



Background Document on DTSC's Microplastics in Consumer Products Research

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Safer Consumer Products Program

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OVERVIEW

The [Safer Consumer Products \(SCP\) Regulations](#) define the process and criteria we use to evaluate consumer products for possible designation as [Priority Products](#). A Priority Product is a consumer product that (1) contains one or more Candidate Chemicals that have the potential to harm people or the environment, and (2) has been formally listed in the California Code of Regulations through rulemaking. As part of the process of evaluating consumer products, we issue a [Priority Product Work Plan](#) (Work Plan) every three years, which identifies the product categories the SCP Program may evaluate over that period. In addition to the factors outlined in the SCP Regulations, we evaluate the product categories based on the Work Plan's stated policy goals.

This document summarizes our preliminary research on microplastics in select consumer products, which fall under DTSC's current Work Plan product category of products that contain or generate microplastics. Additionally, we evaluated these product-chemical combinations based on the Work Plan priorities of:

- Reducing the release of microplastics to the environment during all stages of the consumer product life cycle, including manufacturing, transportation, use, and end-of-life.
- Protecting California's valuable and limited water resources and aquatic ecosystems from consumer product-derived chemical contamination.
- Protecting the health of children and workers from potential exposures to Candidate Chemicals in consumer products.
- Reducing potential releases of Candidate Chemicals from consumer products to indoor air and dust.
- Leveraging the work of other boards, departments, and offices within the California Environmental Protection Agency (CalEPA) and other state agencies and leveraging our new authorities under SB 502.

The release of this document is part of our external engagement process, which helps us decide whether to conduct additional research or potentially list one or more products that contain or have the potential to generate microplastics as Priority Products. Further, this document identifies additional information needed to fill data gaps. Based on our evaluation, we are concerned about the potential for adverse impacts from exposure to microplastics in consumer products frequently used by the general public, workers, and children.

INTRODUCTION

Microplastics are generally plastics that are less than 5 millimeters (mm) in their longest dimension , and can be classified as:

- primary microplastics that are manufactured and intentionally added to products, such as microbeads in personal care products; or
- secondary microplastics that arise from the degradation of plastic products, such as plastic bags or water bottles [2].

Microplastics are persistent, mobile, and ubiquitous in the environment [3–5]. They have been detected in every ecosystem, including water, air, soil, drinking water, surface waters, stormwater, wastewater, oceans, deep ocean sediments, and on the tops of the highest mountain peaks, as well as in agricultural soil, household dust, indoor air, and foods and beverages that humans consume [3–13]. Figure 1 illustrates how microplastics are released to the environment during use and disposal of consumer products, with a focus on potential exposure routes to humans and ecosystems. Microplastics can be transported through wind, rain, runoff, wastewater effluent, and via leaching of land-applied biosolids. There is a growing global concern over the potential adverse impacts of microplastics released to the environment [8, 14–16]. Humans and animals are exposed to microplastics on a regular basis via ingestion, inhalation, and dermal routes [6, 7, 9, 17]. Microplastics have been detected in human blood, lungs, placentas, testes, breast milk, and stool samples [18–23]. Wildlife can mistake microplastics for food, which can result in survival and reproductive impairment [24]. Exposure to microplastics may cause physical stress and damage, disrupt endocrine and immune systems, and negatively impact mobility, reproduction, and development [25, 26]. Microplastics can have additional hazards depending on their polymer type, size, and shape, additives (e.g., phthalates) they contain, and chemicals they can adsorb (e.g., persistent organic pollutants) from the environment [24].

We are concerned about the adverse impacts of exposures to microplastics on the general public, pregnant people, children, workers, wildlife, and the environment. We conducted a high-level review of consumer products that contain microplastics (i.e., primary microplastics) or have the potential to release microplastics (i.e., secondary microplastics) to determine which products to prioritize for additional research. We are requesting additional information from interested parties about the potential exposure to microplastics from products, specifically those outlined in Table 1, and the resulting adverse impacts of this exposure. In addition, we are requesting information about the feasibility of eliminating or reducing the release of microplastics from consumer products. Please see the “Topics for Feedback from Interested Parties” section below for our specific topics.

