and chemical releases) associated with the plastics and petrochemical manufacturing sector between January 1, 2021, and October 15, 2023 (Nelms and Bernat 2023).

In addition to its localized health and safety effects, plastics production, like fossil fuel extraction, is a major contributor to global climate change. Taken together, the extraction of fossil fuels for plastics and plastics manufacturing globally amounted to 2.24 GtCO2 e in 2019, or 5.3% of total global greenhouse gas emissions. These emissions are only expected to grow, and so is their share of the global carbon budget, undermining climate goals in the coming years. Models forecast that if plastics production increases at 4% per year, the associated emissions would account for 25% to 31% of the global carbon budget to limit global warming to 1.5°C by 2050 (Karali et al. 2024).

Use

After production, plastics are transported for distribution and use—a phase of the plastics life cycle that varies widely depending on the product. Single-use plastics—such as plastic utensils, grocery bags, and takeout containers—are used for just minutes or hours, whereas more durable plastic goods—such as building materials and car parts—may be used for years. Regardless of their lifespan, plastics pose two significant concerns during their use phase: (1) the shedding of microplastics and (2) the leaching of chemicals contained in the plastic products.

Plastic does not readily biodegrade, but instead breaks up into smaller and smaller pieces called microplastics, defined as plastic pieces less than 5 mm in length. Plastic items shed microplastics during everyday use. For example, slicing on plastic cutting boards, tearing plastic packaging, opening a plastic water bottle, driving (which wears down plastic-containing tires and road paint), and washing synthetic clothes are all activities that release microplastics (Habib et al. 2022; Sobhani et al. 2020; Winkler et al. 2019; Sommer et al. 2018; Napper and Thompson 2016). Due to their prevalence and small size, microplastics have become ubiquitous pollutants in the environment and in our bodies. In the environment, microplastics have wide ranging adverse effects on soil quality and invertebrate health (Boots et al. 2019; Doyle et al. 2022). They also spread bacteria and disease, infiltrate the food chain, and contaminate drinking water (Zhang et al. 2022; Al Mamun et al. 2023; Nicole 2021; Novotna et al. 2019). In the body, microplastics have been found in the brain, blood, lungs, and beyond, and this exposure has been linked to increased risks of cardiovascular disease, colon cancer, and dementia (Nihart et al. 2025; Leonard et al. 2020).

Of additional concern is that plastics, and the microplastics they shed, contain a complex mixture of harmful materials (Monclús et al. 2025). More than 16,000 chemicals have been identified in plastic materials and products (Wagner et al. 2024).

These chemicals fall into three categories: (1) Some are part of the plastic polymer itself, such as styrene in polystyrene and vinyl chloride in PVC. (2) Some are unintentionally present in plastic, such as impurities, reaction byproducts, and degradation compounds. (3) Finally, chemicals are also intentionally added to plastic to enhance its functionality, durability, and appearance. Plastic's additives can comprise up to 70% of plastic by weight and include plasticizers (to make plastics flexible), flame retardants (to reduce flammability), antioxidants (to prevent degradation), acid scavengers (to neutralize acidic byproducts), light/heat stabilizers (to protect against ultraviolet or thermal damage), lubricants (to reduce friction), and dyes (to alter color), among others (Weber et al. 2023; Hahladakis et al. 2018).Because additives are usually not chemically bound to the plastic polymers, they can leach into foods and beverages packaged in plastic, and they have been widely detected in breast milk, blood, urine, and the environment (Poovarodom et al. 2014; Ahmad and Bajahlan 2007; Net et al. 2015; Wu et al. 2018).

The chemicals in plastic raise significant health concerns. Studies have found that exposure to chemicals found in plastic contributes significantly to disease burden in the United States (Trasande, Krithivasan et al. 2024; Attina et al. 2016).For instance, phthalates and bisphenols, common plasticizers, are known endocrine disruptors that interfere with hormone regulation and are linked to reproductive issues, obesity, and developmental delays (Hlisníková et al. 2020; Dalamaga et al. 2024; Minatoya and Kishi 2021). Flame retardants, such as polybrominated diphenyl ethers (PBDEs), are associated with neurological impairments and thyroid dysfunction (Costa et al. 2014; Zhao et al. 2015). More than 4,200 of the 16,000 chemicals found in plastic are of concern because they are persistent, bioaccumulative, mobile, and/or toxic (Wagner et al. 2024). However, the vast majority of these chemicals do not have enough known about them to make a determination about their safety or toxicity.

Waste Management

At the end of its useful life, a plastic item is discarded, oftentimes into a recycling bin with the hopes that it will be reborn into something new. However significant economic and technical barriers make large-scale plastic recycling infeasible. These barriers include the complex chemical makeup of plastic materials, the difficulty of sorting them, and the lack of end markets for recycled plastics. As a result, the nation's plastic recycling rate has never exceeded 10% (The Last Beach Cleanup and Beyond Plastics 2022). In 2019, of the 44 million metric tons of plastic waste discarded in the United States, only 5% was actually recycled (Milbrandt et al. 2022).

If placed in a recycling bin, plastic is taken to a materials recovery facility (MRF) for sorting, an often-challenging process. A MRF in the United States handles thousands of items daily with varying polymer and chemical makeup, color, and shape. Some plastics, like bags and film, jam machines; polystyrene foam breaks apart; and small items like straws and utensils fall through grates. The materials in multimaterial items—like drink pouches made of both plastic and aluminum—cannot be profitably separated. Even items made up of the same material often need to be meticulously sorted by

structure or color (e.g., green polyethylene terephthalate (PET) bottles need to be separated from clear PET bottles).

If successfully sorted, there must then be a place for that plastic to be used. In the United States, viable end markets currently only exist for PET and high-density polyethylene (HDPE) plastic bottles and jugs (plastics #1 and #2). Most other plastic materials placed in the recycling bin will go on to be incinerated or landfilled (Hocevar 2020).

Finding a place for recycled plastics to go has only become more challenging in recent years. Up until 2018, the United States—the world's second-largest plastic waste exporter—exported about half of its recycled plastic waste (1.4 million metric tons per year) to China (Bourtsalas et al. 2023; Brooks et al. 2018). However, China's National Sword Policy banned plastic waste imports in 2018 as a result of high contamination rates and the health and environmental burdens of managing the waste. In response, the United States diverted its exports to countries like Thailand and Vietnam, where the influx of imported plastic waste raises health, pollution, and waste management concerns for these countries (Brooks et al. 2018).

Due to challenges with recycling, the vast majority (86% in 2019) of plastic waste is landfilled (Milbrandt et al. 2022). The US Environmental Protection Agency estimated that, in 2018, plastics comprised 18% of landfilled municipal solid waste by weight, the second-largest category after food (24%) (EPA 2024b).

Effort and cost are required to landfill the amounts of plastic waste generated in the United States. The direct costs are largely borne by local governments who operate municipal solid waste programs and pay tipping fees—the cost per ton for a truck to "tip" its bed and unload solid waste at a landfill. Indirect costs affect surrounding communities, whose property values are lowered from living near landfill sites and who are at risk of exposure to microplastics and leached plastic chemicals that escape the landfill (Reichert et al. 1992; Ready 2010; Kabir et al. 2023; Lang et al. 2017; Walsh and Woods 2023).

Following landfilling, incinerating plastics is the next most common method to manage plastic waste in the United States, accounting for 9% of plastic waste disposal in 2019 (Milbrandt et al. 2022). However, plastic incineration comes with its own set of harms. Today, 79% of incinerators are located in low-income communities and communities of color, where they expose residents to elevated levels of air pollutants such as particulate matter, nitrous oxides, sulfur dioxides, and volatilized metals such as lead and mercury (Baptista and Perovich 2019). Additionally, in 2015, waste incineration released an estimated 11 million metric tons of CO2 e in the United States. More than half of those emissions (5.9 million metric tons) came from burning plastic waste (Hamilton et al. 2019).

Mismanagement

Waste that is not properly managed ends up in the environment as litter, one of the most visible and tangible impacts from plastics. In the United States, 0.98 to 1.25 million metric tons of plastic waste were estimated to be littered or illegally dumped in 2016 (Law et al. 2020). Since plastic does not readily biodegrade in the environment, it can remain largely intact for years, posing choking and entanglement hazards to animals. More than 1,500 marine and terrestrial species are known to have ingested plastic, leading to increased risk of mortality (Santos et al. 2021). For example, a sea turtle has a 50% probability of dying if it has just 14 pieces of plastic in its gut (Wilcox et al. 2018). Plastic litter is also a source of microplastics to the environment, posing the same threats previously described (Weinstein 2016).

Mismanaged plastics have wide-reaching impacts on the economy. Litter is costly to clean up, and the associated time and money largely falls to state and local governments, nonprofits, and businesses (Stickel et al. 2012). These entities have an impetus to clean up litter because it reduces the aesthetic value of a landscape and thus deters tourism, poses hazards to the shipping industry, and reduces fisheries productivity (English et al. 2019; McIlgorm et al. 2009, 2022). A review of 1191 data points of plastic impacts to the marine environment, including ingestion, entanglement, and colonization of plastic, concluded that marine plastic induces a staggering 1% to 5% loss of marine ecosystem services (Beaumont et al. 2019).

METHODS To quantify the economic cost of plastic's harms to the United States across its entire life cycle, we compiled secondary cost data associated with plastic's effects on human health, ecosystems, and the economy from a systematic search and review of a subset of the screened scientific literature (Figure 1). These compiled costs represent externalities—costs caused by one party but incurred or received by another. The approach of assessing costs by life cycle stage and harm category was adopted to avoid double counting if multiple studies provided cost estimates for the same harm. As such, this report considers each life cycle stage and category of harm identified in the literature and presented in Figure 1 to be mutually exclusive.

Figure 1. The human health, ecosystem, and economic harms of plastic at each stage of its life cycle

Definitions and Scope

We consider the social cost of plastic to the United States to be the costs associated with the stock of plastic within the country's borders. This is because most existing studies that estimate an economic cost of plastic do not estimate marginal costs; that is, cost to society caused by an incremental unit of plastic produced or an incremental unit of plastic in the environment.

While the United States is the geographic scope of analysis for this study, this boundary cannot necessarily be considered a closed system. Plastic and plastic waste produced outside the United States can end up in and cause harm to the United States, and these costs are included in our analysis. Calculating the cost of landfilling plastics is one example. The cost to landfill plastics is calculated by multiplying the average cost per

ton paid in tipping fees by the numbers of tons of plastic waste generated in the United States. However, the plastic that makes up that waste could have been produced anywhere in the world.

On the other hand, plastic and plastic waste produced inside the United States can cause harm and pose costs to other countries. For example, the United States exports plastic waste to other countries where it poses waste management costs and health risks and can contribute to marine debris. These harms and costs imposed on other countries from the United States' plastic, while likely substantial, are outside the scope of this analysis.

Literature Search

To find literature with cost estimates associated with the plastics life cycle, we conducted a systematic search complemented by targeted searches for recent scientific articles and grey literature.3 We used two databases: Web of Science and Google Scholar, with search window 2011–2024, inclusive.4 We developed the following search string based on foundational literature (e.g., OECD 2022a):

(Topic key words) AND

(plastic* OR microplastic* OR macroplastic* OR nanoplastic* OR "plastic* life cycle" OR polymer*) AND

(cost* or econom*) AND

(impact* OR leakage* OR pollut* OR damag* OR debris OR litter)

The topic keywords included: marine pollution, air pollution, soil pollution, water pollution, terrestrial, disease, health, GHG5 emission, carbon, navigational impact, agriculture fertility, reduced fertility, urban impact, flood risk, biodiversity, toxicity, and chemical.

After retrieving the papers and eliminating duplicate records from the database, we retained 1,600 papers for screening. To screen the 1,600 papers, we reviewed the article titles and abstracts to ensure that they included relevant data on harms and/or costs. From these 1,600 papers, 300 were retained for full review.

To supplement the systematic search within search window 2011–2024, we performed targeted searches in Google Scholar6 using the general search string:

(plastic) AND

(health OR cost OR damage)

We also relied on expert recommendations for the latest relevant papers in the health literature and performed snowball searches from the papers recommended by experts.

Snowball searches included tracking the papers cited in and citing papers already in our database.

Extraction, Calculation, and Limitations of Cost Estimates

For papers with cost estimates for the United States, we noted the cost, the year the data were collected or calculated, the dollar year used, and, where available, any confidence intervals or error estimates. Some of the cost estimates presented in this study were directly extracted from existing literature without any modification beyond dollar year. However, some cost estimates required additional calculations. For example, the estimate for cost associated with mismanaged waste was adjusted according to how much of that mismanaged waste is expected to be plastic. Additionally, for the costs associated with emissions of greenhouse gases, we conducted our own calculation by combining values from multiple literature sources.

All cost estimates were inflation-adjusted using the consumer price index (CPI) and are presented in 2025 US dollars to allow for comparison of the relative magnitudes of cost estimates (BLS 2025). If assumed that all values in the literature are average annual costs, the total of these costs amounts to the estimated annual cost of plastic to the United States in 2025 dollars.

The following limitations should be considered when interpreting the data provided in this report. First, while most data extracted for this study are from peer-reviewed literature (e.g., health cost data were extracted directly from peer-reviewed publications), some data were obtained from grey literature (e.g., the cost of litter cleanup) that has not undergone a formal peer review process. Evaluating the accuracy and robustness of these individual cost estimates, whether peer-reviewed or not, was outside the scope of this study. Second, when data from earlier years were used, the values were adjusted to 2025 dollars by accounting for inflation. However, no other adjustments were made. As such, other factors, such as changes in plastics production, consumption, or waste generation over time could have effects on the data that are not reflected in the adjusted estimates.

