

SECTION 2 Program Description

The City is proposing the Program to reduce the volume of single-use plastics and related items in the City’s waste stream and reduce environmental and human health impacts of single-use plastics. The Program would include City actions and policies that can be defined as upstream measures to reduce or eliminate the use of single-use plastics and products in the City’s waste stream and downstream measures to expand the City’s ability to manage reuse, recycling, and composting of alternative materials in order to support reusable products. Upstream and downstream measures are described in Section 2.2 and 2.3, respectively. Figure 2.2-1 illustrates the different measures categories and the individual Program elements within each category.

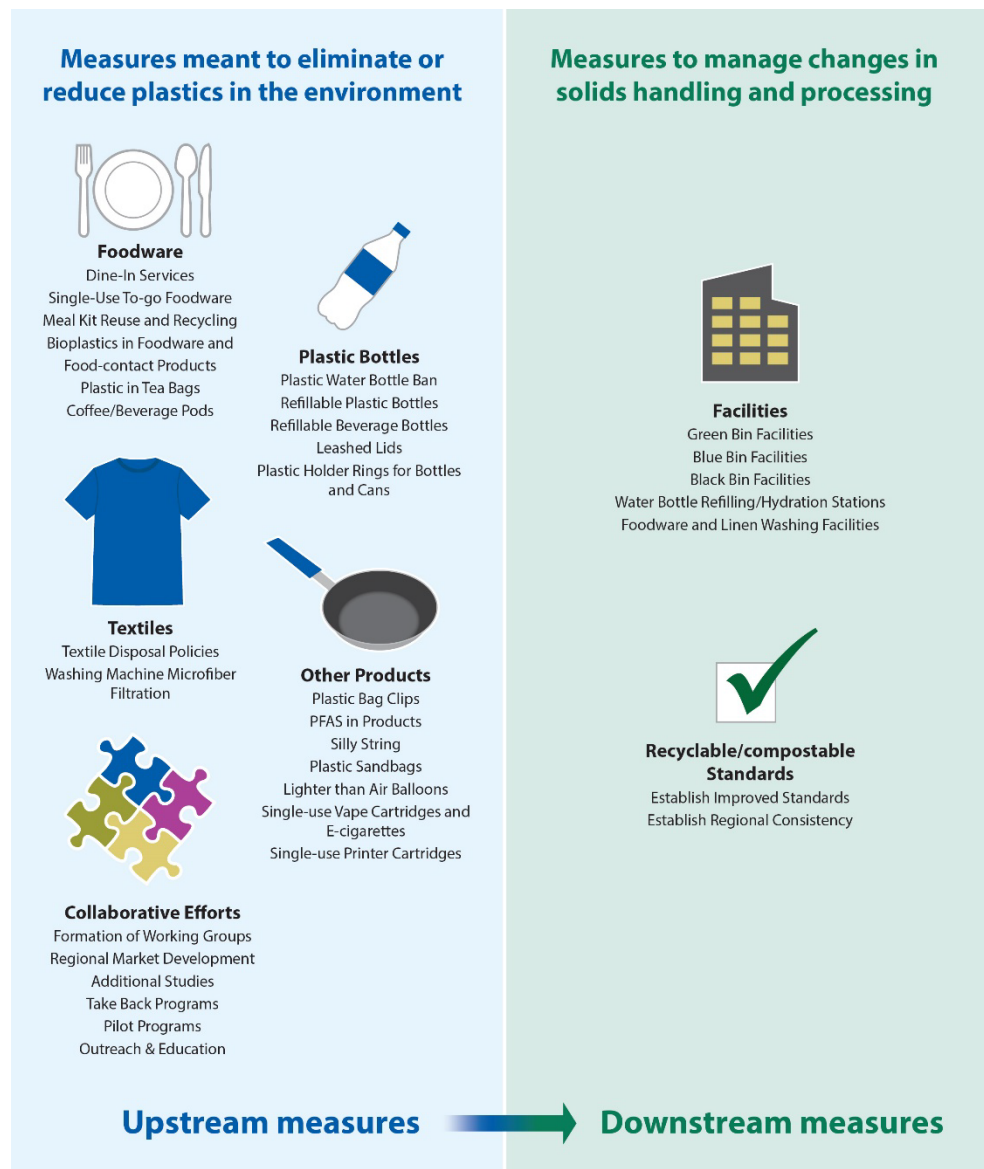


Figure 2.1-1. Overview of Comprehensive Plastics Reduction Program Measures

2.1 Program Location

Implementation of the Program would occur throughout the entirety of the incorporated City of Los Angeles, which encompasses approximately 469 square miles, stretching from the Angeles National Forest to the north to the Pacific Ocean to the south (Figure 2.1-2).