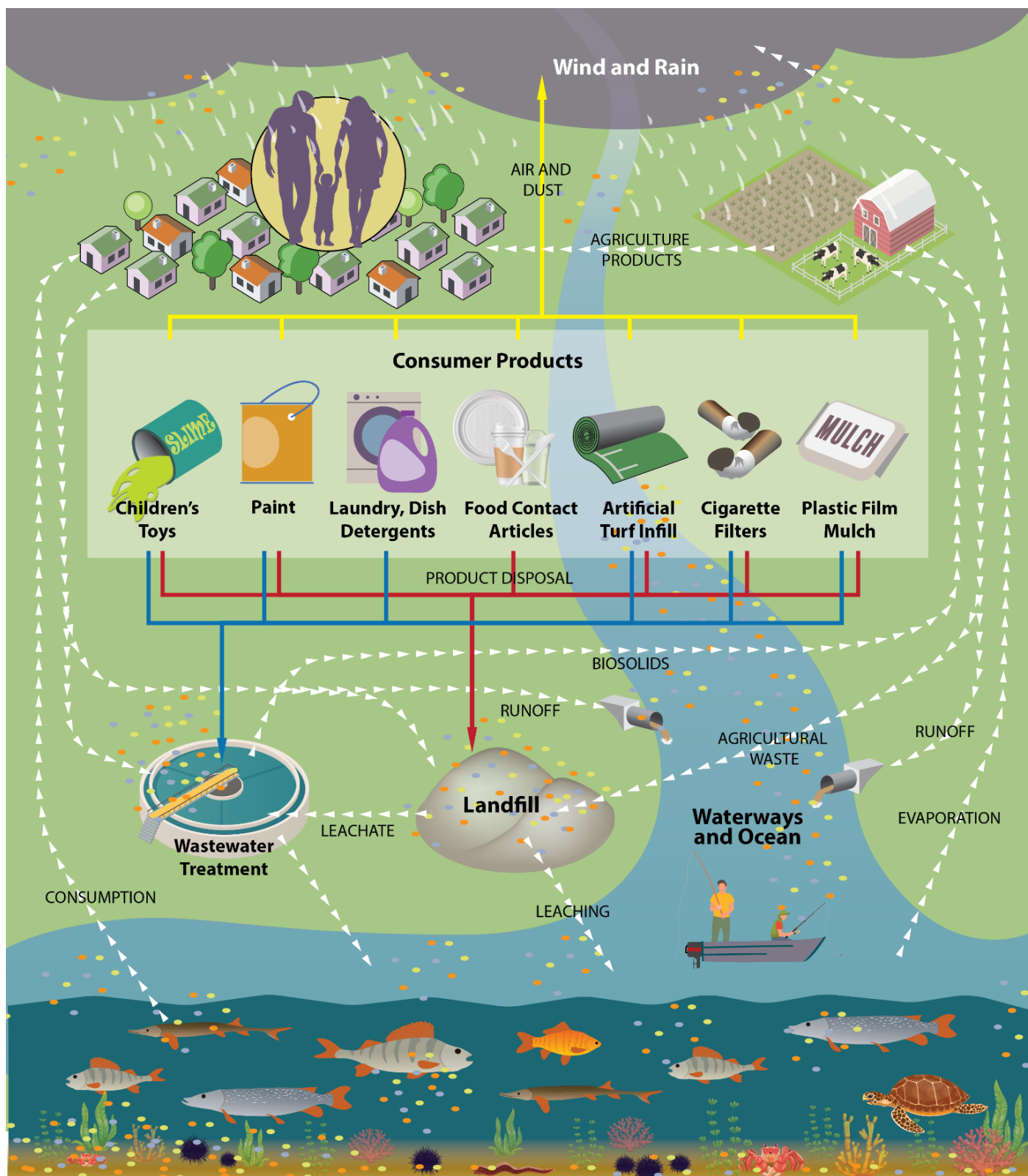


Figure 1. Conceptual model for exposure to microplastics: sources, pathways, and environmental fate. This figure focuses on the release of microplastics from certain consumer products, and it does not illustrate an exhaustive list of sources, pathways, or fate of microplastics.