FINDINGS

Cost Estimates in the Literature

The systematic search and post-screening for relevant papers with local, regional, and national cost data yielded 13 papers, including both peer-reviewed journal articles and grey literature. As expected, United States–specific cost estimates have not been measured for every harm posed by plastic throughout its life cycle. We found cost estimates for the following harms: fossil fuel extraction, increased disease and mortality, landfilling, litter cleanup, loss of tourism, reduced fisheries productivity, and marine shipping (Table 1). Nine of these papers calculate costs at the national level and four calculate costs at the local or regional level. Most of these studies examine the cost of harms that occur at the end of the plastics life cycle when plastics are mismanaged and/or human health harms that occur when plastics are used by individuals.

Summation of Estimated Costs to the United States

Select cost estimates, presented in Table 1, were summed to provide the estimated annual social cost of plastic to the United States in 2025 dollars, with two exceptions. For the cost of lost marine ecosystem services, we extrapolated values for the United States from estimates provided by Beaumont et al. (2019) and Lopez-Rivas and Cardenas (2024). For the cost of greenhouse gas emissions, we multiplied the social cost of carbon by the emissions produced from the plastics life cycle, as reported by Zheng and Suh (2019).

From our synthesis of secondary data, we find (in 2025 dollars):

- Greenhouse gas emissions from the plastics life cycle cost $6.4 billion to $15.9 billio
- Increased disease and mortality from oil and gas extraction costs $2.9 billion to $31.9 billion
- Increased disease and mortality from plastic use costs $410 billion to $930 billion
- Landfilling costs $2.9 billion
- Plastic litter cleanup costs $9.8 billion to $13.3 billion
- Loss of tourism costs $2.0 billion
- Damage to the fisheries and aquaculture industry costs $88 million
- Damage to marine shipping costs $909 million
- Loss of marine ecosystem services costs $1.4 billion to $112 billion

Table 1. National and Subnational Costs to the United States Associated with the Plastics Life Cycle as Reported in the Scientific and Grey Literature

Figure 2. Annual social costs of plastic to the United States, billions 2025 dollars

These costs, totaling between $436 billion to $1.109 trillion per year, are summarized in Figure 2. Their calculations are described in more detail in the following sections.

Greenhouse Gas Emissions

Global greenhouse emissions from the production, conversion, and end-of-life stages of plastic were estimated to be 1.7 billion metric tons of CO2 e in 2015 (Zheng and Suh 2019). These emissions contribute significantly to climate change, which in turn drives extreme weather events, sea-level rise, reduced agricultural productivity, and negative public health outcomes (Nicholls et al. 2021; Newman and Noy 2023; Praveen and Sharma 2019; Patz et al. 2005).

To capture the cost of these types of harms, economists developed the social cost of carbon, a representation of the economic damages associated with a one-ton increase in carbon dioxide emissions in a given year (Nordhaus 1993). It encompasses a wide range of harms, including property damage from floods, health costs from heat waves and air pollution, ecosystem degradation, and more. Social cost of carbon values can be global estimates, representing the cost of harms to the world, or domestic, representing the cost of harms to a specific country.

The domestic social cost of carbon for the United States has been valued at $16 to $40 per metric ton (EPA 2023; Kopits et al. 2025). Applying this domestic social cost of carbon range to the global greenhouse gas emissions tied to the plastics life cycle, we find that the cost of global plastic-related greenhouse gas emissions to the United States alone amounts to between $27.2 billion and $68.0 billion ($33.5 billion to $83.7 billion when adjusted to 2025 dollars). If left unchecked, greenhouse gases associated with the plastics life cycle are expected to grow from 1.7 billion metric tons CO2 e in 2015 to 6.5 billion metric tons CO2 e in 2050. Consequently, we expect the cost of these greenhouse gas emissions to also rise to between $104 billion and $260 billion ($128 billion to $320 billion in 2025 dollars). North America (Canada, Mexico, and the United States) produces 19% of global plastics and consumes 21% of the global total (Heller et al. 2020). Using the 19% figure to scale the global estimate calculated above, we find that the cost of greenhouse gas emissions to the United States resulting from the life cycle of plastics produced only in North America, most of which are likely produced in the United States, amounts to a cost of $6.4 billion to $15.9 billion in 2025 dollars.

Increased Disease and Mortality from Oil and Gas Extraction

In 2016, air pollutants (ozone, particulate matter, and nitrogen dioxide) emitted from the oil and gas sector resulted in 410,000 asthma exacerbations, 2,200 new cases of childhood asthma, and 7,500 excess deaths, among other health impacts. These health impacts amounted to an estimated $27 billion to $170 billion (average of $77 billion) in 2016 dollars (Buonocore et al. 2023). However, only a portion of extracted oil and gas will go on to become plastic. The International Energy Agency estimates that 14% of global oil demand and 8% of gas demand is driven by plastics (IEA 2018). If we assume these percentages are consistent for the United States, we find that disease and mortality attributable to fossil fuel extraction for plastics amounts to $2.9 billion to $31.9 billion annually in 2025 dollars.

Increased Disease and Mortality from Plastic Use

There is strong evidence that a significant cost is associated with the use stage of plastic’s life cycle. For the use stage, a total of 49 cost estimates were recorded for the United States from five scientific papers, each of which reported primary data (see the appendix for the complete dataset) (Trasande, et al. 2022; Trasande, Krithivasan et al. 2024; Cropper et al. 2024; Attina et al. 2016; Obsekov et al. 2023). Most of these data were reported as annual cost estimates for years 2010, 2014, 2015, 2018, or 2020. The cost estimates in this segment of the literature took many forms, from cost of treatment to disability-adjusted life year over a single year, over a 15-year period, or over a lifetime. Overall, there were 18 different health-related impacts with cost estimates in the literature.

The cost estimates included data for the plastic-attributable disease burden for breast cancer, cardiovascular issues, cryptorchidism, diabetes, endometriosis, hypothyroidism, ischemic heart disease, infertility, drop in IQ points and intellectual disability, kidney cancer, low birth weight, low testosterone, male infertility, obesity, pneumonia, polycystic

ovary syndrome, stroke, and testicular cancer. The plastic additives with cost data include BPA, PBDE, PFAS, and phthalates, which are only a small fraction of the chemicals of concern identified in the literature (Wagner et al. 2024)

In total, the cost of health-related harm, assuming the incidence rates reported in the original studies, is estimated at $410 billion to $930 billion in 2025 dollars. These are underestimates, as we have yet to consider the widespread exposure to food contact chemicals from plastics and the chronic exposure to multiple carcinogenic additives (Geuke et al. 2025; Vincoff et al. 2024). Furthermore, recent literature identified many data gaps that prevent us from understanding the complete scope of plastic chemicals and their impacts on human health. For instance, many chemicals lack basic structural information or chemical property data, details on their functions or presence in plastics, or hazard information, and thus lack cost estimates (Monclús et al. 2025).

To provide another relevant data point, we converted the estimated health costs of disease and disability caused in 2015 in the United States by the plastic-associated chemicals PBDE, BPA and DEHP to 2025 dollars (Landrigan et al. 2023). This yielded an indicative cost of $1.2 trillion per year.

In both approaches, the underlying assumption is that many chemicals in plastic cause health-related costs. It is important to note that there are methodological differences with respect to the estimation of the fraction of health-related costs that are caused by additives in plastics (Landrigan et al. 2024; Trasande, Park et al. 2024).7 Estimates suggest that more than 90% of exposure to PBDEs, phthalates, and bisphenols; 98% of exposure to flame retardants; and 93% of PFOA (perfluorooctanoic acid) and 32% of PFOS (perfluorooctanesulfonic acid) PFAS exposures come from plastics (Trasande, Krithivasan et al. 2024).

Landfilling

The only type of waste management cost found in the literature was for landfilling plastic waste, which was the fate of 86% of the 44 million tons of plastic waste generated in the United States in 2019 (Milbrandt et al. 2022). In 2019, the average tipping fee in the United States was $61/ton. Multiplying this average tipping fee by the amount of plastic waste that was landfilled in 2019 (37.7 million tons) yields a cost to the United States of $2.3 billion, or $2.9 billion when adjusted to 2025 dollars.

Loss of Marine Ecosystem Services

No study has estimated the loss of United States-based marine ecosystem service value caused by plastic. However, Beaumont et al. (2019) did estimate these losses for global ecosystem services, which we use here to generate an indicative value of the magnitude of this type of cost. In 2011, global ecosystem services (i.e., the benefits that nature supplies to people) provided by various marine systems equated to approximately $49.7 trillion per year in 2007 dollars (Costanza et al. 2014). Beaumont et al. (2019) suggested that the stock of marine plastics in the ocean reduces this marine ecosystem service value by somewhere between 1% to 5%. Therefore, at the global

level, marine plastics reduce ecosystem service flows at a cost of $500 billion to $2.5 trillion annually (or $780 billion to $3.9 trillion when adjusted to 2025 dollars).

The loss to the United States is expected to be significantly smaller than this global value. The 4.4 million square miles United States Exclusive Economic Zone (EEZ) in the ocean accounts for approximately 8% of the world's total EEZ area (Vivid Maps 2017). Therefore, as an indicative range, United States losses of marine ecosystem service values amount to amount to $62.4 billion to $312 billion annually in 2025 dollars).

We also estimated an indicative value for marine ecosystem services value reduction using a second approach that yielded a more conservative estimate. Specifically, a recent meta-regression analysis estimated the economic value of provisioning marine and coastal ecosystem services at $25,881 to $397,674 per square mile per year (Lopez-Rivas and Cardenas 2024). Applying the 1% to 5% reduction of ecosystem service value due to marine plastic pollution suggested by Beaumont et al. (2019) to the 4.4 million square miles of EEZ yields a cost range of $1.1 billion to $87.5 billion in 2018 dollars, or $1.4 billion to $112 billion when adjusted to 2025 dollars.

Plastic Litter Cleanup

In 2009, Keep America Beautiful estimated the direct costs to governments, businesses, educational institutions, and volunteer organizations to clean up litter. Through a series of surveys, they found that the cost these entities spent on cleaning up litter amounted to $11.5 billion annually, or $17.2 billion when adjusted to 2025 dollars (KAB 2009).

However, this cost is for cleaning up all litter types, not just plastic. The same report found that 57% of all roadway litter by number was composed of plastic items (when "tobacco products" are included with the plastics category). This percent is lower than more recent estimates. For example, citizen science data collected across all United States river basins between 2021–2023 (11,597,653 data points) indicates that 77% of littered items are plastic. Using this range (57% to 77%), we estimate that cleaning up plastic litter costs the United States $9.8 billion to $13.3 billion annually in 2025 dollars.

Damage to Fisheries, Marine Shipping Hazards, and Loss of Tourism

McIlgorm et al. (2020) estimated the direct costs of marine debris on marine industries, specifically fisheries and aquaculture, shipping (transport and shipbuilding), and marine tourism. These marine industries suffer from plastic debris in a variety of ways. The boats used in the fishing and shipping industries can collide with, suck up, and become entangled in debris, causing damage to gear and loss of operational time. The marine tourism industry suffers from debris on beaches and shorelines because it deters tourist visits, resulting in losses in revenue for the local economy (Krelling et al. 2017).

Building on work from Takehama (1990), McIlgorm et al. (2020) assumes that costs from the harms of marine debris amount to a 1% loss in GDP from the fisheries and aquaculture sector (GDP valued at $8.1 billion in 2015 dollars), a 1% loss in GDP from the marine shipping sector (GDP valued at $84 billion), and a 1.5% loss in US GDP from the marine tourism sector (GDP valued at $119 billion). If we assume that 80% of

this marine debris is plastic, these losses amount to $88 million to fisheries and aquaculture, $909 million to shipping, and $2.0 billion to tourism in 2025 dollars (McIlgorm et al. 2022).

Critical Data Gaps

The available evidence suggests that the harms caused by plastic impose a substantial economic burden on the United States, with the sum of estimates in the range of $436 billion to $1.109 trillion. However, these estimates likely represent a significant underestimate due to data gaps. Here, we highlight several critical areas where either (1) the harms of plastic are well-defined, but their associated costs remain unquantified or (2) the harms are not yet fully understood, though emerging research indicates their potential significance. Addressing these data gaps through future research is essential to accurately and comprehensively assess the true cost of plastic to the United States.

Human Health

While recent studies have quantified the costs associated with poor health outcomes from exposure to plastic additives, we consider those costs to be an underestimate of the true health costs for several reasons. First, as discussed above, those studies only quantify costs for a small fraction of the chemicals of concern in plastic. Second, we did not identify any cost estimates for health outcomes from micro- and nanoplastic exposure. Nonetheless, evidence points to clear associations between micro- and nanoplastics and poor health outcomes, including increased risk for cardiac events and dementia, as well as emerging links to increased diversity and abundance of antibiotic-resistant genes (Marfella et al. 2024; Nihart et al. 2025; Wu et al. 2024). Filling these data gaps is critical to estimate the full cost of damages from plastics use.

Additionally, little is known about the cost of increased disease, disability, and mortality resulting from living near waste management infrastructure (recycling, landfilling, incineration). Studies have evaluated the impacts of plastic waste management generally, waste incineration, and recycling, but further research is needed on the costs associated with the health impacts of living near and being exposed to pollution from this infrastructure (Helm et al. 2023; Nikiema and Asiedu 2022; Tait et al. 2020; Celis et al. 2021; Nagy and Kuti 2016; Deeney et al. 2023).

Due to multiple impacts across life cycle stages and exposure to multiple chemicals, cumulative risk assessment (CRA) has been recommended to evaluate the combined risks from exposure to multiple plastic additives (Archer and Payne-Sturges 2024, Knudsen 2027). Such assessments consider how chemicals might interact and impact human health together in a way that exacerbates damages relative to the result of exposure to individual chemicals. The CRA approach is crucial because exposure to multiple stressors is common, and their combined effects can be greater than the sum of individual risks. CRA has been used in the evaluation of some plastic additives, such as phthalates, but expanding the use of the CRA approach would yield more accurate damage estimates in the health literature (Payne-Sturges et al. 2023; Yang et al. 2019).