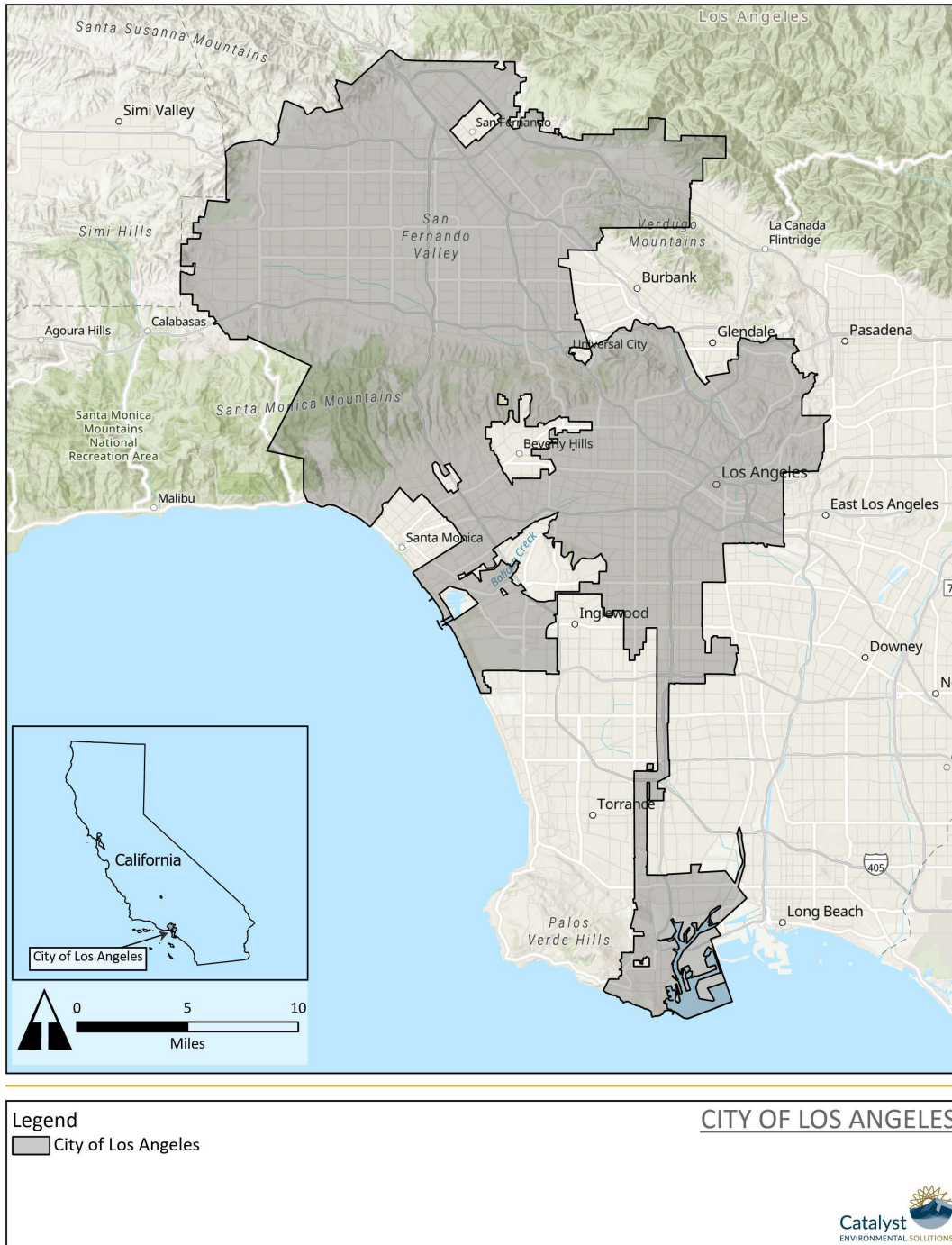


Figure 2.1-2. Program Location

2.2 Upstream Measures

The City may implement various measures to reduce or eliminate the use of single-use products within the City. These measures fall into the following categories and are described in detail herein (see also Figure 2.1-1 and Table 2.2-1):

- Plastic Bottle Policies
- Foodware Policies
- Textile Policies
- PFAS
- Additional Products
- Formation of Working Groups and Additional Studies
- Outreach and Education

The policies proposed include bans on particular products and materials, requirements for alternative materials use, and requirements for EPR programs. EPR is a policy approach that places the responsibility for the end-of-life management of a product, including its packaging and waste, on the producers or manufacturers. It also implies extended consumer responsibility, because it requires the active and correct participation of consumers for success, and in some cases including fees paid by consumers. Working together, the goal is to create a more circular economy by incentivizing producers to adopt more sustainable practices in the design, production, and end-of-life management of their products that minimize the volume of material that is landfilled, and supporting the behavioral changes and financial contributions needed for active participation by consumers.

In this section, each general upstream measure category contains all related specific Program elements (Figure 2.1-1 and Table 2.2-1), organized as follows: 1) description of the proposed measure and 2) rationale for the proposed measure, including relevant background information and context.

Table 2.2-1. Overview of Upstream Measures

Upstream Measure Policy Category	Associated Elements
Plastic Bottles	Single-use plastic water bottles Refillable plastic bottles Refillable beverage bottles Leashed lids on single-use plastic bottles Single-use plastic beverage holder rings
Foodware	Dine-in services Single-use to-go foodware Meal kit reuse and recycling Plastic tea bags Coffee/beverage pods Bioplastics ban City reusable foodware pilot projects
Textiles	Textile disposal policies Washing machine microfiber filtration
PFAS	--
Additional Products	Plastic bag clips Aerosol string (Stilly String™) Plastic sandbags Lighter-than-air balloons Single-use e-cigarettes Single-use printer cartridges
Working Group and Additional Studies	Zero waste in food or beverage facilities EPR program support
Outreach and Education	--

2.2.1 Plastic Bottle Policies

2.2.1.1 Single-Use Plastic Water Bottle Ban

2.2.1.1.1 Proposed Measure(s)

The City may consider prohibiting the distribution, offer, provision, and sale of water⁹ in plastic bottles in the City, unless the bottles are considered reusable or refillable¹⁰ by the consumer, the vendor, or the manufacturer.

⁹ Pre-packaged water includes purified water or mineral water.

¹⁰ Per SB 54 “reusable” or “refillable” or “reuse” or “refill,” in regard to packaging or food service ware, means either of the following:

(2) For packaging or food service ware that is reused or refilled by a consumer, it satisfies all of the following:

The City may also consider implementing strategies to develop more drinking fountains and water bottle filling stations throughout the City (see Section 2.3.4 for a description of these stations). To assist City residents and visitors in locating these existing and new facilities, the City may publish online, via City websites and/or a mobile app, a map of all publicly accessible water fountains. The City may provide information such as a list of the fountains, with addresses and hours of public accessibility, and which locations have bottle fillers.

2.2.1.1.2 Rationale for Proposed Measure(s)

Single-use plastic water bottles have become ubiquitous due to their ease of use, transport, and availability: approximately 1 million plastic bottles are sold globally every minute (United Nations University 2023). Plastic bottles have been one of the top ten items collected on California beaches during the California Coastal Commission’s Cleanup Day, since the cleanups began in 1988 (California Coastal Commission 2020) and were the third-most collected item worldwide during Ocean Conservancy’s beach cleanups in 2021 (Ocean Conservancy 2022). It is estimated that in 2006, producing water bottles for American consumption required the equivalent of more than 17 million barrels of oil, not including energy for transportation; bottling water produced more than 2.5 million tons of carbon dioxide; and it took 3 liters of water to produce 1 liter of bottled water (Pacific Institute 2006). Bottled water is also very expensive: Los Angeles Department of Water and Power supplied approximately 160 billion gallons of clean water to 4 million people in the City in 2018, for less than half a penny per gallon. In comparison, the cost of bottled water is approximately \$1.22 a gallon, almost 250 times more expensive than municipal tap water.

In 2018, the recycling rate of PET bottles and jars in the U.S. was 29.1% (USEPA 2023). When these bottles are recycled, the recycled material is used to produce textile polyester fibers as well as packaging, with bottle-to-bottle recycling increasing (Welle 2011).