PRELIMINARY SCREENING RESULTS

This document provides an overview of DTSC’s preliminary screening research results on various consumer products that contain microplastics or have the potential to release microplastics. In 2022, the Ocean Protection Council released a Statewide Microplastics Strategy to provide a multi-year roadmap for managing microplastics pollution in California [5]. Our evaluations of artificial turf infill (including infill made of used tires), detergents, paints, plastic film mulch, single-use cigarette filters, and single-use food contact articles summarized in this document align with the Statewide Microplastics Strategy [5].

Products we evaluated during our preliminary screening research are listed in Table 1.¹ The list of additional products we evaluated that we may consider for further research in the future is available in Appendix A (see Table A1).

¹ During our evaluation of plastic grocery and produce bags, a new regulation banned plastic grocery bag sales in California by 2026 [27]. We also evaluated silicone materials used for cooking and baking. However, current research showed no evidence of microplastics shedding from silicone during cooking or baking [28].

Table 1. List of products evaluated during DTSC’s preliminary screening research that contain microplastics (MPs) or have the potential to release MPs.

Product description	Type of MPs	Potential for exposure	Potential alternatives	Relevant regulations
Artificial turf infill	Primary and secondary	Humans, organisms, and ecosystems can be exposed to MPs and other chemicals released from artificial turf infill during use phase [29–32].	Sand, wood fiber, cork, coconut, walnuts, and olive cores [33–35].	EU ¹ ban on MPs infill by 2031 [36].
Children’s toys that contain primary MPs (e.g., polymer-coated toy sand, slime, putty, toy foam, and other polymer modeling materials)	Primary and secondary	These toys may contain plastic glitter or other primary MPs that can remain on hands after play. Children can be exposed to MPs when they put their fingers and toys in their mouths [37, 38].	Toy foam made from renewable cork, at-home recipes for play sand and slime, cellulose and mica as alternatives to plastic glitter, and non-plastic modeling materials [39–44].	EU banned loose plastic glitter in 2023 [45].
Cleaning Product: Intentionally added polymers in laundry and dishwashing detergents	Primary and secondary	Humans and aquatic life can be exposed to MPs during manufacturing, use, and from the accumulation of MPs in wastewater and the environment at the end of life [46, 47].	Biodegradable and function-specific alternatives, such as plant-based emulsifiers, mineral opacifiers, and non-plastic rheology modifiers are available and appear on the functional use class of the Safer Chemical Ingredients List [48].	EU ban on polymers in detergents by 2029 [36]. Proposed California (CA) regulation to ban plastic microbeads that are used as abrasives in cleaning products was unsuccessful in 2025 [49].

Product description	Type of MPs	Potential for exposure	Potential alternatives	Relevant regulations
Cleaning Product: Polymeric fragrance microcapsules in laundry detergents and fabric softeners	Primary	Humans and aquatic life can be exposed to MPs during manufacturing, use, and from the accumulation of MPs in wastewater and the environment at the end of life [46, 47].	MPs-free and biodegradable microcapsules are under development [50, 51].	EU ban on fragrance microcapsules in detergents by 2029 [36].
Cleaning Product: Water-soluble polymers in laundry and dishwashing detergents pods	Secondary	Humans and aquatic life can be exposed to MPs during manufacturing, use, and from the accumulation of MPs in wastewater and the environment at the end of life [46, 52, 53].	Non-plastic and single-use tablets [54].	Proposed New York City ban on polyvinyl alcohol use in detergent pods by 2026 [55].
Food Contact Article: Plastic baby feeding bottles	Secondary	Infants can be exposed to MPs during formula preparation and use, and MPs can be released from abrasive cleaning and heat sterilization of bottles [56, 57].	Glass, stainless steel, ceramic, and silicone bottles [58, 59].	No relevant regulations identified.
Food Contact Article: Plastic beverage bottles and caps	Secondary	Humans and wildlife can be exposed to MPs and the environment can be contaminated with MPs that shed from plastic bottles and caps during use or disposal phases [60–62].	Biodegradable plastics and re-useable bottles made of glass, ceramic, aluminum, and stainless steel [63–66].	CalRecycle ² is revising its regulations in CA [67]. EU ban on single-use plastic food packaging in restaurants by 2030 [68].