Terrestrial Ecosystem Services

Research on the economic costs of plastic has focused on marine ecosystems, overlooking costs to terrestrial ecosystems. Yet terrestrial animals, including invertebrates, freshwater fish, and other animals, are known to be harmed by plastics and microplastics (Richard et al. 2024; Zheng et al. 2023). Further, plastics and microplastics can alter soil composition, reduce photosynthesis and agricultural productivity, and disrupt terrestrial food webs, degrading and reducing terrestrial ecosystem services (Kublik et al. 2022; Zhu et al. 2025; Boctor et al. 2025). Despite these harms, the associated costs for terrestrial ecosystems remain largely unexplored, representing a significant data gap (Ullah et al. 2022).

Recycling and Incinerating Plastic Waste

As discussed previously, landfilling plastic waste costs the United States an estimated $2.9 billion per year in 2025 dollars. However, an estimated 14% of plastic waste in 2019 was managed through recycling or incineration, and we were unable to find direct cost estimates in the literature for managing waste through these means (Milbrandt et al. 2022).

Property Values

The presence of plastic waste, litter, and industrial facilities related to plastics production, recycling, and incineration likely diminishes property values, particularly in communities located near landfills or waste processing sites. While studies have quantified impacts of landfills on property values, research has not yet isolated the effects of specifically plastic waste, infrastructure, and pollution on property values across the United States (Hite et al. 2001).

RECOMMENDATIONS

Policy Implications

In the United States, a patchwork of state and local governments has already taken steps to reduce the harms and costs associated with plastic. Some of these policies target plastics at the source, such as bans on plastic grocery bags and plastic foam foodware, and have been enacted in many jurisdictions across the country. Others are responsive to plastic contamination in drinking water and the environment, such as California’s mandate requiring public water systems to test for microplastics in drinking water and the enforcement of surface water quality standards for trash in Maryland, California, and the District of Columbia (CA Health & Safety Code 2024; EPA 2025).

Despite these local and state efforts, there has been no coordinated or comprehensive national response to plastics, as recommended in the Congressionally mandated report from the National Academies of Sciences, Engineering, and Medicine (Committee on the United States Contributions to Global Ocean Plastic Waste 2022). The most comprehensive national proposal to date—the Break Free From Plastic Pollution Act—has been introduced three times since 2020. In each instance, the bill was referred to

committee but never seriously considered. The bill proposed sweeping reforms including a pause on new plastics production facilities, the implementation of a national bottle deposit law, and a phaseout of many single-use plastic items. In 2024, the Biden-Harris administration issued the National Strategy to Prevent Plastic Pollution, in which the federal government acknowledged the scope and urgency of the plastics crisis. However, the plan lacks funding and is entirely voluntary (EPA 2024a).

With plastics production projected to increase in the coming decades, plastic's harms—and its associated costs—will rise too. For example, the costs associated with greenhouse gas emissions from the plastics life cycle could more than triple by 2050 if left unchecked.

Addressing the rising harms and costs from the plastic stock in the United States requires coordinated action across the private sector and all levels of government—local, state, national, and international—working together to intervene at every stage of the plastics life cycle. However, to meaningfully reduce plastic's harms and costs, the highest priority must be placed on upstream interventions that target the beginning of the plastics life cycle. This means reducing both the supply of new plastic and the demand for plastic products through interventions such as capping virgin plastic production, phasing out single-use plastics, and incentivizing and supporting reuse and refill systems.

Without upstream action, efforts to reduce plastics' costs are a zero-sum game, as instituting changes to lessen the cost of one type of harm can, in turn, increase the cost of another harm. For example, if an education campaign successfully discourages littering, costs to properly manage the would-be littered plastic increase. Similarly, if a coastal town works hard to remove mismanaged waste from roadsides and beaches to revamp its tourism potential, the town reduces one cost (loss of tourism) but increases another (litter cleanup). Moreover, the same plastic throughout its different life cycle stages can bring about costs across multiple harms categories. A piece of plastic can be associated with the emission of greenhouse gases and other air pollutants during its manufacturing and go on to leach chemical additives, shed microplastics, and become litter. Only upstream solutions prevent these cascading harms from accumulating.

Future Research

We have identified recommendations for future research to strengthen the accuracy of the social cost of plastic estimates and/or their utility in decision-making.

First and foremost, we recommend filling the critical data gaps outlined previously to more accurately and comprehensively assess the true cost of plastic to the United States. A high priority is expanding our understanding of plastic's impacts on human health. Steps to fill this research gap include increasing our understanding of the (1) chemical makeup of plastic products, (2) transport and fate of plastics, their chemicals, and microplastics through ecosystems and bodies; (3) health outcomes from chronic exposures to plastics, their chemicals, and microplastics; and (4) health outcomes from chronic exposures to chemical mixtures from plastic and the interactions of plastic

chemicals with other chemical or environmental exposures. Where health costs have been estimated outside the United States, value transfer could be used to fill in knowledge gaps of, complement, or add nuance to United States-specific estimates (Pelch and Reade 2025).

Second, beyond national-level cost estimates like the one generated in this report, policy- and decision-making can be improved by developing localized estimates to assess the magnitude of harm-induced costs in specific communities. Certain areas, such as those near production or disposal facilities, may incur outsized costs from the burdens of plastic. Developing these local cost estimates and making them accessible through publicly available databases or online tools will help us better understand who disproportionately pays for plastic's harms and at what magnitude, how local communities can better protect themselves, and how national strategies can better protect overburdened communities.

CONCLUSION

This literature review and analysis serve as a robust starting point for estimating the social cost of plastic to the United States. Not all the harms of plastic throughout its life cycle have estimated cost values, so it is not possible to accurately estimate the true costs of the harms inflicted on society from plastic.

Of the costs available to date, the costs from the health effects of plastic use are an order of magnitude higher than all other cost estimates: on the order of several hundred billion dollars. These high costs are driven largely by the value of IQ loss and reduced productivity associated with exposure to plastic additives. Greenhouse gas emissions, loss of marine ecosystem services, disease and mortality attributable to fossil fuel extraction for plastics, and the cost of plastic litter cleanup are estimated to be on the order of tens of billions of dollars. Landfilling, shipping, fisheries, and tourism-related damages are less than $10 billion each. When combined, the value of these social cost estimates is estimated to be between $436 billion and $1.109 trillion per year.

The costs presented in this report likely represent a lower bound, as the literature currently lacks costs for the (1) increased incidence of many health-related outcomes (because only a fraction of chemicals have been evaluated and information on cumulative exposures is lacking), (2) loss of terrestrial ecosystem services, (3) recycling and incineration of plastics, and (4) lowered property values.

While this report highlights the immense and growing economic costs of plastic to the United States, it also reveals blind spots in our existing knowledge. Addressing these gaps through further research is critical to developing informed policies and interventions to curb the economic, environmental, and health harms associated with plastic throughout its life cycle.

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APPENDIX

Table A1. National-Level Cost Data on the Health-Related Harm Caused by Plastic Additives, Billions of Nominal Dollars

Appendix C. Needs Assessment Haulers Roundtable Notes

August 18, 2025

As part of the Collection, Processing, and End Markets Needs Assessment Study, CalRecycle held three roundtables with MRF operators, haulers, and organics processing facilities from August to October 2025. The purpose of these roundtables was to gather feedback on a variety of topics, including incremental costs of collecting and processing additional covered material, changes needed to support increased collection, recycling, and composting, factors to consider to increase recyclability, compostability and recycling rate of plastic covered material, and material design considerations to meet the goals of the Act. Appendices B-D include meeting notes from the roundtables.

Facilitated Discussion Part 1

Question 1: What additional investments and costs will arise from increasing recyclability, compostability, and recycling rates of single-use packaging and plastic food service ware to meet the goals of SB 54? How can we estimate those costs?

- What changes are needed to support:
  - Increased collection?
  - Increased recycling and composting?
- What are costs and other investments needed to support changes?
- Are there specific factors that we need to consider when looking at cost? Is there information or are there assumptions we can provide to get at more accurate costs?

Concerns about estimating incremental costs

- Estimating costs is a chicken and egg issue. Facilities can come up with costs but only some materials are deemed recyclable or compostable on the CMC list. That is difficult to project because these materials have many ways to be recycled. It is not currently clear which items will be collected through curbside versus what will be directed more to alternative collection systems based on the PROs plan and changes to the CMC list. Hard to estimate due to these uncertainties.
- How flexible packaging will be managed will have a huge impact. For example whether it is collected separately or processed through MRFs. If the department could come up with specific case studies, it would help haulers to project potential incremental costs.
- It is hard to know which material types will be phased out of use and which will not be. We can do what we can to accommodate but MRFs have varying levels of performance.
- SB 54’s promise was that existing programs and infrastructure would be utilized to the maximum extent possible. If packaging manufacturers won’t abandon the use of

a problem material, then that still leaves us with a problem material that has no home, especially if there are no end markets. Before doing anything, we need to understand, what are the type of materials that producers will continue to use? We cannot just add technologies to MRFs without more information.
- Need to understand the end markets to estimate costs.
- Changes to packaging can really affect processors. How can haulers and MRFs ensure that investments in their processing are not made meaningless by changes to packaging?
- Clarifying CMC list is important. What CMCs are deemed compostable or recyclable? What would it cost to collect and process those materials.
- CalRecycle is assuming that we know the full cost for certain materials or how to redevelop the MRFs. That is not as easy as buying an optical sorter. MRFs may need to reconfigure their set up and there might not be the ability to add certain functionality. We don't know what needs to exist to get certain materials. We need engineers from the PRO to even understand if we can process the material, as it is not obvious to us either.
- Estimating costs on what this looks like today is premature for MRFs given current unknowns.

Factors to consider when estimating costs

- There are general things that haulers can share they would need such as
  - New trucks
  - Education is a big part, not just for residents but also for hauler staff
- Need to consider costs to implementing different laws together (e.g., SB 1383 labeling requirements on bins vs SB 54 requirements)
  - What are the needs for other state laws? This kind of education is also for producers.
- Would the PRO be able to pay for increased disposal costs? Increased contamination?
- The other factor is real estate and space. This is a huge constraint. If they need to sort out more commodity types, then there isn't enough space for many existing facilities.
- Permitting is a big challenge, especially in terms of timing and costs. Will need to modify permits to expand facilities. Can there be any streamlining for permitting that can be done to support SB 54? This should also be considered when suggesting the timing of needed investments to meet the requirements of SB 54.
- The most recent draft of the regs does not give haulers much insurance around collection of hard to recycle materials. While they may be willing to brainstorm costs and new programs, don't know how to do it if there is no clear goal.
- Critical thing is end market development. Is the CalRecycle permitting team involved in these conversations? The department needs a strategy with CAA to do the permitting. Material cannot be recycled without an end market as it is a statutory requirement. Identifying how this can be met is important.
- The recent report on SB 54 materials reaching landfills just came out. Lots of plastic ends up at MRFs. To meet requirements, we need more capacity but what that study

doesn't cover is how much of SB 54 material goes into the blue bin. This is important to determine how much is already in the system. Are there any updates on this? For material that is already being recycled?

Facilitated Discussion Part 2

Question: What additional investments and costs will arise from increasing recyclability, compostability, and recycling rate of single-use packaging and plastic food service ware to meet the goals of SB 54?

- What changes are needed to support:
  - Decreased contamination?
  - Decreased environmental and human health impacts?
  - What are costs and other investments needed to support changes

Contamination related challenges

- Hard for them to think about contamination, without working with the PRO since in SB 54 technically no material should be contamination. If it's not recyclable or compostable, it shouldn't be in the system.
- Voiced concern about producers not changing their design and how that will affect facilities
  - Contamination is on end market side but end market accepting the covered material needs to decide if the material is contaminated or not.
  - How does eco-modulation fee extension work? If there isn't much incentive right now for design changes by producers, how will that impact system change?
- A robust discussion about compostables and what is being composted in our system is another discussion that should be had.
- Issue of contamination where they pick up the 7 main recyclables and send to market- cardboard, HDPE, aluminum, glass, paper etc. Will do more positive sorting at MRFs. Most MRFs sort everything except mixed waste paper. In relation to alternative collection, it is up to MRFs to come up with strategy to handle film.
- From curbside reports, residents only put 65% of what is recyclable in that bin. There is an opportunity in education.
- Need more clarity on what counts as sorting commodities into defined streams
- Asked whether there is going to be an allowance for contamination fees in any bin type (not just recycling, but also solid waste)?
  - At least one person doesn't think that most jurisdictions feel like they have the authority to levy fees on customers for contamination in the landfill stream but unless the landfill container is targeted, people will just push items to that container.

Environmental and Health Impacts

- Questioned why CalRecycle would be asking hauler for environmental impacts by system at large and that this question should be directed to EJ groups and others doing this type of research. CalRecycle clarified that this was specific to

environmental and public health impacts associated with hauling and collection.
- Suggested that standards for reducing environmental impacts and ensuring product safety don't interfere with using recycled content.
- Many health and environmental impacts need to be considered when discussing bioplastics and compostability. May need 3rd party support. Know that farmers don't want to buy compost with bioplastics. However, on the other side, chemical recycling is heavily debated. Will CalRecycle consider a process like Article 2 in SB 1383? Need another entity to make this determination and not ask haulers to propose options.
- Concerned about alternative collection. Haulers are highly regulated and alternative collection systems are not as highly regulated, which could lead to worse environmental outcomes.
- Safety is important for hauler staff as they will be doing more checking now. Need to make sure they have proper equipment

Facilitated Discussion Part 3

Question: Factors to consider for increasing recycling and composting. How do they influence costs, public health impacts of other contaminants.