There have already been several bans on single-use plastic water bottles in both Los Angeles and San Francisco. In 2014, San Francisco became the first major U.S. city to ban the sale of plastic water bottles on city-owned property, including San Francisco International Airport. The ban targeted events and vending machines on city property, aiming to reduce plastic waste generated at these public gathering places. In 2019, Los Angeles World Airports (LAWA) adopted a Sustainability Action Plan that called for phasing out the sale and provision of single-use plastic water bottles and development of a zero waste plan for LAWA. Since then, LAWA has adopted such a policy, which took effect on June 30, 2023. In 2022, the Los Angeles City Council passed the Zero Waste at City Facilities and Events Ordinance, which bans Contractors from providing water in plastic bottles or in disposable cups and requires them to provide hydration or bottle refilling stations.

A ban on single-use plastic water bottles would support the adoption of reusable alternatives, such as refillable water bottles made from materials such as stainless steel, glass, ceramic, paper cartons/boxes, aluminum bottles and cans or durable polycarbonate plastics. Single-use alternatives to single-use

(A) Explicitly designed and marketed to be utilized multiple times for the same product.

(B) Designed for durability to function properly in its original condition for multiple uses.

(C) Supported by adequate and convenient availability of and retail infrastructure for bulk or large format packaging that may be refilled to ensure the packaging or food service ware can be conveniently and safely reused or refilled by the consumer multiple times.

plastic water bottles include materials that may or may not be recyclable, such as cardboard boxes/cartons, aluminum cans, glass bottles, and pouches, which can be made from a variety of materials including plastic films, aluminum foil, PET, and PP.

2.2.1.2 Refillable Plastic Bottles

2.2.1.2.1 Proposed Measure(s)

The City may consider requiring that 25% of all plastic bottles and jugs sold in full-line supermarkets and certain grocery stores¹¹ be refillable by a certain implementation date. This measure would include those plastic bottles and plastic jugs that are used as packaging for beverages of all types, fresh and prepared food, personal care products, and home care products.

The City may also consider requiring regulated supermarkets and grocery stores to establish a “refill convenience zone”, which must contain a facility at which plastic bottles can be refilled with the purchased product (e.g., detergent, cleaning fluids, lotions, etc.). These facilities would be located within existing retail establishments or within a new retail establishment.

2.2.1.2.2 Rationale for Proposed Measure(s)

An estimated 12 billion plastic bottles containing home care products, personal care products, and beverages other than water are sold every year in California, and more than one-quarter of these (i.e., over 3 billion bottles) are not recycled but end up as trash or litter (Packaging Strategies 2020).

For refillable systems to be successful, consumer, supplier, and retailer coordination is necessary. A refill convenience zone requires a physical dispensing point for consumers. Many forms of bulk dispensing can already be found in dry goods sections of supermarkets. These “refill zones” would be located within existing grocery stores or new storefronts that would exist regardless of this specific measure. The proposed measure applies to certain grocery stores; as such it is not reasonably foreseeable that stand-alone new facilities would also be constructed to only provide refill capacity required under this measure. However, it is possible that economic forces in the future could lead to the development of such new stand-alone refill facilities, but this is speculative and outside the scope of this measure. Components of refill zones include the following:

- Dispensing Stations: Suppliers and manufacturers of branded goods may have their own bulk packaging and dispensers. Gravity fed dispensers are common for dry goods, while pump-based dispensers may be used for liquids.
- Containers: Customers may bring their own suitable reusable containers or bags, and refillable containers available for purchase are necessary for those who are buying products for the first time.
- Weighing/Labeling: Refilled goods are typically measured by weight, with scales and printers in the refill zones for customers to record product information and amount.

¹¹ Mandate would apply to a full-line supermarket. A full-line supermarket is one that sells dry groceries, canned goods, or non-food items and perishable items and has annual revenue ≥ \$2 million, and grocery stores with facilities ≥ 10,000 square feet.

2.2.1.3 Refillable Beverage Bottles

2.2.1.3.1 Proposed Measure(s)

The City may consider requiring that 10% of all beverage bottles sold in full-line supermarkets and certain grocery stores¹² be refillable by a certain implementation date. For this policy, the City may also require that 10% of all beverage bottles filled in beverage bottling plants within the City be refillable by the established implementation date. Refill facilities would primarily be located within existing establishments under the assumption that existing beverage filling plants have the ability to support reuse through modernization and investment in “swing line” bottling infrastructure that provides operational flexibility between single-use and reuse bottling lines.

2.2.1.3.2 Rationale for Proposed Measure(s)

A study completed by the non-governmental organization Oceana estimates that a 10% increase in the share of soft drink beverages sold in refillable bottles could decrease marine plastic pollution by up to 22% (Schroerer et al. 2020). With its location adjacent to the Pacific Ocean and heavy tourist industry reliant on access to clean beaches, the City is interested in measures that could decrease marine pollution.

Refillable bottles are multiple-use bottles, made of glass, plastic, or aluminum, which are owned by beverage companies and returned by customers, and then cleaned, re-labeled, refilled, and sold again. Beverage companies report that they use refillable glass bottles up to 50 times and refillable PET bottles up to 20 times before they are retired and recycled (Schroerer et al. 2020). A “return on the go” refill system is described below:

- Step 1: Consumers buy beverages in refillable bottles from grocery stores, supermarkets, convenience stores, etc.
- Step 2: After drinking the bottles’ contents, consumers return the bottles to the shop where they bought them or another location. Drop-off points can be integrated into existing infrastructure (e.g., in grocery stores), or through new third-party systems.
- Step 3: Once the bottles are returned, the retailers store the bottles until they are picked up by the local bottlers or third-party firms. These bottles are delivered back to a centralized location where they are sorted, washed, and put back into the manufacturing process. Transportation and cleaning efficiency are determining factors for the overall environmental performance of refillable materials (Ellen McArthur Foundation 2019; Zero Waste Europe [ZWE] 2020).

Benefits of refill/reuse models include the following:

- Potential cost reductions: At scale, well-designed and successful reuse models may offer significant cost savings for manufacturers and drive efficiency in the supply chain. Passing cost savings on to consumers helps to incentivize customers to adopt reuse, while maintaining profit margins for manufacturers.

¹² Mandate would apply to a full-line supermarket. A full-line supermarket is one that sells dry groceries, canned goods, or non-food items and perishable items and has annual revenue ≥ \$2 million, and grocery stores with facilities ≥ 10,000 square feet.

- Stronger customer relationships: Subscription schemes for reuse create long-term customer relationships and boost brand loyalty and customer retention. Brand loyalty is carried out through potential deposit and reward schemes, and collection data directly informs businesses on effective practices.
- Lower emissions and plastic pollution: When well implemented, reusable packaging may reduce GHG emissions and plastic pollution compared to single-use plastic packaging. For example, reuse schemes can decrease life cycle emissions by 70% when compared to single-use plastic products (ZWE 2020).