Product description	Type of MPs	Potential for exposure	Potential alternatives	Relevant regulations
Food Contact Article: Plastic cling wraps and films	Secondary	Humans can be exposed to MPs via ingestion when the material is cracked, sheared, or heated [69]. Humans and wildlife can be exposed to MPs and the environment can be contaminated with MPs at the end of life [69–71].	Emerging biodegradable materials, ceramic, and glass [72–74].	Five U.S. states have proposed regulations to prohibit polyvinyl chloride (PVC) use in food contact articles [75]. Proposed CA regulation to ban PVC in food contact articles was unsuccessful in 2024 [76].
Food Contact Article: Plastic wrappers for snacks and candy	Secondary	Humans can be exposed to MPs via ingestion and inhalation when wrappers are opened or cut [77, 78]. Non-recyclable plastic wrappers can shed MPs at the end of life [79].	Plant-based compostable materials [80, 81].	CalRecycle is revising its regulations in CA [67].
Food Contact Article: Polystyrene foam foodware	Secondary	Humans and aquatic life can be exposed to MPs and the environment can be contaminated with MPs during use and at the end of life phases [82–86].	Foodware made from potato starch, palm leaf, wood pulp, coconut, bamboo, and silver grass [87, 88].	Prohibited in CA unless recycling rates are met [89]. Banned in EU in 2021 [90].
Food Contact Article: Single-use plastic tea bags	Secondary	Humans can ingest MPs released into tea during the brewing process [91].	Cotton, paper, and biodegradable plastic tea bags, and reuseable metal strainers [92–94]	France banned non-biodegradable plastic tea bags in 2022 [95].

Product description	Type of MPs	Potential for exposure	Potential alternatives	Relevant regulations
Plastic film mulch used in agriculture	Secondary	Water, soil, and food sources can be contaminated with MPs, and soil biota (e.g., microbes) and wildlife can be exposed to MPs during installation, use, and removal of the product [96–99].	Biodegradable plastic film mulches and organic alternatives including straw, bark, leaves, cardboard, jute, bio-based sprays, sand coated in soybean oil, and wool [100–105].	The USDA ⁴ National Organic Program allows the use of conventional and biodegradable plastic film mulches with restrictive annotations for growing certified organic produce [106]. However, no biodegradable plastic film mulches currently meet USDA’s criteria [107].
Single-use cigarette filters made of cellulose acetate	Secondary	Humans, wildlife, and aquatic life can be exposed to MPs and other harmful chemicals from used cigarette filters at end of life [4, 108, 109].	Non-filtered cigarettes, biodegradable filters, and charcoal filters [110–112].	Santa Cruz County, CA ban by 2027 [114]. Proposed CA ban was unsuccessful in 2022 [115]. Proposed New York ban in 2019 [116].
Water-based interior wall paints	Primary and secondary	Drinking water and surface waters can be contaminated with MPs. Humans and aquatic life can be exposed to MPs from washing paint application tools down the drain and improper disposal of paint. MPs shed from dried paint can contaminate indoor air and household dust [117–119].	Mineral, clay, and lime paints [120, 121].	No relevant regulations identified.

¹ EU: European Union

² CalRecycle: California Department of Resources Recycling and Recovery

³ U.S. FDA: United States Food and Drug Administration

⁴ USDA: United States Department of Agriculture

NEXT STEPS

DTSC is asking interested parties to provide feedback on the topics outlined below. Written comments can be submitted via our online information management system, [CalSAFER](#). In addition, DTSC will hold a virtual public workshop on this background document. This workshop and public comment period will focus on microplastics in consumer products, with the goal of soliciting information on data gaps, availability and feasibility of alternatives, and methods to reduce microplastics exposure and pollution. This external engagement process will help inform additional research that may result in the proposal of one or more Priority Products. Further details about this workshop will be available on our [Workshops and Events Webpage](#).

TOPICS FOR FEEDBACK FROM INTERESTED PARTIES

DTSC is asking for additional information on the following topics listed below.