Key Factors: Regional differences and education costs

- Can't stress the importance of education enough. This must go beyond haulers. Needs to go to every aspect of this process. To decrease contamination, education is very important.
- There needs to be educational material provided in multiple different languages. Jurisdictions often rely on haulers for education. Education is not just on the end user. There needs to be education materials beyond the end user, including education of drivers, haulers, and producers. Jurisdictions get money sometimes for education. Costs need to be considered as we start talking about education.
- Education needs to happen at all stages in the recycling process, including with producers and internal staff who are doing route reviews
    - Route reviews are a great opportunity, but route reviews generate labor costs, including how to train them to handle irate customers (who don't like route reviews)
    - Noted that based on route reviews, have added items to their education to explain what is or is not recyclable. This is a great opportunity to align SB 1383 and SB 54.
    - Suggested that route reviews are the best education method. Review included tags that listed materials that were in the wrong bin. The landfill bin often had the most wrong items
- Education at schools has been effective, because kids take it home and tell parents
- Clear identification of material and whether is recyclable, compostable, or not is needed.
- Staff need to be well trained to address questions and helps to have actual contact with people, boots on the ground approach.

- Many of these rural areas don't have MRFs, so they have to transfer mixtures of materials. In general, encouraged us to think about how to make remote recycling system work, including overcoming challenges of transportation distances.
    - Rural markets show regional difference. Have a quite a few non-mandatory service areas. Need to think about how to educate rural people who do a lot of self-haul, or go to a remote transfer station or drop-off center.
- Encouraged alternative collection systems be implemented through local jurisdictions
- Education for alternative collection systems is very important. Need coordinated effort by the PRO on education across the various systems.
- Only way the program works is if there are enough staff to do door to door outreach. Most jurisdictions do themselves. Waste haulers that have 50+ cities are a challenge. Having enough staff to interact with multi-family complexes is difficult especially because multi-family housing population is more transient, so have to keep outreaching people (since people are coming are going)
- Pointed out that multi-family housing is a commercial enterprise, and hauler is not responsible for ensuring that multi-family is participating correctly. Property owner should take responsibility for ensuring compliance with bin requirements.
    - Suggests that cities require a permit to run a multi-family apartment complex, and that permit could require a waste management plan and compliance with the plan
    - Need to engage property owners for education of multi-family dwellings.
- Need translators available for outreach, not just translated materials
- Suggest that CalRecycle help to educate CAA on programs that exist in CA, they are working with other states, relying on other states that may not have the most robust recycling and organics programs in country. California already has robust local programs. We are not starting from scratch.
- The following education-related costs was shared by one of the attendees.
    - Internal training
    - External training
    - Admin costs - Material development/design (handouts, websites, presentations, manuals, container tags)
    - Printing off all the above where necessary
    - Kitchen pails
    - Stickers and posters (including upgrades and time spent on replacement given CMC list)
    - Translation of materials (and cost to ensure we have translators)
    - Route reviews
    - Conflict management resolution training
    - Door to door staff outreach (comm, SFD, and MFD)
    - Ongoing outreach and training at schools
    - Containers (not just the bins or carts, but containers for the businesses for internal collection like kitchen, offices, and schools)
    - Onsite education and signage for transfer stations and drop off

Information Sharing

CalRecycle: What opportunities exist for us to obtain information? We want to brainstorm what you would be comfortable with sharing. There could be another meeting held where we ask targeted questions or a follow up of targeted questions via email. Will need to make assumptions as part of needs assessment modeling. Are there preferred ways you would like to engage?

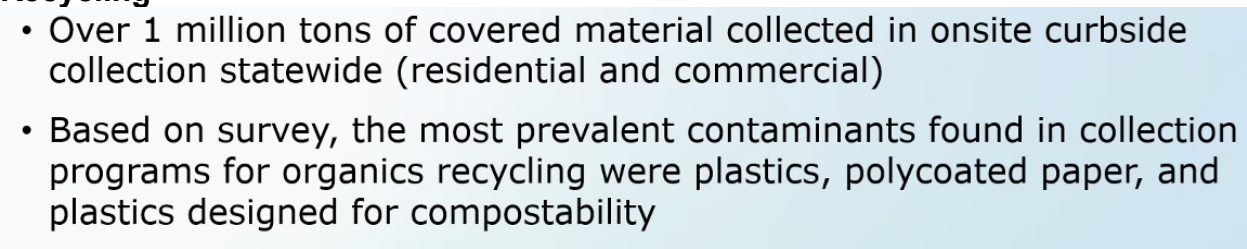
- Hauler community probably not going to provide much current cost information, but would like to contribute so would be good to have a session on costs because there are geographic differences in distances. Incremental costs maybe.
- Attendee happy to have more dialogue as there are still unanswered questions.
- Haulers prefer to share information with department. CalRecycle noted that would like to have specific discussions of what we can and cannot share directly with the Contractors in terms of data provided to ensure that we can meet the needs of the contractor while allowing haulers to feel comfortable sharing.
- Hauler industry should implement solutions. Offering services to do audits of SB 54 information currently going through our system. We've done studies across the country, all stakeholders and government contractors. We don't know baseline currently. So, how do you move forward. We have good technology that can make this happen.
- Happy to have CalRecycle come visit facility or facilities. Seeing the composting process, can help with respect to discussions with how things are happening on the ground and the challenges we are facing.
- Expressed that it was great to have everyone on the call. People are concerned about confidentiality. Everybody has been doing this for a while. There are certain things they aren't comfortable with. Another meeting like this would be helpful
- We need a focused conversation about composting and compostability of plastics and the responsible end market definition.
- Disposable of compostable plastics was also suggested as a future topic for rigorous discussion.

Appendix D. SB 54 Statewide Needs Assessment Organics Processing Facilities (OPF) Roundtable Notes

October 14, 2025

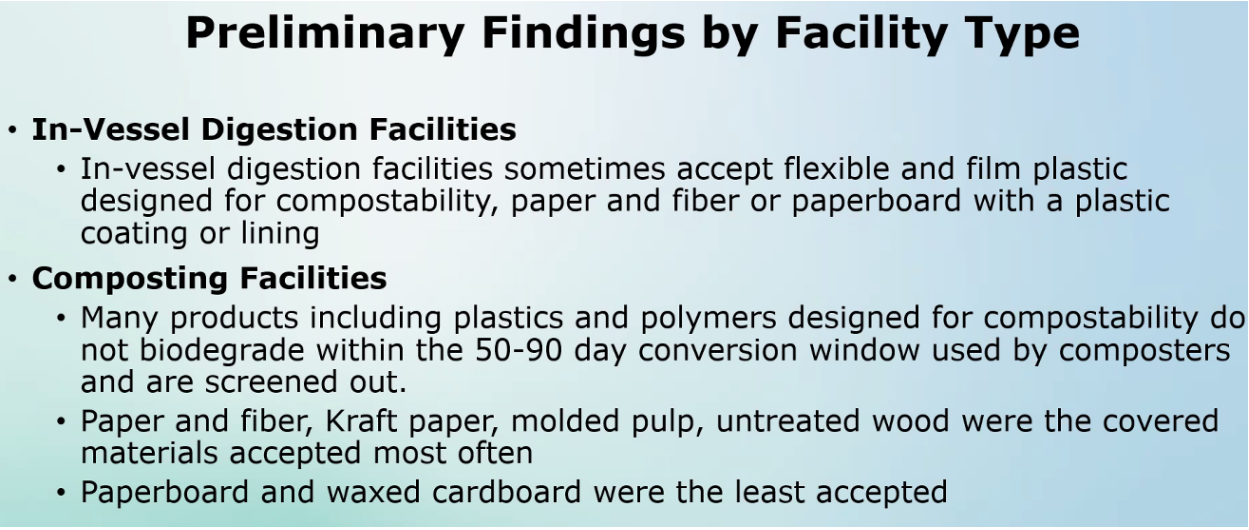
Overview of Current State

Discussion of Preliminary Findings: Collection of Materials for Organics Recycling



Slide / Image text:

- Over 1 million tons of covered material collected in onsite curbside collection statewide (residential and commercial
- Based on survey, the most prevalent contaminants found in collection programs for organics recycling were plastics, polycoated paper, and plastics designed for compostability.



Slide/ Image text:

- Preliminary Findings by Facility Type
- In-vessel Digestion facilities

    - In-vessel digestion facilities sometimes accept flexible and film plastic designed for compostability, paper and fiber or paperboard with a plastic coating or lining
- Composting Facilities
    - Many products including plastics and polymers designed for compostability do not biodegrade within the 50-90 day conversion window used by composters and are screened out.
    - Paper and fiber, Kraft paper, molded pulp, untreated wood were the covered materials accepted most often
    - Paperboard and waxed cardboard were the least accepted

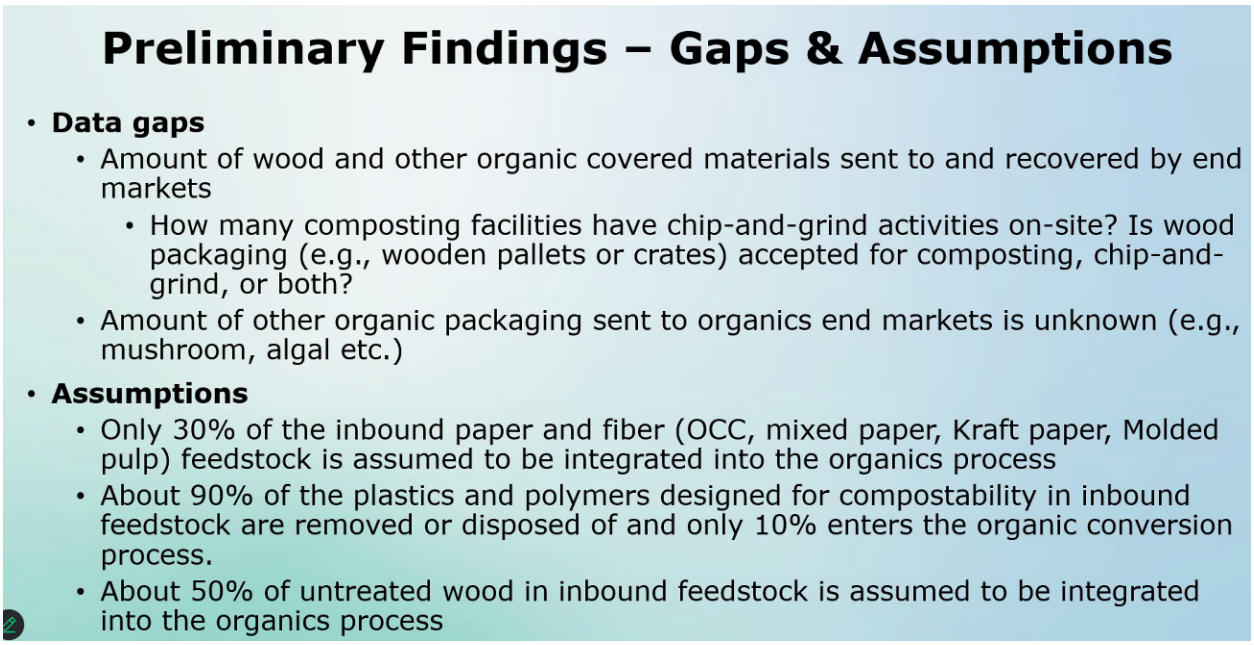
Notes:

- CalRecycle provided a brief overview of the preliminary findings from the Collection, Processing, and End Markets Study, along with highlighting data gaps and assumptions made for the study and clarified methodology used by contractors to gather data. CalRecycle noted that data will be available when the needs assessment is published. However, some information that is covered by NDA with the contractor will not be available to CalRecycle and the public.
- Attendees noted the following:
    - Supported that the contractor asked what happened after acceptance of materials by OPF, whether it was screened out or incorporated into organics conversion process. It is important to highlight that in the published findings.
    - Support to characterize materials designed for compostability as contaminants. All plastics are contaminants for organics recycling; including those designed for compostability and are typically screened out by OPFs because they cannot be distinguished from conventional plastics and there isn't a feasible way at scale to deal with these products.
    - At their facility everything other than food and green waste is screened out, such as waxed cardboard, paperboard, and plastics.
    - Anaerobic digestion (AD) facilities do not accept plastics and polymers designed for compostability unless specially certified for AD.
    - Important issue to understand is if there are robust studies or trials that show that plastics and polymers designed for compostability would compost in the 50–90-day window for air permitting?
    - The Compost Research and Education Foundation evaluates compostability. Over 3500 products were evaluated under variety of operating conditions, temperatures and moisture. Some of these products break down but they are highly variable based on technology. There are no reliable pathways at scale in a compost operation to be certain that these products will break down. If we can

figure out a way to pull out all these products out, it will give everything else a chance to break down.

- Differentiation of packaging designed for compostability from other types of packaging is critical. No feasible way to distinguish one material from another as you receive it on the tipping floor.
- Organics recycling should be limited to food and green material. Everything else should be made to be recyclable.
- Sometimes large commercial operations approach us to allow certain clamshells or other packaging in the green bin. Only way we can do that is if we test anaerobic degradability for our specific conditions and if the material meets those specifications. Else, we categorically do not allow packaging designed for compostability in our green bins in the area.
- There is a wide array of products in the market, and materials are difficult to distinguish from each other. Due to contamination concerns, we require all plastics to be removed.
- Products meeting ASTM standards does not guarantee that the products will biodegrade in a composting facility. It is unclear if the ASTM standards are informed by composting community.
- Organics processing facilities have to meet permitting and regulatory requirements for the composting facilities, not the ASTM standard. This is inconsistent with the requirement in SB 54 that existing local infrastructure is not adversely affected.
- Some packaging designed for compostability may be processable if sourced from within-venue systems, like Petco Park, where the types of materials received are limited. However, small scale operations are unproven for large scale replication, especially for municipal systems statewide.
- There needs to be discussion on how to rebuild collection system to accommodate packaging. Open to the PRO coming up with a plan to make plastics work for composters.
- Manufacturers assume that facilities will be designed for their products, but composting facilities were designed to handle food and green waste.