Refillable systems show empty bottle return rates up to 95% (Schroerer et al. 2020). The “return on the go” model of refillable systems are successful in part due to deposit return schemes in which consumers pay a deposit per bottle for the first bottle or bottles they buy, and the deposit is paid back when the empty bottles are returned. Accordingly, under this policy, customers are assumed to be incentivized to return the reusable bottles through deposit return schemes. Once the bottles are returned, the retailers would store the bottles until they are picked up by the local bottlers or outside transport companies working with them. These bottles would be delivered back to the plant where they are sorted, washed, refilled, and transported to distribution centers or retailers.

2.2.1.4 Leashed Lids on Single-Use Plastic Beverage Bottles

2.2.1.4.1 Proposed Measure(s)

To reduce the number of bottle caps and plastic lids littered and ensure that the caps and plastic bottles are collected and recycled together, the City may require that all lids on plastic beverage bottles sold within the City be leashed (i.e., attached) to the bottle.

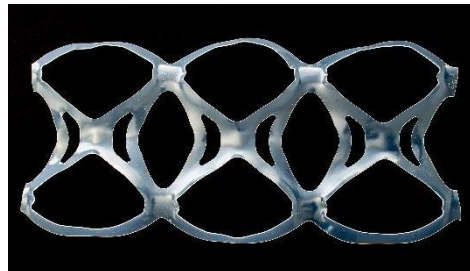
2.2.1.4.2 Rationale for Proposed Measure(s)

Plastic bottle caps and lids are commonly made of HDPE (resin identification code 2) or PP (resin identification code 5), both of which are recyclable within the City. However, bottle caps and lids are commonly littered items. Bottle caps and lids have been the third-most collected item on California beaches during the California Coastal Commission’s Cleanup Day, since the cleanups began in 1988, accounting for over 9% of all debris/litter collected (California Coastal Commission 2019). Plastic bottle caps were the fifth-most collected item during the Ocean Conservancy’s coastal cleanups worldwide in 2022 (Ocean Conservancy 2022). Plastic beverage bottle makers are already manufacturing bottles with leashed lids to meet the European Union’s Single-Use Plastics Directive, which states that single-use plastic bottles that “have caps and lids made of plastic may be placed on the market only if the caps and lids remain attached to the containers during the products’ intended use stage,” beginning in 2024 (European Union 2019).

2.2.1.5 Single-use Plastic Beverage Holder Rings

2.2.1.5.1 Proposed Measure(s)

The City may ban the manufacture, distribution, offer, provision, and sale of non-recyclable, plastic single-use beverage holder rings.



2.2.1.5.2 Rationale for Proposed Measure(s)

Single-use plastic beverage holder rings are commonly made of LDPE (resin identification code 4) and are not recyclable within the City. The USEPA requires that all plastic ring carriers be degradable according to certain testing requirements (Title 40, Code of Federal Regulations [CFR] Part 238¹³). However, the rings may take months to degrade when improperly littered and degrade into microplastics.

Alternatives to single-use plastic beverage holder rings include plastic circular handles/carriers that snap onto the top of cans. These products are often made of HDPE (resin identification code 2), which is recyclable within the City. These carriers are also reusable. Other alternative products are made with unbleached plant fibers that are compostable and paperboard/cardboard that are recyclable in the City.

2.2.2 Foodware Policies

2.2.2.1 Dine-in Services

2.2.2.1.1 Proposed Measure(s)

The City may require all food or beverage establishments to provide only reusable foodware, including but not limited to straws, cups, bowls, plates, utensils, and beverage containers, for all dine-in consumption.¹⁴ Condiments shall be available only via “bulk dispensers” or reusable containers and not individual disposable condiment packets/containers of any type. All disposable napkins provided to customers shall be made of unbleached paper with at least 60% post-consumer recycled content.

2.2.2.1.2 Rationale for Proposed Measure(s)

Single-use foodware items are not necessary for dine-in meals, contribute unnecessarily to the waste stream, and often cannot be recycled. They are also frequently littered: food wrappers and containers as well as cups, plates, and utensils have been the second- and fifth-most collected items, respectively, on California beaches during the California Coastal Commission’s Cleanup Day, since the cleanups began in 1988 (California Coastal Commission 2019).

¹³ The USEPA defines a “Ring carrier” as a plastic ring carrier device that contains at least one hole greater than 1 ¾ inches in diameter which is made, used, or designed for the purpose of packaging, transporting, or carrying multi packaged cans or bottles.

¹⁴ Ordinance 2022-0016, adopted by the Los Angeles County Board of Supervisors on April 19, 2022, amended Title 12 – Environmental Protection, Chapter 12.86 of the Los Angeles County code to enact various single-use plastic and EPS bans. It also requires full-service restaurants to use reusable foodware for dine-in customers.

Reusable/durable substitute products are made from a variety of materials including durable plastics, metals (e.g., stainless steel), ceramic, wood, stoneware, and glass. Each restaurant would be free to choose the specific reusable alternative materials to single-use foodware products, and it is anticipated restaurants would choose alternatives based on the following factors:

- Type(s) of food that the restaurant provides;
- Specific product (foodware, foodware accessory, etc.) to be substituted;
- Availability of and ease of access to specific replacement products; and
- Cost.

The requirement for restaurants to provide reusable foodware for dine-in services would necessitate that restaurants have the ability to wash and sanitize the foodware in accordance with California Health and Safety Code Section 114099. It is assumed that most restaurants other than fast food establishments already provide reusable foodware or a mix of reusable and single-use foodware and therefore already have the required washing equipment on site. For example, in a recent survey, 76% of Seattle, Washington restaurants had a commercial dishwasher onsite (Winsten et al. 2021). In 2017, approximately 40% (9,571) of restaurants in Los Angeles County were classified as “quick service” (Gase 2019). It is assumed that some of these restaurants located in the City may need to install commercial dishwashers or the three-sink system to wash reusable dishes.

2.2.2.2 City Reusable Foodware Pilot Projects

LASAN currently has a Reusable Foodware Microgrant Program that provides financial support to eligible food service establishments within the City to assist with the purchase of washable, durable, reusable foodware. With a priority on Clean Up Green Up community businesses, LASAN aims to provide equitable access to funding for those businesses to reduce pollution and improve their operations. Restaurants and other businesses in different parts of the City are welcome to apply and may receive some assistance. Applications will be accepted through April 2024 or until funds are exhausted. The City may consider establishing other pilot programs to assist in reducing plastic pollution, primarily by replacing single-use foodware with reusable products.