Artificial turf infill

- Whether manufacturers plan to phase out plastic infill in North America in addition to EU.
 - Necessity of plastic infill for certain applications and why.
 - Types of alternatives are being developed to plastic infill to meet the EU requirements.
 - Effectiveness of natural materials such as coconut husks, wood fiber, or cork as replacements for plastic infill.
 - Trade-offs (e.g., economic, functional, and performance differences) among different types of infill.
- Availability of engineering controls to prevent plastic infills from being transported into the surrounding environment or onto people.
 - Whether these engineering controls are actively in use and their effectiveness of reducing infill dispersal.
 - Whether these engineering controls are not widely used and why.
- Types of infill that are less likely to be transported into the surrounding environment.

Children's toys that contain primary microplastics

- Other children's toys that contain primary microplastics or can generate microplastics DTSC should consider evaluating.
- Available data showing human or environmental exposure to primary microplastics from children's toys (e.g., play sand, slime, putty, toy foam, and polymer clay).

Cleaning Products

a. Intentionally added and water insoluble polymers in laundry and dishwashing detergents

- Whether manufacturers plan to phase out intentionally added and water insoluble polymers from detergents from the North America market in addition to EU.
- Alternatives that are being considered to comply with the EU regulation.
- Functional uses (e.g., opacifiers, rheology modifiers, and anti-foaming agents) of intentionally added polymers in laundry and dishwashing detergents, and their concentration ranges or percentages of the product weight.

b. Polymeric fragrance microcapsules in laundry detergents and fabric softeners

- Types of polymers that are currently used for microencapsulation of fragrances in liquid and powder laundry detergents and fabric softeners.
- Alternative materials that are being developed to comply with the EU ban on polymeric fragrance microcapsules, and their effectiveness.
- Whether detergent manufacturers plan to deploy these alternatives beyond the EU market, including North America.
- To what extent the alternatives are made of natural materials and readily biodegradable under environmental conditions.
- Whether alternatives include water-soluble polymers, and if so, their effectiveness at providing long-lasting fragrance on fabrics.
- Whether scent booster beads differ from polymeric fragrance microcapsules used in detergents and fabric softeners.

c. Water-soluble polymers in laundry and dishwashing detergents

- Effectiveness of removal of polyvinyl alcohol (PVA) released from laundry and dishwashing detergents using wastewater treatment plants (WWTPs). Whether removing PVA requires secondary or tertiary treatment.
 - Behavior of PVA in WWTPs, including removal efficiency and interactions with other wastewater constituents (e.g., microfibers, chemicals, or treatment equipment).
 - Number of days typically take for PVA to achieve 60% biodegradation under the OECD 301 biodegradability test.
- Availability of non-plastic alternatives to water-soluble polymers in laundry and dishwashing detergents.

Food Contact Articles

a. Plastic baby feeding bottles

- Availability of alternatives to plastic baby feeding bottles in addition to glass, stainless steel, and silicone.
- Shedding rates of microplastics from silicone bottles compared to polypropylene or other plastics.
- Available data on concerning chemicals (e.g., siloxanes) that may leach from silicone bottles or teats.

b. Plastic beverage bottles and caps

- Challenges in replacing plastic beverage bottles and caps with non-plastic alternatives, such as glass, stainless steel, aluminum, or cardboard.
 - Limitations of available alternatives to plastic beverage bottles and caps.
 - Types of beverages that may require specific performance criteria for packaging material (e.g., acidic drinks).
- Types of coatings that are used for cardboard beverage containers. Whether there are plastic-free coatings available.
- In our review of the literature, we identified plastic packaging materials, such as polylactic acid and polyhydroxyalkanoate, that are marketed as “biodegradable.” DTSC seeks to better understand what these claims mean. For example, whether these plastics meet the ASTM D6400 standard for biodegradation (degrade within 12 weeks with a 90% biodegradation rate in 180 days under environmental conditions).
- Obstacles to using biodegradable plastics to manufacture bottle caps.