Discussion of Preliminary Findings: Gaps and Assumptions



Slide/ Image text:

- Preliminary Findings – Gaps and Assumptions
- Data gaps
  - Amount of wood and other organic covered materials sent to and recovered by end markets
    - How many composting facilities have chip-and-grind activities on-site? Is wood packaging (e.g., wooden pallets or crates) accepted for composting, chip-and-grind, or both?
  - Amount of other organic packaging sent to organics end markets is unknown (e.g., mushroom, algal etc.)
- Assumptions
  - Only 30% of the inbound paper and fiber (OCC, mixed paper, Kraft paper, Molded pulp) feedstock is assumed to be integrated into the organics process
  - About 90% of the plastics and polymers designed for compostability in inbound feedstock are removed or disposed of and only 10% enters the organic conversion process.
  - About 50% of untreated wood in inbound feedstock is assumed to be integrated into the organics process

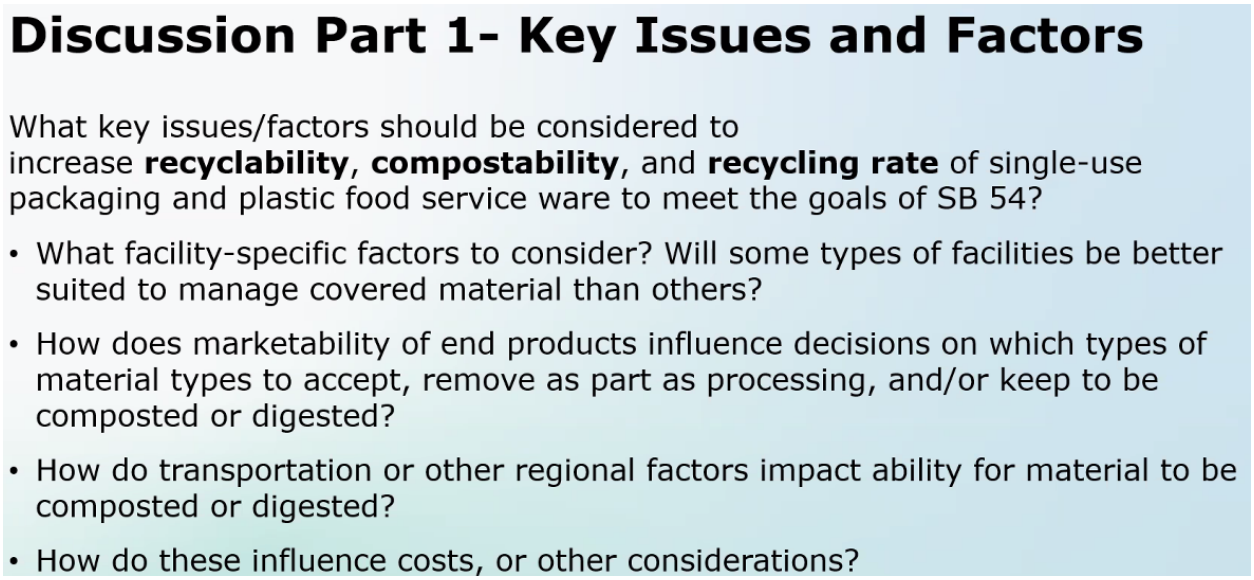
Notes:

- CalRecycle presented the data gaps in the CPEM study as well as the assumptions made.
- Attendees noted the following in relation to data gaps:

    - Some compost operations (3) in N. California accept wood pallets and crates. These are ground but not put into composting process because it takes too long to break down.
    - One entity has several facilities and tries to keep untreated wood separate. Wood is chip and ground or biomass. Does not go into composting or into digester.
- Attendees noted the following in relation to the assumptions:
    - Regarding assumption on 30% of fiber is integrated into conversion process, was this based on the survey? Challenge is that unless we are working on something intentionally for the department, we are not paying attention to the individual packaging coming in.
    - 30% for paper and fiber seems possible but will appear low. Department should follow up specifically for fiber and what that looks like now.
    - Department should think about sending out a follow-up to the survey to get more precise data. Send out surveys to get more information because there are huge data gaps.
    - The assumption that 90% of plastics and polymers designed for compostability being removed is a huge assumption and probably shouldn't be included. It is accurate that composters try to remove 100% of plastic but are probably successful at about 99%.
- Attendees also noted the following:
    - To the extent there are look-alike materials, such as cushioning designed for compostability that looks like expanded polystyrene, these are especially problematic. The problem is that they are trying to replicate a product, and it looks exactly the same. There is zero feasibility for composting this. If it looks like garbage, it is going to get screened out.
    - If it is not labeled properly, it is an issue for educating haulers because it is hard to distinguish whether it is foam designed for compostability or polystyrene? Our drivers will not know.

Facilitated Discussion Part 1

Key Issues and Factors



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Discussion Part 1 – Key Issues and Factors

- What key issues/factors should be considered to increase recyclability, compostability, and recycling rate of single-use packaging and plastic food service ware to meet the goals of SB 54?
- What facility-specific factors to consider? Will some types of facilities be better suited to manage covered material than others?
- How does marketability of end products influence decisions on which types of material types to accept, remove as part as processing, and/or keep to be composted or digested?
- How do transportation or other regional factors impact ability for material to be composted or digested?
- How do these influence costs, or other considerations?

Notes:

- Attendees noted the following:
  - Regarding whether some facilities are better suited for processing this material, in general MRFs are intentionally designed to take in a wide variety of materials and sort them and provide them to those who could use some of the products. Sorting at MRFs will be more cost effective and have less impact if majority, if not all CM go through material recovery facilities and not to compost facilities.
  - It is important to have labeling standards for packaging generally. With 3 bins it is difficult enough already. Consumers are confused about where material goes. This is true for composting but also recycling. Most consumers have no idea

where a pulp drink tray should go? You stand in front of these bins for 1 second. It needs to be way more obvious.

- If plastics are allowed to be labeled compostable under the National Organic Program, then we could have bifurcated system where some facilities choose to take materials designed for compostability and are incentivized to do so while others do not. Such an approach will disrupt the existing system and penalize facilities that do not take this material. Jurisdictions looking to lower costs for consumers may look unfavorably on composters who do not accept the incentive provided to accept covered materials. This may also impact hauling if jurisdictions only want to work with facilities that take all material designed for compostability. Could result in facilities being forced into it or forced out of the market.
- Marketability of end products is job number one. There is no purpose in producing products that cannot find highest value market
- Most facilities take large amounts of food soiled paper with food waste. They found that removing plastic is easier in terms of preserving quality of end product.
- Regarding marketability of end products, are consumers willing to take materials that have incorporated packaging designed for compostability? We are concerned about aesthetics, and our reputation and in maintaining positive reviews of the products we put out. In the end, the consumer decides. End markets are the driver for quality of material and consistency.
- This is a massive point we don't talk about enough. A recent article from Recology shows that not a single compost user wants more plastic here. https://www.latimes.com/environment/story/2025-07-04/does-plastic-waste-in-compost-make-sense.
- We have a success story on composting in California. California leads the country largely because of our access to agricultural markets. If we cannot sell the final products, the success story ends. The agricultural markets go away if we do not sell them high quality, contaminant free, plastic free products.
  - Social media can sway people for or against products. Marketability, it is the customers, cities, landscapers or farmers that dictate if there will be markets.
  - Transportation costs are major factors, specifically if there are 1 or 2 facilities that opt to take these plastics designed for compostability. Transporting food material with plastics designed for compostability from LA to northern California is likely not feasible due to costs. The environmental costs are also significant.
    - There is limited access to collection and processing infrastructure for some communities within the state. Some communities we serve don't have access to food waste composting. Anything done around SB 54 will not change the

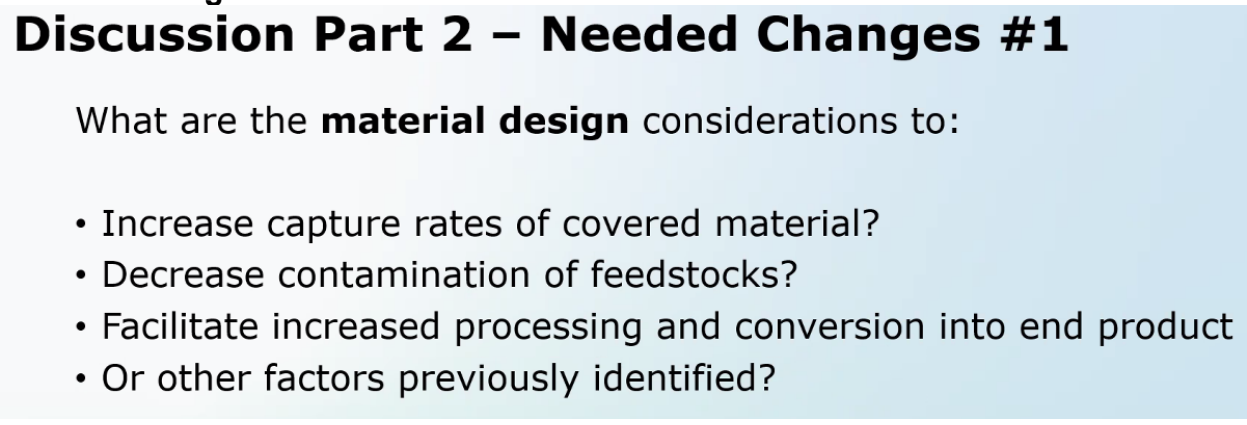
factors limiting access except funding. Cost is the biggest factor preventing these communities from access.

- The green bin stream is fundamentally not equivalent to the blue bin stream. But they're being treated the same. Marketability is the entire purpose of this. Majority of MRFs in state will accept and process products. When talking about AB1201, whole concept was about marketability. Non-organic farmers still rely on those standards set by NOSB and CDFA. Marketability needs to be the number 1 consideration. Marketability = compostability = recyclability.
- Compostables in the blue bin is something the European Union is thinking about. MRFs are designed to deal with lots of things. The term "compostability" you cannot use that term without suggesting it belongs with compost. Words matter. Make sure that compostability is a term that people will always associate with compost. They should not be labeled compostable until challenges are resolved.
- PLA is by far the dominant resin designed for compostability used in the market. It is functional in a number of uses and is made of durable molecules. It can be used in same way that other poly resins can be used. This needs to be reconsidered by recycling markets.
- As both a composting facility and an MRF, we do not want this packaging designed for compostability in our recycling stream either. What is the pathway for this kind of material? It's not for compost, it contaminates recycling.

- A big part of it is clear labeling, reuse when possible. Labeling is the way to increase recycling and composting rate.
- Packaging designed for compostability is a linear product. It may be degraded in compost operation but has no value added to compost or agronomic value.

Facilitated Discussion Part 2

Needed Changes #1



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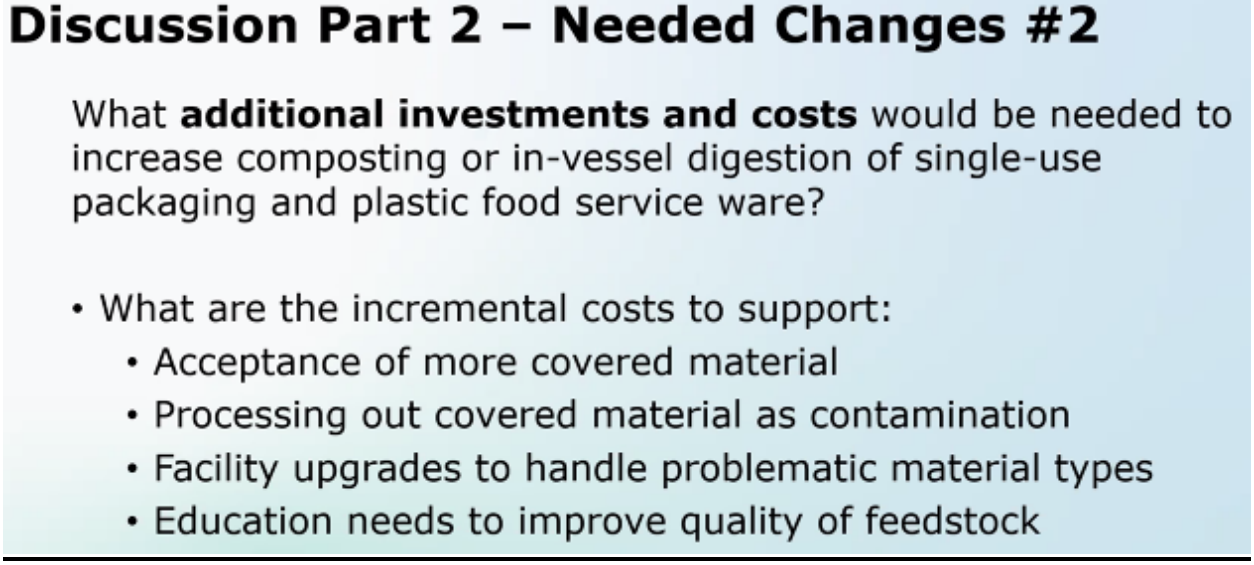
Discussion Part 2 – Needed changes #1
What are the material design considerations to:

- Increase capture rates of covered material?
- Decrease contamination of feedstocks?
- Facilitate increased processing and conversion into end product
- Or other factors previously identified?

Notes:

- Attendees noted the following:
    - Identification and labeling of the materials so that everybody is clear where they should go is key. New innovative material types need to conform to labeling standards if they are truly going to be a compostable option. There needs to be a clear idea on what is and isn't allowed in certain bins. This should be mission number 1 for PRO. Extent that PRO can develop and enforce or set their own labeling standards should be a part of their program. They want to create products that are circular. Consumers need to know what to do with them.
    - At our facilities, we cannot see that small of a label on the material when it comes in. There needs to be an identification that is visible at a distance: e.g., coloring things hot pink. It needs to be readily and easily identifiable on the incoming processing line / stream. A tiny leaf does not meet this standard.
    - The other important thing is that other materials cannot look the same. Mushroom based foam products, we will always remove something if it resembles expanded polystyrene. Similar with other plastic and fiber. Fiber products need to be… Current standards in draft regs, we need to be even more stringent. We are always going to remove things that are meant to look like products that are bad for our streams. We will be more stringent and have to be able to quickly identify what's compostable and what's not.