2.2.2.3 Single-Use To-go Foodware

2.2.2.3.1 Proposed Measure(s)

Single use foodware and foodware accessories often end up as trash or litter in the City. To reduce the input of these products into the City’s landfills and the environment, the City may consider requiring food or beverage facilities to do the following for to-go foodware and foodware accessories:

- Distribute, offer, provide, and sell only single-use to-go foodware (cups, lids, plates, bowls, utensils, containers) that are recyclable or compostable within the City.
- Food or beverage facilities that offer single-use to-go and delivery foodware must also provide returnable, reusable to-go and delivery foodware, and the returnable, reusable foodware must constitute 50% of all to-go and delivery foodware that is provided to customers by a certain implementation date.

- Distribute, offer, provide, and sell only single-use to-go foodware (cups, lids, plates, bowls, utensils, containers) that contain a minimum of 30% post-consumer recycled content.

2.2.2.3.2 Rationale for Proposed Measure(s)

There are numerous recyclable and compostable to-go foodware products that can be used to replace plastic to-go foodware products. Compostable alternatives include fiber or paperboard (cardboard) made from tree fiber (virgin or recycled); compostable plant fibers made of the refuse of corn, potatoes, rice, and other starch materials, such as bagasse products; wood; bamboo; and palm leaf. Recyclable to-go foodware includes PET or PP (resin identification codes 1 and 5, excluding any black plastics or films); metals, including aluminum and tin, and glass (LASAN 2023a). Reusable and durable substitute products for to-go and delivery foodware are made from a variety of materials including durable plastics, metals (e.g., stainless steel), ceramic, wood, stoneware, and glass.

A product made from post-consumer content is made from products that were purchased, used, and then recycled by a consumer. The recovered material (e.g., plastic water bottles, aluminum cans, paper) becomes feedstock for new products. Foodware with post-consumer content can be made from certain plastics, mostly resin identification codes 1, 2, and 5, aluminum, and paper/cardboard. Post-consumer content raw material degrades during each recycling and remanufacturing process. Therefore, most products are a combination of post-consumer content and virgin materials.

The City anticipates that the requirement to provide reusable to-go and delivery foodware would lead individual food and beverage facilities to create their own reusable foodware take-back programs or to the development of multi-facility (i.e., numerous food or beverage facilities developing a system to be shared across vendors) or third party take-back programs. Some food or beverage facilities may need to install commercial dishwashers or the three-sink system to be able to wash reusable dishes in accordance with California Health and Safety Code (CHSC) Section 114099.

2.2.2.4 Meal Kit Reuse and Recycling

2.2.2.4.1 Proposed Measure(s)

The City may prohibit the sale of delivery meal kits in the City unless the meal kit manufacturers or providers establish and fund take-back or reuse programs for the non-recyclable components of their meal kits, including but not limited to, gel or ice packs and insulating materials. The take-back and reuse programs would be required to be designed and approved by organization(s) with take-back or EPR expertise.

2.2.2.4.2 Rationale for Proposed Measure(s)

Meal kits are pre-portioned, individually packaged ingredient boxes delivered to customer homes. Meal kits offer convenience in meal curation and preparation time, with a marketed advantage of low food waste. However, because meal kits contain perishable items (including dairy and meat), necessary temperature-regulating packaging (gel packs) can result in high levels of related packaging waste.

Food waste occurs at every stage of the value chain and can greatly alter the overall impact of any meal, and this fluctuation is evident in the comparative literature between grocery stores and meal kit deliveries. Retail and consumption stages of domestic food production included 56 million metric tons of

food waste in 2016. Since 1960, food waste levels have tripled in the U.S. (USEPA 2021). Meal kits, because of the pre-portioned sizes, may reduce food waste (Schuster 2022).

Home delivery meal kits contain significant amounts of packaging, much of which is not recyclable, including the following:

- Freezer packs in meal kits are typically made from a superabsorbent polymer sodium polyacrylate. Superabsorbent polymers do not readily degrade in the environment but are not shown to bioaccumulate (HERA Project 2014). Sodium polyacrylate has a high potential to clog drains and sewers.
- Insulation and liners support a critical need for meal kit deliveries to stay at food-safe temperatures during delivery. Corrugated liners, honeycombed paperboard, denim fill (#60 cotton) and insulation panels such as ClimaCell, a cellulose-based foam, have all been introduced as alternatives to polystyrene or other insulating materials that line a meal kit box. EPS foam is an inexpensive insulator/liner, but due to environmental concerns is increasingly replaced with fiber-based alternatives. Meal kit companies also may use reflective insulation in meal kits, this includes metallic bubble wrap: a multi-layer combination of plastic films (typically PET) and aluminum foil or another reflective layer. The addition of a thin metal layer can make recycling metallic bubble wrap difficult, as separating different layers of material may only be done in specialized recycling facilities. This product type is not recyclable in the City.
- Plastic film and bags made from LDPE (resin identification code 4) are not accepted in City recycling.
- Small plastic items (bottles, lids less than 3 inches in size) include containers and jars typically made of PET (resin identification code 1) and lids made from PP (resin identification code 5); these plastic types are among the materials accepted in the City’s recycling system. However, due to the smaller sizes of single-serving ingredient packaging found in kit meals, plastic elements (bottles, lids, spice bags) under 3 inches can be difficult to capture in MRFs, regardless of plastic type.

2.2.2.5 Plastic Tea Bags

2.2.2.5.1 Proposed Measure(s)

To reduce exposure of people to microplastics, and eventual deposition of microplastics in wastewater, the City may prohibit the distribution, offer, provision, and sale of tea bags constructed of, or containing, plastic components.

2.2.2.5.2 Rationale for Proposed Measure(s)

Tea bags can be made of a variety of materials including filter paper, food-grade plastic, cotton, or silk. Paper tea bags are made from wood and vegetable fibers including wood pulps, abaca plant fibers, which come from a species of banana (sometimes referred to as Manila hemp), and hemp. Plastic tea bags can be made of nylon, PET, and the bioplastic polylactic acid (PLA). Some tea bags are reusable, made of materials such as muslin cotton, and allow consumers to refill and adjust the amount of tea leaves used.

Many tea brands use a heat-sealing process to seal individual tea bags. This can be done using a conventional plastic, e.g., PP, or a bioplastic, PLA. Tea bags that are heat-sealed using conventional

plastic or bioplastic would not be allowable under the Program, as they consist of plastic components. Other methods used to seal tea bags, which do not require conventional or bioplastic, include sewing them shut using string, which is often made of organic cotton, or closing them using a metal staple.

The packaging of individual tea bags can also vary. Tea bags are often packaged within a sealed envelope, often lined or containing a small amount of plastic which is used in the sealing process. Some tea brands do not package the individual tea bags in envelopes but will package the entire box of tea bags in a plastic film. Other packaging options include using metal tins to seal the individual tea bags inside. These packaging materials separate from the tea bags themselves, are not considered in this analysis. The Program would only apply to the individual tea bags, which consumers steep in hot water.