c. Plastic cling wraps and films

- Availability of non-plastic alternatives for wrapping food in grocery stores.
- To what extent foods with high fat content (e.g., cheese or meat) can absorb microplastics or other chemicals from plastic cling wraps and films.
- Availability of standard methods for testing the release of microplastics from various types of plastic films (e.g., polylactic acid or polybutylene adipate terephthalate).

d. Plastic wrappers for snacks and candy

- Availability of alternative materials to comply with CalRecycle’s SB54 proposed mandates for single-use plastic snack and candy wrappers to meet compostability or recyclability rates.
- Useability of compostable plant-based alternatives for packaging snacks and candy.
- Available studies assessing the potential for migration of chemical additives from snack and candy wrappers into food.

e. Polystyrene foam foodware

- Whether there are efforts underway to replace polystyrene foam foodware with non-plastic alternatives.
- Availability of feasible alternatives for replacing polystyrene foam foodware in the U.S. market.
- Whether plant-based foodware contains plastic components that can release microplastics.
 - Whether chemicals or treatments are applied to plant-based foodware to make them resistant to oil and water.
 - Available studies that assess the potential for migration of chemical additives from plant-based foodware into food.

f. Single-use plastic tea bags

- Whether there are functional advantages of plastic tea bags over cotton or paper tea bags.
- Whether cotton or paper tea bags contain plastic components that can release microplastics.

Plastic film mulch

- Factors that may impact microplastics shedding rates (e.g., film thickness, tensile strength, plastic type, and duration of use, etc.).
- The feasibility and effectiveness of organic alternatives (e.g., straw, bark, jute, or bio-based spray mulches, etc.).
- Whether biodegradable plastic films could be safer alternatives, including:
 - Availability of engineering controls to slow degradation rates of biodegradable plastic film mulch.
 - Challenges with switching to biodegradable plastic film mulch.

Single-use cigarette filters

- In addition to cellulose acetate, whether there are other plastics used in the manufacturing of cigarette filters.
- Availability of non-plastic alternatives to cellulose acetate cigarette filters.

Water-based interior wall paints

- Whether manufacturers are developing non-plastic alternatives to primary microplastics in paints.
 - Obstacles to replacing primary microplastics in paints.
 - Whether paints can be formulated with non-plastic alternatives to primary microplastics (e.g., mineral, clay, or chalk paints) that can provide the same performance as microplastics-based interior paints.
 - Types of paint (e.g., interior, exterior, road, or marine) that it would be feasible to switch to non-microplastics alternatives and still meet performance requirements.

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APPENDIX A: ADDITIONAL PRODUCTS EVALUATED DURING PRELIMINARY SCREENING RESEARCH

Table A1 summarizes the list of additional products that we evaluated during our preliminary screening research. These products may be considered for further research in the future. DTSC welcomes any additional information on these products.

Table A1. List of additional products evaluated during DTSC's preliminary screening research.

Product category	Product type
Agricultural products	Plastic seed coatings, coated fertilizers, greenhouse plastic sheeting, biosolids, and compost
Aquaculture and fishery products	Foamed polystyrene vessels, docks, floating devices, and fishing equipment; and ropes and nets used in aquaculture products and fisheries
Artificial turf	Artificial turf blades and backing
Beauty, personal care, and hygiene products	Leave-on personal care products (e.g., make-up, skin-care products, lipsticks, and face creams); and wet wipes that are used for personal hygiene, makeup removal, baby care, pet care, and used in healthcare and fitness settings
Building products and materials used in construction and renovation	Plastic flooring, solvent-based interior paints, and foams used in construction
Cleaning products	Toilet bowl cleaners
Furniture	Foams used in furniture and mattresses
Glitter	Glitter used in art and crafts products marketed to children, make-up, nail polish, greeting cards, and holiday decorations
Motor vehicle parts, accessories, maintenance, and repair materials	Tire wear particles and foams used in cars
Nurdles	Nurdles (i.e., pre-production pellets) used in the production of various plastic products
Personal protective equipment	Disposable face masks
Products used for floral industry	Floral foam
Synthetic textiles	Synthetic textiles used in clothing, fabric, furniture, and vehicles; and geotextiles used in construction
Toys	Balloons and children's toys that can generate secondary microplastics