Needed Changes #2



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Discussion Part 2 – Needed changes #1
What additional investments and costs would be needed to increase composting or in-vessel digestion of single-use packaging and plastic food service ware?

- What are the incremental costs to support:
  - Acceptance of more covered material
  - Processing out covered material as contamination
  - Facility upgrades to handle problematic material types
  - Education needs to improve quality of feedstock

Notes:

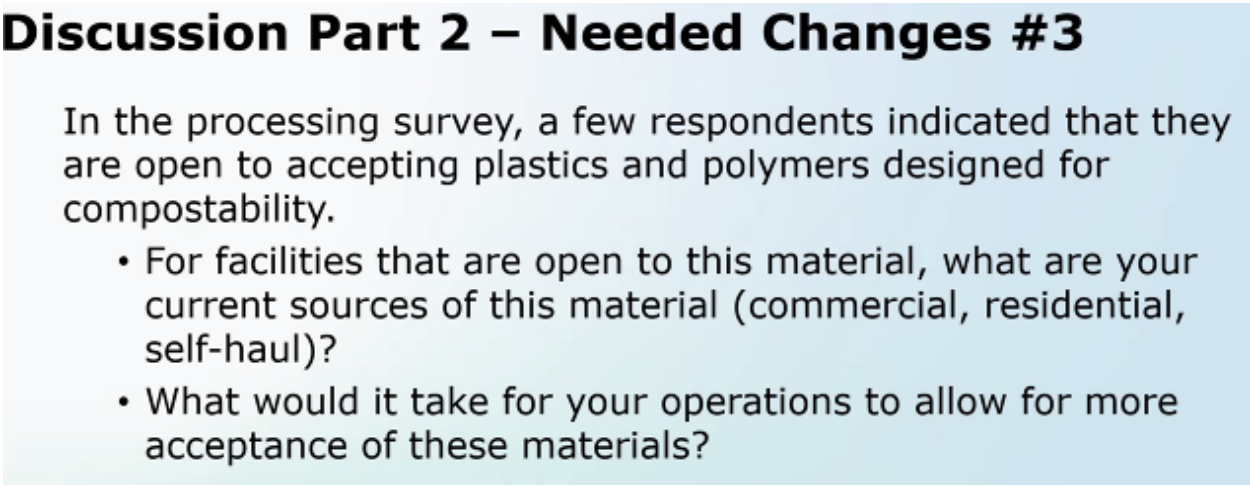
Attendees noted the following:

- To increase composting of covered material, investments are better targeted upstream focused on labeling, outreach, and education or even different types of collection or secondary processing rather than at the compost facility level because once it arrives at the facility it cannot be processed at a material type level as in MRFs.
- Hypothetically, what would be required for compostable plastics in particular to be composted as consistent with statute and regs? The following are a list of costs: (1) Transportation costs for covered material to be sent to few facilities that accept them; (2) Cost of equipment installed at front end to separate materials into bifurcated streams; (3) Land costs to expand facility to run two parallel compost facilities - municipal organics and one for compostable plastics; (4) Pay for cost of compost that cannot be sold; and (5). Pay for materials to be redesigned and labeled properly.

- To accommodate these materials, we need to redesign compost facilities in California and develop a market for these materials. Need to accurately compare cost of making material compostable and cost of making material recyclable.
- A Closed Loop Partners Study found that 15-31% of costs for composting facilities are for contamination removal (https://www.closedlooppartners.com/wp-content/uploads/2024/03/Dont_Spoil_the_Soil_CLP_CompostingConsortium.pdf) . Increasing the amount of covered material in those systems will have a substantial effect on those costs. Lack of identification for consumers. Food service ware is a small percentage of food adjacent plastic. Vast majority of products are in plastic. Consumers will dispose of food in this original plastic. This ends up in green bins. Though we encourage more organic materials in green bins, we are also increasing contamination because of lack of identification. More education and outreach clearly need to be done.
- We've spent hundreds of millions on public education over the years. We still have material ending up in completely wrong containers. We have an opportunity with a new set of rules to nail this and do it right.
- Some people think it's easier to meet compostability than recyclability standards. There is a lack of understanding of regulation. It needs to be very clear - challenges with making films and flexibles recyclable are lack of available end markets today. PRO needs to invest in end markets to make this recyclable. Need robust REM standard for compost facilities and would also need an entirely new REM for film, if compostable. Just shifting to compostability does not resolve the issue.
- We're focused on a paradigm shift of recycling. This is so much more complicated than we make it seem. There is limited time, limited resources. What would it take to recover those depackaged materials? Education costs will be massive.
- We need to do more studies or tap into studies that provide information on what can actually cause behavior change. Our education and outreach approaches have not changed much over the years.
- California has the most advanced recycling system in maybe the world. Our system is supposed to work for everyone. So, we design systems on back end to accommodate bad consumer sorting. Adding bins, or new collection programs for compostables will not make it easier for the consumer. We have a robust system now. Creation of an alternative collection system for compostables will not make it easier for consumers.
- We've been talking about increased contamination we see. Huge issue with education. We have messaged incorrectly due to huge increases in contamination. missed (as a society and industry) how to communicate this to everybody.
- Proposing a dot-based system. Blue, green or black dot. Blue dot to blue bin. Green dot to green bin. PRO can decide which dot each gets. It needs to be simple. Green

can get grass and food. So, then decision is to recycle vs trash. It needs to be simple.
- First step should be to talk about reusable, when possible. This is important for the conversation.

Needed Changes #3



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Discussion Part 2 – Needed changes #1
In the processing survey, a few respondents indicated that they are open to accepting plastics and polymers designed for compostability.
- For facilities that are open to this material, what are your current sources of this material (commercial, residential, self-haul)?
- What would it take for your operations to allow for more acceptance?

Notes:
Facilitated Discussion Part 2: Open Discussion
- Attendees noted the following:
  - We talk about the circular economy. We need to have infrastructure to recycle things in CA to make it truly circular.
  - Do not want to stifle innovation with permitting. Technology allows us to put more sustainable systems in place, but there are challenges in putting this in place due to permitting. We want to manage the waste stream, and serve the public, with the least impact possible.
  - Academia should be engaged on this. Three packaging schools come to mind as top-ranked: Cal Poly San Luis Obispo, Clemson, and Michigan State. We want some of these graduate students on this panel.

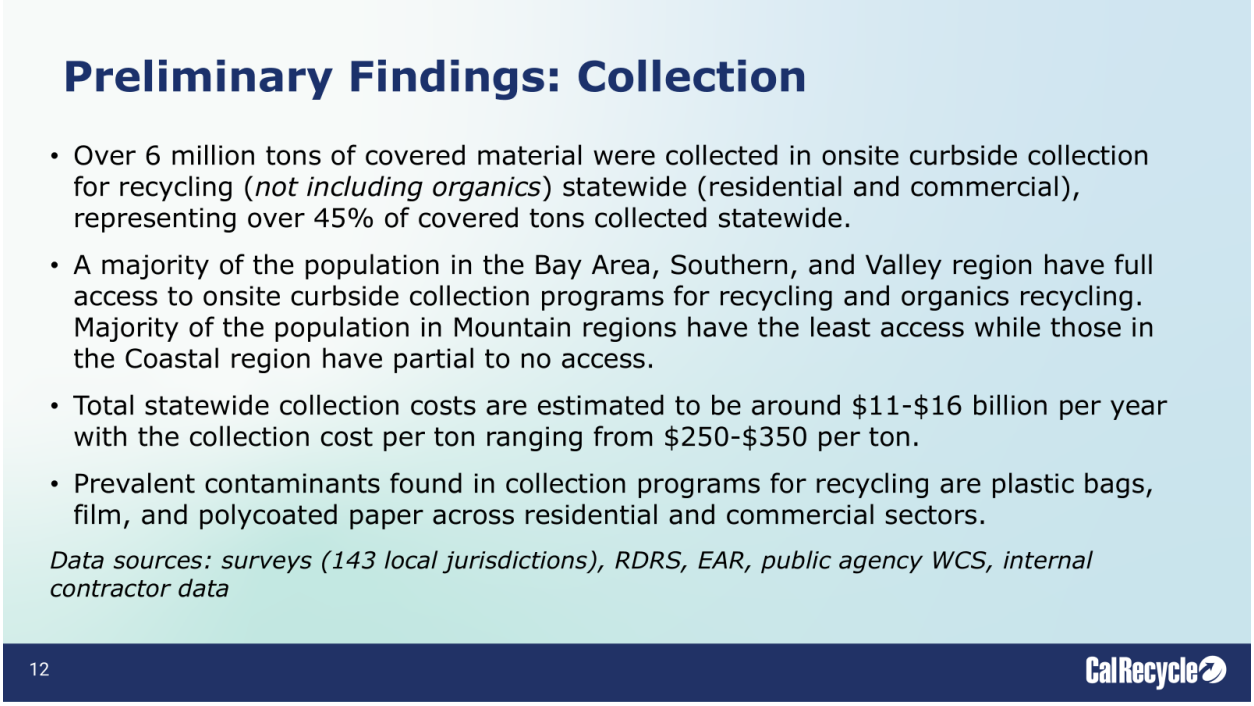
- We compost more material in CA than the other 49 states combined. We put more to agriculture than all the others combined. We need to maintain the important systems we have that currently work. To extent we can find solutions for paper and fiber, we should. We want it out of landfill. But it needs to be clear to consumers and readily identifiable. It cannot have other toxins in it.

Appendix E. SB 54 Statewide Needs Assessment MRF Haulers Round Table Notes

October 23, 2025

Overview of Current State

Preliminary Findings: Collection



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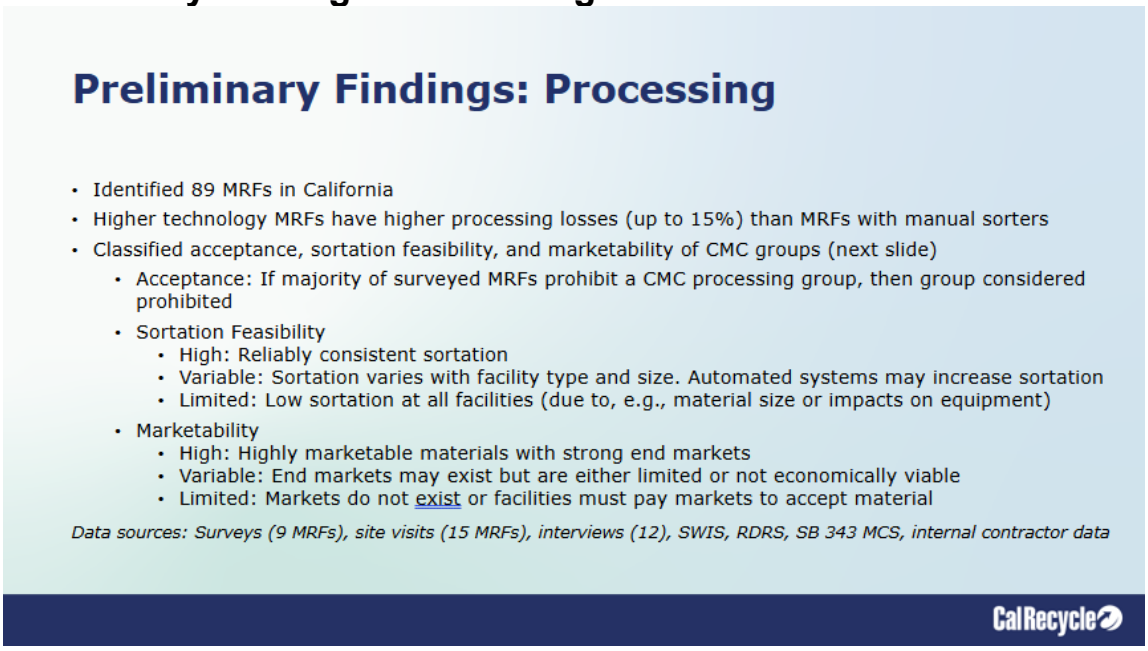
Preliminary Findings: Collection

- Over 6 million tons of covered material were collected in onsite curbside collection for recycling (*not including organics*) statewide (residential and commercial), representing over 45% of covered tons collected statewide.
- A majority of the population in the Bay Area, Southern, and Valley region have full access to onsite curbside collection programs for recycling and organics recycling. Majority of the population in Mountain regions have the least access while those in the Coastal region have partial to no access.
- Total statewide collection costs are estimated to be around $11-$16 billion per year with the collection cost per ton ranging from $250-$350 per ton.
- Prevalent contaminants found in collection programs for recycling are plastic bags, film, and polycoated paper across residential and commercial sectors.