Currently, the City allows tea bags to be disposed of in green bins for compost, with several restrictions. Tea bags are accepted if they are paper-based and have a cotton string, including the attached paper tag. Any staples used to attach paper tags to strings need to be removed prior to composting. If the tea bag is made of plastic mesh, then it would not be allowed in the City green bins. Additionally, any adhesives used to heat seal paper tea bags need to be cut off prior to composting. The tea bag wrapper can also be placed in the green bin if it is made of paper.

According to several studies, steeping plastic tea bags releases large amounts of plastic particles into a cup of tea. One study found that plastic tea bags, made from nylon and PET, leach up to 3.1 billion nanoplastics and 11.6 billion microplastics into a single cup of the beverage. These levels are several orders of magnitude higher than plastic loads reported in other foods (Hernandez et al. 2019).

Many tea brands that advertise that their tea bags do not contain plastic sell tea bags that are made from PLA or use PLA in the sealing process for the tea bags. PLA would not be an acceptable replacement product under the Program. Replacement materials for plastic in tea bags under the Program could include paper (wood and vegetable fibers) and cotton. Additionally, loose leaf tea and a reusable diffuser could be used in the place of plastic tea bags.

2.2.2.6 Beverage Pods

2.2.2.6.1 Proposed Measure(s)

The City may prohibit the distribution, offer, provision, and sale of single-use plastic beverage pods, also referred to as capsules, unless the manufacturers and/or providers have a take-back, recycling, or reuse program.



2.2.2.6.2 Rationale for Proposed Measure(s)

According to market research, in 2020, 35% of U.S. households owned single-serve beverage pod machines (Lazarevic 2023). Beverage pods are available in a range of designs and materials. Specifically, coffee pods are constructed to be impervious to oxygen, as coffee spoils once exposed to air. This necessitates designing and sealing a coffee container for a longer shelf life and can present a challenge for suitable replacement materials.

Single-use beverage pods are made from a combination of plastics (usually PP), aluminum, or materials advertised as compostable such as paper and bioplastics. Many of the components of coffee pods, based on materials of individual components alone, are recyclable. However, due to the difficulty in

separating the different materials from the spent coffee grounds, and the current inability for MRFs to process the pods, regardless of material, single-use beverage pods end up in landfills from the City's waste stream. Despite recyclability claims made by producers of beverage pods, most MRFs are not equipped to sort items smaller than 3 inches and therefore are not separated to a recycling stream.

Lack of convenience is also a barrier to effective beverage pod capture and recycling. Typically, users do not empty out the spent coffee grounds from the pod but may still place it in the recycling bin, which can contaminate surrounding clean recyclable materials. The continued need to separate the components that make up the pod represents one of the main challenges of coffee pod disposal (Marinello 2021).

Single-use beverage pods that are advertised as compostable are made of a bioplastic ring and typically a mesh style pod that holds the grounds. They are not compostable within the City and are within the definition of plastic used for this analysis.

Aluminum is used in both single-use beverage pods and more durable refillable beverage pods. Single-use aluminum capsules may have plastic lining and have a foil lid. Aluminum is 100% impervious to oxygen, making it a desirable material to seal coffee pods for a longer shelf life. It is also, theoretically, an infinitely recyclable material. In the recycling process, these pods, despite being made from aluminum, still require a process by which plastic components need to be removed from the metal.

Reusable pods are made from durable plastics or aluminum and are meant to be filled individually with fresh coffee grounds purchased separately by the user and are therefore not included in this measure.

Because traditional recycling pathways for beverage pods are unrealistic given the state of municipal recycling capabilities throughout the U.S., the establishment of an EPR program for plastic beverage pods would create an opportunity for plastic beverage pods to avoid being landfilled. EPR programs for beverage pods may establish mail in-options, drop-off points within existing infrastructure (like grocery stores), or separate collection points operated individually or collectively.

2.2.2.7 Bioplastics Ban

2.2.2.7.1 Proposed Measure(s)

The City may prohibit the distribution, offer, provision, rental, and sale of single-use foodware and food-contact products made partially or wholly from bioplastics.

2.2.2.7.2 Rationale for Proposed Measure(s)

Bioplastics are plastics that are made wholly or in part from a non-petroleum, renewable biomass source, such as sugarcane and corn. Many of these products are advertised as biodegradable, compostable, and/or recyclable, but these products are not compostable or recyclable within the City. The term 'bioplastic' refers to either the bio-based origin of a plastic or the biodegradable character of a plastic, which are not the same (Van den Oever et al. 2017):

- Bio-based: product that is wholly or partly derived from biomass, which is a material of biological origin, excluding material embedded in geological formations or fossilized.

- Biodegradable: materials that can be broken down by microorganisms, bacteria or fungi, into water, naturally-occurring gases like carbon dioxide and methane, and biomass. The biodegradability of a material depends on environmental conditions, including temperature and presence of microorganisms, oxygen, and water. The biodegradability of a plastic product varies depending on the environment (Van den Oever et al. 2017).

Bioplastics are one of several major categories of materials that can be used to manufacture foodware that is marketed as compostable. The most common bioplastic used in foodware and food-contact products is PLA, which comprised over 20% of global production of bioplastics in 2022 (European Bioplastics 2023). PLA is made via the fermentation of a carbohydrate (e.g., sugarcane) by bacteria. Other bioplastics include the following materials: bio-based polyethylene, bio-based PET, bio-based polytrimethylene terephthalate, bio-based PP, PHA, polybutylene succinate, starch blends, and polybutylene adipate terephthalate. Bioplastics can be used to make entire products (e.g., clear drinking cups that can be almost indistinguishable from some traditional plastics, like PET) or in combination with other materials (e.g., a PLA coating inside of a paper cup) (UCLA Luskin Center 2020).

PHA is a type of bioplastic made by bacteria and microorganisms from organic materials. PHB is the most common type of PHA bioplastic. PHB is a biocompatible¹⁵ and non-toxic polymer that is biosynthesized and accumulated by a number of specialized bacterial strains (McAdam et al. 2020). PHB can be produced by many different microorganisms, with the most common based on bacterial fermentation by heterotrophs, or organisms that consume other plants or animals for energy (non-primary producing). PHB can also be produced using cyanobacteria, which are photosynthetic bacteria known as blue-green algae, instead of microorganisms. Cyanobacteria can synthesize PHB from the inputs of carbon dioxide (CO₂) and sunlight and do not require organic carbon sources. Cyanobacteria also do not require agricultural land to produce feedstock like PLA bioplastics (Rueda et al. 2023). A characteristic of PHB material is its biodegradability, which occurs within a reasonable timescale when in contact with degrading microorganisms in biologically active environments like soils, fresh water, and aerobic and anaerobic composting (McAdam et al. 2020)¹⁶.

Bioplastic products can be certified as commercially compostable (i.e., compostable in an industrial facility) as well as home compostable¹⁷. However, bioplastics cannot be composted or recycled at City-contracted facilities, and therefore, all bioplastics regardless of certifications, end up in the City's waste stream.

¹⁵ This term refers to the ability of a material to be compatible with living organisms, and is used when evaluating materials that do not cause any adverse effect when they come into contact with living organisms, such as proteins, biological cells, and tissues.

¹⁶ During scoping, Newlight Technologies, Inc., a California-based manufacturer of PHB, identified that PHB is “a compostable polymer, it is natural, home compostable, and does not persist in the environment.”

¹⁷ PLA/PHB-blend samples degraded fully under at home-composting conditions, which were simulated at 28°C degrees Celsius (Fogašová et al. 2022). The ASTM has standards for commercially compostable products and the Biodegradable Products Institute is a third party that certifies commercial compostability of products, but no equivalent for home compost standards has been established in the U.S. TUV AUSTRIA has a certification for at home compost (OK compost HOME) which is based on several standards, including Australia's AS 5810 (2010), France's NF T 51800 (2015), and Europe's prEN 17427 (2020) (TUV Austria 2023). The TUV OK compost HOME signifies that a product is certified to compost in a home compost environment in under a year.

Bioplastics can pollute plastic recycling streams because they can be hard to tell apart from conventional plastics (UNEP 2021). For example, PET has a relatively high recycling rate, and many PLA products are difficult to distinguish from PET. This document does not take into account any at-home composting done by individuals.

It is anticipated that replacement products for single-use bioplastic foodware and food-contact products would include reusable products as well as products that could be composted or recycled at City-contracted facilities, which could include a variety of replacement product materials. Additionally, reusable foodware made of bioplastic could also be a replacement product.

The following list of potential replacement products for single-use bioplastic foodware and food-contact products are made from materials that can either be recycled or composted at City-contracted facilities (LASAN 2023a):

- Aluminum foil: recyclable (non-food-soiled products)
- Bagasse: compostable (products without coatings or linings)
- Bamboo/bamboo leaf: compostable and/or reusable
- HDPE: recyclable (non-food-soiled products) and/or reusable
- Palm leaf: compostable
- Paper/paperboard: compostable and/or recyclable (non-food-soiled packaging)
- PET or PETE: recyclable (clean, non-food-soiled products)
- PP: recyclable (clean, non-food-soiled products) and/or reusable
- Wheat fiber/straw: compostable and/or reusable
- Wood: compostable and/or reusable.

Reusable foodware alternatives to single-use bioplastic products include the following: durable/reusable plastics, glass, wood, ceramic, stainless steel, and other reusable bioplastics.

2.2.3 Textile Policies

2.2.3.1 Textile Disposal Policies

2.2.3.1.1 Proposed Measure(s)

The City may implement the following measures to ban manufacturers and retailers from disposing of apparel and textiles as trash:

- Prohibit retailers, distributors, warehouses, and fulfillment centers in the City from disposing as trash, destroying, or otherwise rendering unusable, returned apparel, including shoes and accessories. The City would require these entities, individually or collectively, to establish and fund a take-back, marketing, and/or donation system that would be required to be designed and approved by organization(s) with take-back/ EPR expertise.

- Prohibit textile and clothing manufacturers, clothing and textile designers, “cut and sew” and related companies from disposing as trash, destroying, or otherwise rendering unusable, unused, unsold, excess textiles and/or portions of apparel and apparel, and require these entities, individually or collectively, to fund a take-back, marketing, and/or donation system that would be required to be designed and approved by organization(s) with take-back/ EPR expertise.
- Prohibit online and “brick and mortar” retailers, wholesalers, and distributors in the City from disposing as trash, destroying, or otherwise rendering unusable, returned merchandise and require these entities, individually or collectively, to fund a take-back, marketing, and/or donation system that would be required to be designed and approved by organization(s) with take-back/ EPR expertise.

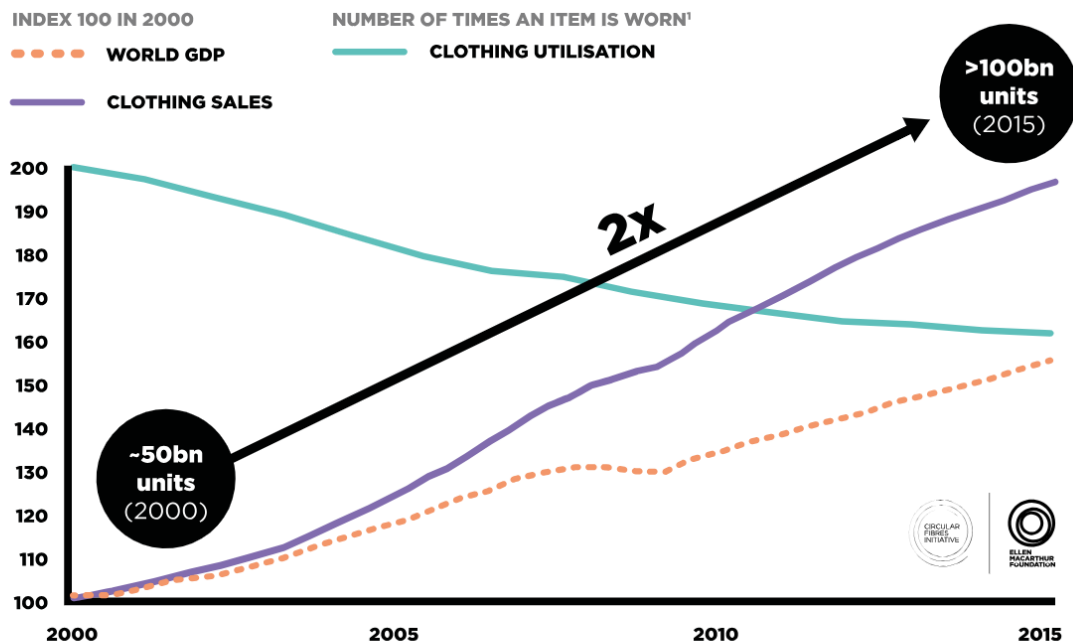
2.2.3.1.2 Rationale for Proposed Measure(s)

Synthetic textiles are the most commonly manufactured fabrics¹⁸, and the majority of textiles are landfilled. As shown in Figure 2.2-2, global clothing sales have doubled from approximately 50 billion units in 2000 to over 100 billion units in 2015. Alongside this increase, clothing utilization (i.e., the average number of times a garment is worn before it is discarded) has decreased from approximately 200 to 160 (Ellen MacArthur Foundation 2017). These trends are driven in part by fast fashion, where production and consumption practices of high turnover rates with low quality materials have come to dominate the market (Moazzem et al. 2021). Fast fashion practices drive waste at both the pre- and post-consumer levels, with higher quantities of clothing produced and discarded. The increase of lower quality textiles makes them less desirable for reuse in the sorting/grading market (Norup et al. 2019).