Data sources: surveys (143 local jurisdictions), RDRS, EAR, public agency WCS, internal contractor data

Preliminary Findings: Processing



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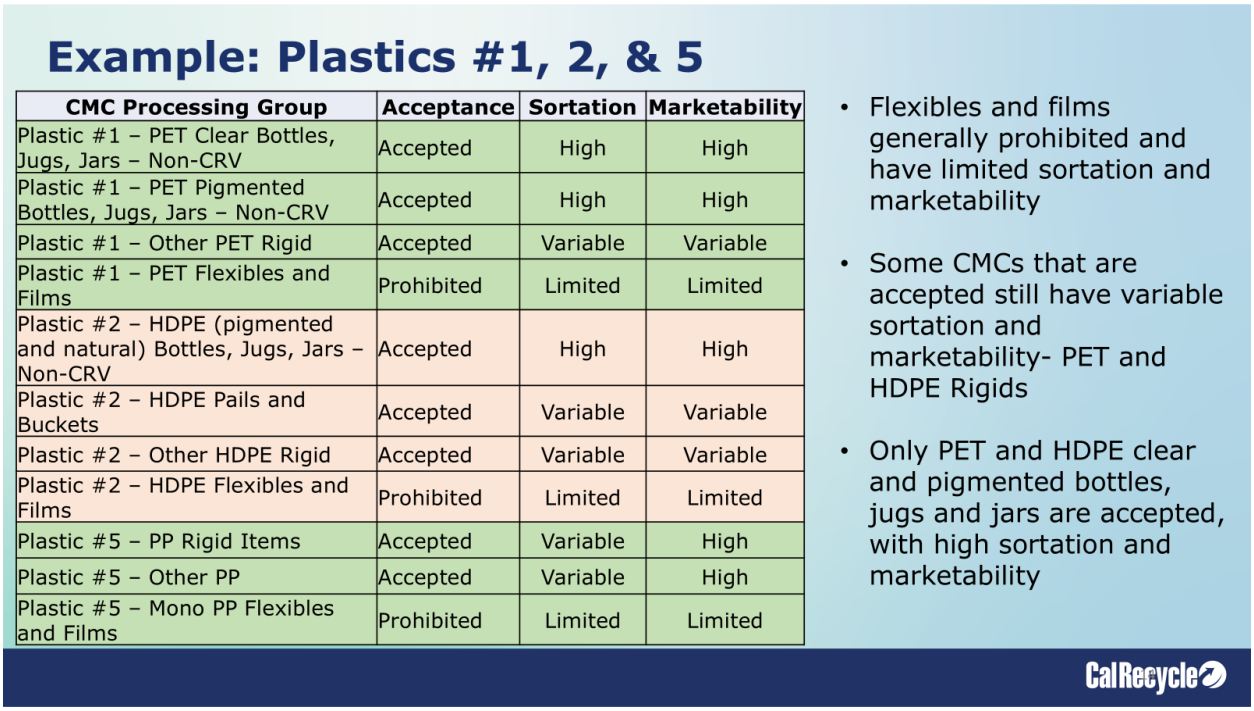
Preliminary Findings: Processing

- Identified 89 MRFs in California
- Automated MRFs have higher processing losses (up to 15%) than MRFs with manual sorters
- Classified acceptance, sortation feasibility, and marketability of CMC groups (next slide)
    - Acceptance: Considered prohibited if majority of surveyed MRFs prohibited CMC group
    - Sortation Feasibility
        - High: Reliably consistent sortation
        - Variable: Sortation varies by facility type and size. Automation may increase sortation
        - Limited: Low sortation at all facilities (due to, e.g., material size or impacts on equipment)
    - Marketability
        - High: Highly marketable materials with strong end markets
        - Variable: End markets may exist but are either limited or not economically viable
        - Limited: Markets do not exist or facilities must pay markets to accept material

Data sources: Surveys (9 MRFs), site visits (15 MRFs), interviews (12), SWIS, RDRS, SB 343 MCS, internal contractor data

Example: Plastics #1, 2, & 5



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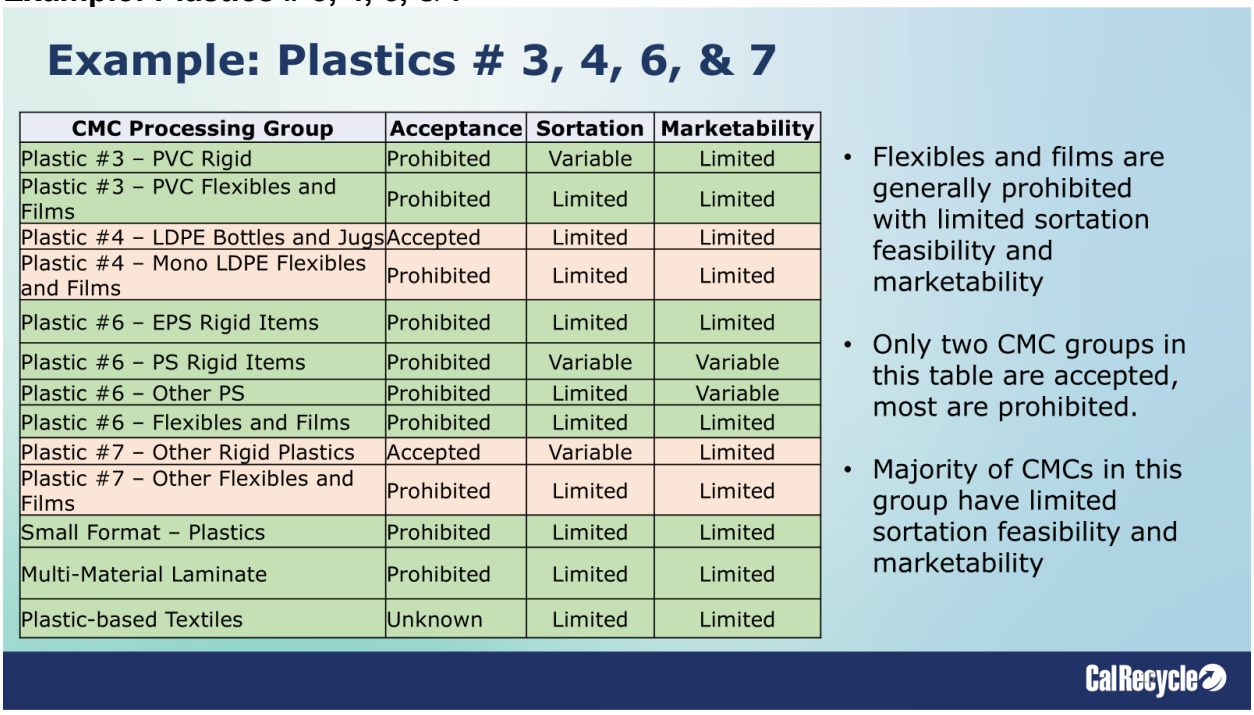
Example: Plastics #1, 2, and 5

CMC Processing Group	Acceptance	Sortation	Marketability
Plastic #1 – PET Clear Bottles, Jugs, Jars – Non-CRV	Accepted	High	High
Plastic #1 – PET Pigmented Bottles, Jugs, Jars – Non-CRV	Accepted	High	High
Plastic #1 – Other PET Rigid	Accepted	Variable	Variable
Plastic #1 – PET Flexibles and Films	Prohibited	Limited	Limited
Plastic #2 – HDPE (pigmented and natural) Bottles, Jugs, Jars – Non-CRV	Accepted	High	High
Plastic #2 – HDPE Pails and Buckets	Accepted	Variable	Variable
Plastic #2 – Other HDPE Rigid	Accepted	Variable	Variable
Plastic #2 – HDPE Flexibles and Films	Prohibited	Limited	Limited
Plastic #5 – PP Rigid Items	Accepted	Variable	High
Plastic #5 – Other PP	Accepted	Variable	High
Plastic #5 – Mono PP Flexibles and Films	Prohibited	Limited	Limited

Text in box on the right of slide:

- Flexibles and films generally prohibited and have limited sortation and marketability
  - Some CMCs that are accepted still have variable sortation and marketability- PET and HDPE Rigids
  - Only PET and HDPE clear and pigmented bottles, jugs and jars are accepted, with high sortation and marketability

Example: Plastics # 3, 4, 6, & 7



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Example: Plastics #3, 4, 6, and 7

CMC Processing Group	Acceptance	Sortation	Marketability
Plastic #3 – PVC Rigid	Prohibited	Variable	Limited
Plastic #3 – PVC Flexibles and Films	Prohibited	Limited	Limited
Plastic #4 – LDPE Bottles and Jugs	Accepted	Limited	Limited
Plastic #4 – Mono LDPE Flexibles and Films	Prohibited	Limited	Limited
Plastic #6 – EPS Rigid Items	Prohibited	Limited	Limited
Plastic #6 – PS Rigid Items	Prohibited	Variable	Variable
Plastic #6 – Other PS	Prohibited	Limited	Variable
Plastic #6 – Flexibles and Films	Prohibited	Limited	Limited
Plastic #7 – Other Rigid Plastics	Accepted	Variable	Limited
Plastic #7 – Other Flexibles and Films	Prohibited	Limited	Limited
Small Format – Plastics	Prohibited	Limited	Limited
Multi-Material Laminate	Prohibited	Limited	Limited
Plastic-based Textiles	Unknown	Limited	Limited

Text in box on the right of slide:

- Flexibles and films are generally prohibited with limited sortation feasibility and marketability

- Only two CMC groups in this table are accepted, most are prohibited.
- Majority of CMCs in this group have limited sortation feasibility and marketability

Preliminary Findings: End Markets

Slide / Image Text:
Preliminary Findings: End Markets

- Materials with limited to no end markets: ceramics, lined paper, waxed OCC, and molded pulp,
- Almost 100% of glass material grades remain within CA for recycling. Glass beverage containers make up a large share of glass going to end markets
- No end markets for covered matal identified in CA. All covered metal exported outside of CA (~50-60% domestic exports; remainder international)
- Thirteen plastic end markets within CA and four outside the state but in the US. End markets only identified for PET, HDPE, PP and PE film.

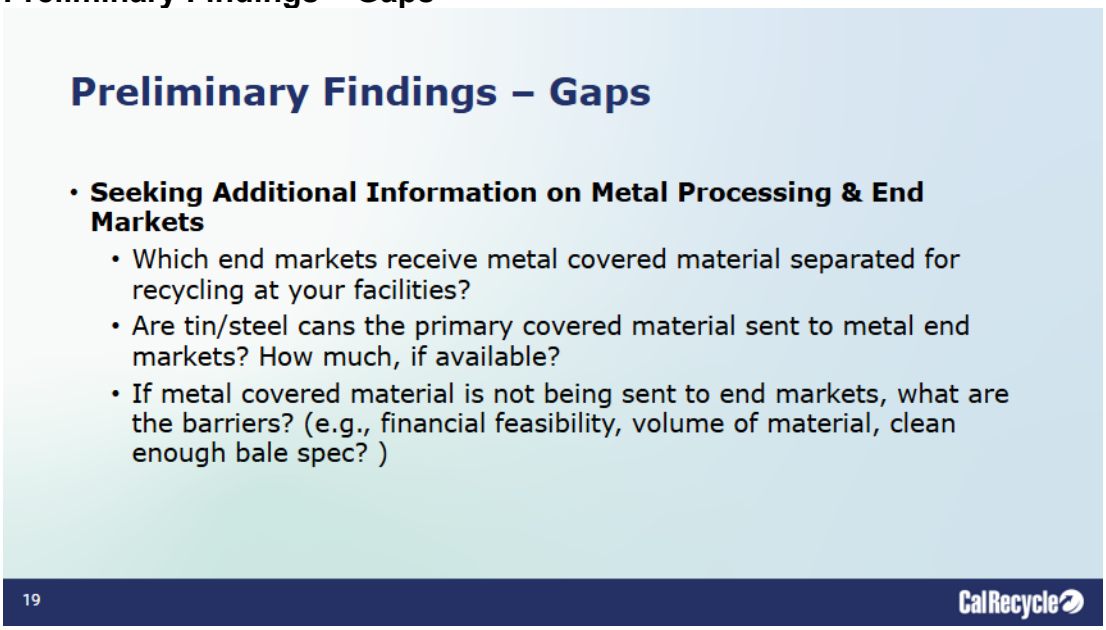
Data sources: Developed end market-specific surveys for California-based end markets for each material class. Estimated domestic and international exports of material to other states an countries using RDRS and WISERTrade

Notes

- CalRecycle provided a brief overview of the preliminary findings from the Collection, Processing, and End Markets study, along with highlighting data gaps and questions for attendees to take back to consider providing data on.
- Attendees noted the following
  - Requested clarification that the discussion was focused on materials collected for recycling as materials collected for organics recycling were dealt with in the Organics Processing Facilities roundtable.

- CalRecycle affirmed that paper was included in the 6 million tons of covered material that were collected in onsite curbside collection for recycling
- That the presentation was focused on plastics going to recycling and the discussion should include moving certain items from organics into recycling.
  - CalRecycle clarified that this specific presentation was focused on plastic, but the report is more comprehensive and includes all material classes and that the discussion will include consideration of moving material from organics into the recycling stream.

Preliminary Findings – Gaps



Slide / Image Text:
Preliminary Findings – Gaps

- Seeking additional information on metal processing and end markets
  - Which end markets receive metal covered material separated for recycling at your facilities?
  - Are tin/steel cans the primary covered material sent to metal end markets? How much, if available?
  - If metal covered material is not being sent to end markets, what are the barriers? (E.g., financial feasibility, volume of material, clean enough bale spec?)

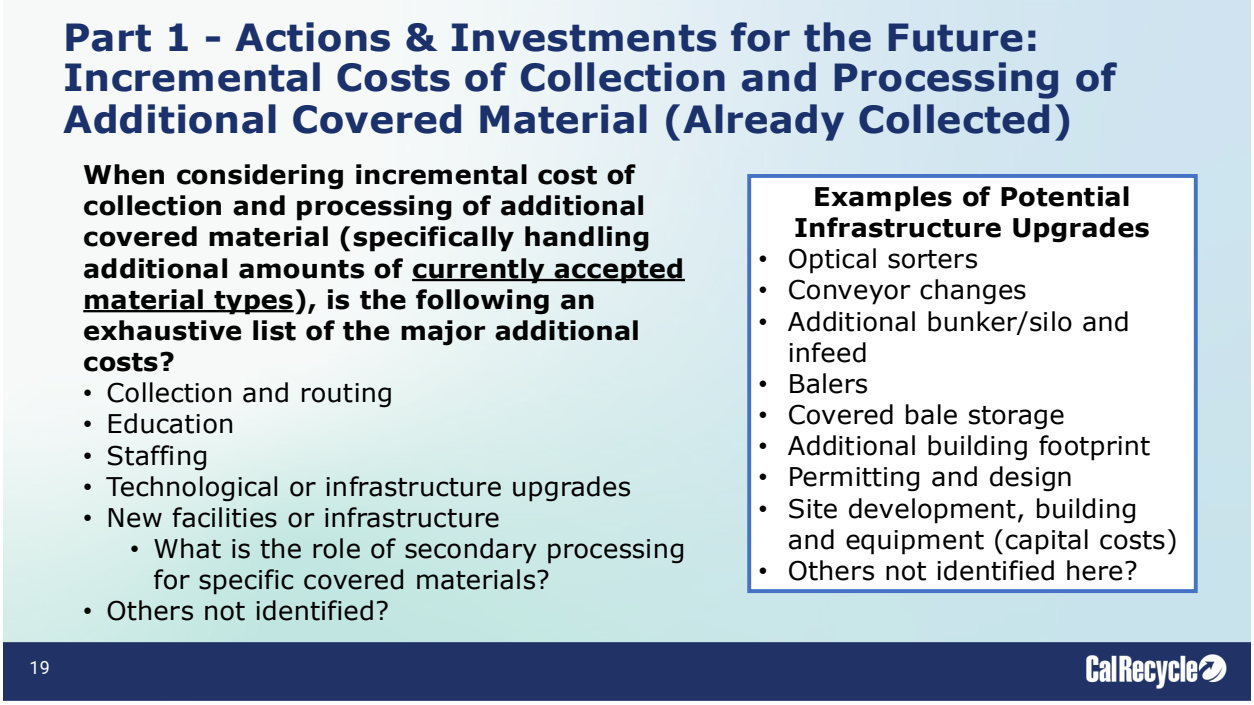
Notes:

- CalRecycle sought additional information on data gaps related to end markets for metal covered material.
  - No questions or comments from attendees.

Facilitated Discussion Part 1

Actions & Investments for the Future: Incremental Costs of Collection and

Processing of Additional Covered Material (Already Collected)



Slide / Image Text:
Part 1 – Actions & Investments for the Future: Incremental Costs of Collection and Processing of Additional Covered Material (Already Collected)

When considering incremental costs of collection and processing of additional covered material (specifically handling additional amounts of currently accepted material types), is the following an exhaustive list of the major additional costs?

- Collection and routing
- Education
- Staffing
- Technological or infrastructure upgrades
- New facilities or infrastructure
  - What is the role of secondary processing for specific covered materials?
- Others not identified

Text in box on the right of slide:
Examples of potential infrastructure upgrades

- Optical sorters
- Conveyor changes
- Additional bunker/silo and infeed
- Balers
- Covered bale storage
- Additional building footprint
- Permitting and design

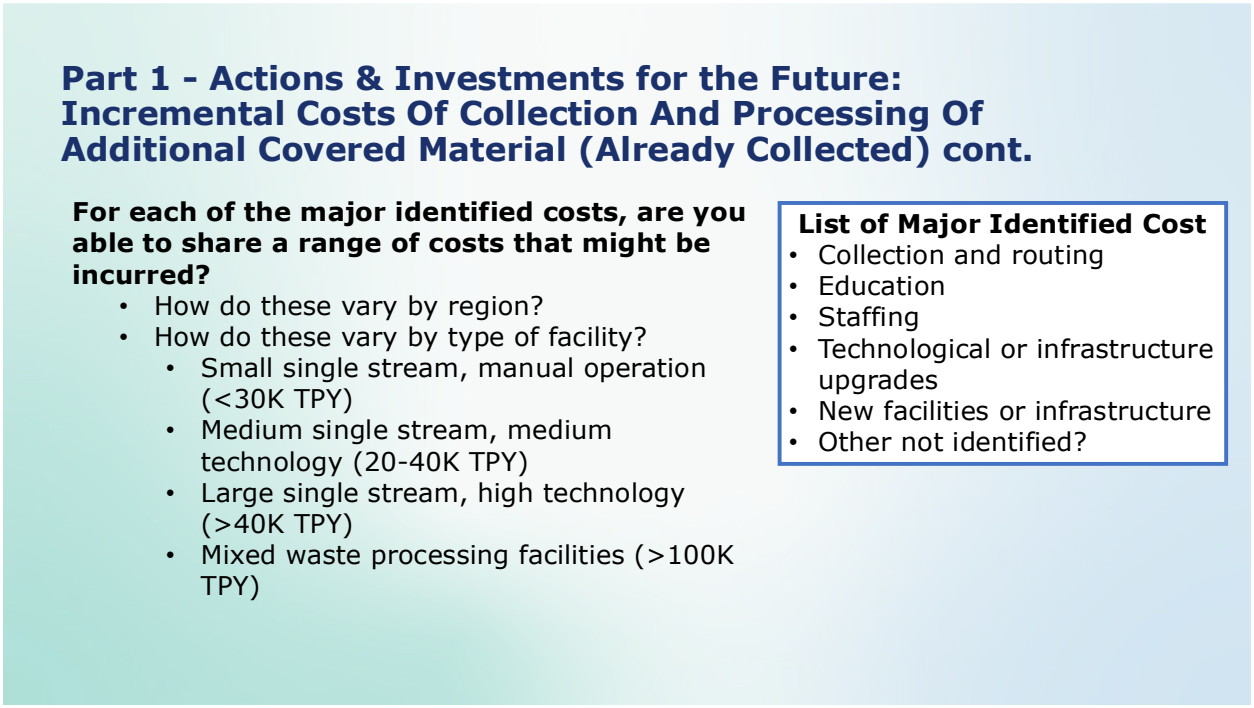
- Site development, building and equipment (capital costs)
- Others not identified here?

Notes:

- CalRecycle presented a list of potential major additional costs that may be incurred when additional amounts of already collected covered material are collected as well as examples of potential infrastructure upgrades for input from the attendees
- Attendees noted the following
    - In terms of collection and routing, would that include having an additional truck collecting curbside for just film?
    - For secondary processing, is that referring to focusing on glass processing that still has plastic in it. Don't have that information off hand but generally our glass pile is 80% glass and 20% everything else. If you need more info, happy to follow up with email
    - Supported that the list of additional costs looked comprehensive.
    - Suggested that secondary processing of film and flex is likely the best way to handle that material.
    - Suggested adding costs related to transportation to new facilities/long haul cost. This is especially important for rural areas. Additionally, transfer stations are important in rural areas given that collection most often happens at a remote transfer station.
    - Participant asked for clarification on whether CalRecycle asking about secondary processing for specific commodities, like glass, or secondary processing of MRF residual (i.e., not necessarily targeting one specific commodity)? CalRecycle responded that they are interested in understanding which materials, including MRF residuals, would have the most value from going to secondary processing. Don't need secondary processing on commodity streams that have already been separated.
    - Previously a facility was baling mixed plastic but stopped due to Basel Convention. Theoretically, they could retool MRF to make a mixed plastic bale that could be sent to secondary processing but don't have bunker space/room to make a new commodity stream that is then going to further processing. Processing on MRF residual and pulling out whatever materials from that would be the most efficient and require minimal changes.
    - Support earlier comment on importance of considering transfer stations as a collection point, especially in rural areas.
    - Marketability is a significant issue. For example, the price of PET is very low right now. Are we expected to store it? Some places have limited or no storage.
    - Important to include soft costs, such as those in permitting, re-negotiating franchise agreements, and coordinating with the local jurisdictions. In addition to

costs, there is time associated with upgrades given that permitting and other agreements are needed before they can move forward with actual upgrades.

Actions & Investments for the Future: Incremental Costs of Collection and Processing of Additional Covered Material (Already Collected) continued



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Part 1 – Actions & Investments for the Future: Incremental Costs of Collection and Processing of Additional Covered Material (Already Collected) cont.
For each of the major identified costs, are you able to share a range of costs that might be incurred?

- How do these vary by region?
- How do these vary by type of facility?
  - Small single stream, manual operation (<30K TPY)
  - Medium single stream, medium technology (20-40K TPY)
  - Large single stream, high technology (>40K TPY)
  - Mized waste processing (>100K TPY)

Text in box on the right of slide:
List of Major Identified Costs

- Collection and routing
- Education
- Staffing
- Technological or infrastructure upgrades
- New facilities or infrastructure

- Others not identified

Notes:

- CalRecycle asked if attendees were able to share a range of costs that might be incurred for each of the major identified costs
- Attendees noted the following
  - It is hard to nail down costs at this broad level and asked if CalRecycle has scenarios to model costs after or other parameters to provide to help estimate incremental costs?
  - Need to know how much additional covered material will need to be collected in order to estimate incremental costs - 10% or 50%? Some MRFs will have capacity some won't so cost will be greater.
  - CalRecycle noted that they may be able to provide some rough estimates for scenarios based on the most recent disposal data from the SB 54 Material Characterization Study.
  - Based on CalRecycle's note, it was clarified that a statewide percentage may not be sufficient. Knowing scenarios by location/by region will be helpful.
  - CAA is going through a similar process for reimbursements that looks at facility-level costs because even within a region, the costs by facility can vary widely. Cost for facilities in Bay Area that are 5 miles apart vs 15-20 miles apart are drastically different because of union agreements and other factors such as who owns the property and needed equipment. How does the needs assessment analysis align with what CAA is doing? Their process of asking for individual claims will be on a facility-to-facility basis which is the best way to do it.
  - Did contractors look at the public documents that are required to be posted about the different rates for jurisdictions? All costs are required to be bucketed.
  - The cost of disposing of residual waste should be included as an additional cost. If collection needs to be expanded, it will also increase the amount of residuals that need to be disposed. All parts of the expanded collection and processing should be covered including costs related to contamination associated with the collection of covered material.

Facilitated Discussion Part 2

Actions & Investments for the Future: Incremental Costs of Adding New Material Types to Collection (Not Already Collected)

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Part 2 – Actions and Investments for the Future: Incremental Costs of Adding New Material Types to Collection (Not Already Collected)

When considering incremental costs of collection and processing of additional covered material (specifically adding new material types), is the following an exhaustive list of the major additional costs?

- Collection and routing
- Education
- Staffing
- Technological or infrastructure upgrades
- New facilities or infrastructure: Upgrade possible with existing permit?
- Others not identified here

For each of the major identified costs, are you able to share a range of costs that might be incurred?

- How do these vary by region?
- How do these vary by type of facility?

Notes:

- CalRecycle presented a list of major additional costs that may be incurred to collect covered material that is not being currently collected and how they may vary by region or type of facility
- Attendees noted the following

- It is important to consider contamination cost. For example, if MRFs are suggested as the facilities that should process food service ware, there will be more food contamination that MRFs need to handle. The additional food contamination could reduce the quality of existing commodities, such as paper bales which risks that the bales could get rejected by end market. If bales get contaminated, then who will pay for the costs? Then CAA might pay only for part of transportation.
- Cost shown here are all valid and there is additional cost to add materials like thermoforms or aseptic cartons. Costs that are missing are transportation to locations that receive it once segregated given there aren't many facilities today and it could be great distances. Additionally, those facilities may charge a tip fee for materials.
- Adding film and flex to list is a whole another thing since it will need to be processed again and may require additional routing.

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Part 2 – Actions and investments for future: Additional needs to accommodate more covered material

- Do you anticipate significant number of additional routes will be added
  - Or will this generally be absorbed through migration of material from the refuse stream to the materials collected for recycling stream?
- To what extent can the proposed upgrades be accommodate within the existing permits?

Notes:

- CalRecycle requested information on whether significant number of additional routes need to be added to collect more covered material and to what extent proposed upgrades could be accommodated within existing permits.
- Attendees noted the following
    - Currently, films and flexibles are not able to be processed through a MRF. Need help removing films that are already reaching MRF processing lines and need more routing and education.
    - We see film in every step of our MRF, including in certain commodities we still find film.
    - Looking at results of MCS could be helpful here to help understand covered material collected and not collected and what those quantities look like.
    - Looking at the recent MCS results will provide an estimate of current amounts but does not help estimating additional contamination a MRF may receive if that is the pathway suggested for food service ware that is currently being considered for the compostable pathway. More contamination would be expected if those materials reach MRFs. Neither compost nor recycling should be a dumping ground because that's what's convenient. It's important to understand the path that composters and recycling facilities go through to understand what we can and cannot handle.
    - Another thing to consider is not just food contamination but also liquid contamination. For example, paper cups – the issue is they're fully lined which means we'll get the coffee that someone had in there still and the lid, which is a different type of plastic, and the sleeve and the plug. It will come in as one and that, with the liquid, will contaminate the paper.

Material Design Considerations

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Part 2 – Material Design Considerations
For materials with limited sortation feasibility and marketability, what material design changes if any, would be necessary to increase collection and processing of a single-use packaging and plastic food service ware?

Notes:

- CalRecycle posed a question on what material design changes would be necessary to increase collection and processing of covered material that that limited sortation feasibility and marketability
- Attendees noted the following
  - This is a good question for haulers. We already have routes and how they work in jurisdictions. Example: we have a truck that picks up e-waste, add to that curbside film plastic collection. Support infrastructure for reusable food service ware to stop contamination. Work with people with routes already established to send things to end markets
  - As a composter, we're very much interested in biopolymers moving to becoming recyclable. When you have a cup that says compostable but looks like plastic, it should shift to the recyclability line. There should be a push for material redesign back to recyclable products. All the folks were making recyclable products prior to getting into wish-composting.
  - Need a focus on reusability for hard to recycle or compost materials.
  - In the European Union, there is a new packaging directive that requires most bioplastics to be recyclable by 2028. The idea is to reduce the use of fossil

plastics to the extent that bioplastics will replace those fossil plastics. There has to be some recyclable options for the use of those materials. There should be reusable/refillable containers of bioplastics. I've been engaged with Nature Works that makes PLA and is a resin type that could be used where fossil-based products and can produce the same products without the environmental impacts.