In 2018, over 11.3 million tons of textiles were disposed of in landfills in the U.S., accounting for almost 8% of all landfill waste, and almost double the amount disposed of in 2000 (USEPA 2022c). The USEPA estimated that the amount of clothing and footwear recycled in 2018 was 1.7 million tons, amounting to a 13% recycling rate nationally (USEPA 2018).

Textiles are the 6th most prevalent waste category in California, with apparel and other textiles accounting for 2.5% of the total tonnage of waste produced in 2021, and accessory goods including shoes, purses, and belts accounting for an additional 0.5% (CalRecycle 2022). This amounts to a combined total of over 1.1 million tons of textiles in the state’s waste stream every year (CalRecycle 2022). Californians spend more than \$70 million annually to dispose of used textiles (CalRecycle 2019), while approximately 95% of textiles are in a condition to be reused or recycled (CalRecycle 2022).

¹⁸ Petrochemical-based synthetic fibers (polyester, nylon, elastane, acrylic, polyamide, and spandex) make up approximately 66% of all textile production, and of petrochemical-based clothing, polyester is the most common textile material manufactured (Palacios-Mateo et al. 2021).



Source: Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005–2015); World Bank, World development indicators – GD (2017)

Figure 2.2-2. Global Clothing Sale Trends

It has been estimated that between 10% and 18% of textiles enter the global waste stream at the production level, including estimates of excess and overstock (Roberts et al. 2023; Ellen McArthur Foundation 2017; GreenStory 2021). The disposal of unused goods, whether returned or ultimately unsold, has the most negative impact of any textile in the production chain as the input materials and resources used to produce the item are never offset by actual use.

Reasons for pre-consumer product destruction include the following:

- consumer behavior (fast fashion driven);
- business model (forecasting, bulk-purchasing, overproduction);
- product characteristics (low quality, obsolescence);
- profit margins (retail return costs);
- other economic incentives;
- brand integrity; and
- liability concerns (Roberts et al. 2023).

Of all textiles discarded at the residential, commercial, and industrial level, approximately 85% are discarded in landfills, and 15% are initially diverted to thrift stores and other collection points. Of this 15%, 20% is resold and once the other 80% is sorted and graded, 30% is recycled to industrial rags, 20% is recycled into shoddy/stuffing, 5% is landfilled, 45% is utilized in the exported reuse and resale market, and less than 1% is used for recycling into new fibers (Shumacher and Forster 2022).

By attributing the responsibility of unsold and excess textiles to producers via an EPR model and requiring reuse and recycling, there should be a shift away from disposal of usable textiles. Waste stream levels would be impacted by numerous factors, including the following:

- Specific tonnage of reusable textiles to be diverted from the solid waste stream at the pre-consumer level;
- Alternative needs for typically destroyed textile goods;
- Material of the goods that are diverted;
- Availability of and ease of access to textile collection infrastructure;
- Cost; and
- Systems available to promote reuse and to a lesser degree, recycling of textiles.

2.2.3.2 Washing Machine Microfiber Filtration

2.2.3.2.1 Proposed Measure(s)

The City may require that all clothes washers sold as new in the City by a certain implementation date be equipped with a microfiber filtration system with a mesh size of 100 microns or smaller. The City may also consider working with other relevant departments to develop a rebate program to retire washers without these filtration systems or to retrofit them with necessary filtration.

The City may require single-family homes, multi-family complexes (i.e., those with greater than two units), and commercial laundromats to install microfiber filtration systems with a mesh size of 100 microns or smaller to existing washing machines by a certain implementation date.

2.2.3.2.2 Rationale for Proposed Measure(s)

Microfibers are very short textile fibers that measure under 5 millimeters long; not all microfibers are plastic, but synthetic-based microfibers are a type of microplastic. Synthetic textile production results in microfiber release during use and laundering. The ultrafine thread that composes synthetic microfiber goods include performance wear, other clothing, bedding, and other textiles that make up some of the 5.4 metric tons of synthetic textiles purchased in California between 2008 and 2019, which has coincided with a 26% increase in microfiber shedding (Geyer et al. 2022). Microfibers commonly found in aquatic environments include polyester, polyethylene, acrylic, and elastane (Boucher and Friot 2017). Synthetic microfibers are now one of the most abundant types of microplastics found in the natural environment (Geyer et al. 2022).

Washing textiles is a major contributor of microfibers into the environment, with estimates that one average household load of laundry can shed thousands to millions of microfibers (Erdle et al. 2021). Microfibers can enter the environment directly from washing machine effluent via untreated wastewater, and indirectly through treated wastewater and biosolid application in terrestrial environments (Figure 2.2-3; Erdle et al. 2021).

In California, 95% of microfibers are diverted from waterways via treatment of wastewater at municipal facilities (Geyer et al. 2022). However, microfibers are not filtered out of biosolids at wastewater treatment plants. In the state, the release of microfibers occurs through mainly terrestrial

environments: in 2019, terrestrial application of biosolids accounted for 1.6 kilotons of synthetic microfibers released into the environment in California (Geyer et al. 2022). The majority of microplastics are removed in the preliminary and primary treatment stages of wastewater treatment. New filtration technologies have been shown to remove an additional 98-99% of microparticles in final effluent. However, microfibers currently captured in the sludge produced at wastewater treatment facilities continue to enter the environment through terrestrial application in the form of biosolids (Erdle et al. 2021). An increase in wastewater treatment efficiency would likely result in a greater amount of biosolids, and a corresponding increase to microplastics released into the environment through terrestrial applications (Geyer et al. 2022). Diverting microfibers from waterbodies to land shifts rather than reduces microfiber pollution. Once in terrestrial systems, microfibers can also re-enter waterbodies via runoff or wind transport and eventually reach marine ecosystems downstream (Erdle et al. 2021; Geyer et al. 2022; Liu 2022). Synthetic microfibers in the environment are of concern due to additive chemicals (e.g., treatments and dyes), bioavailability to organisms, and toxicity.

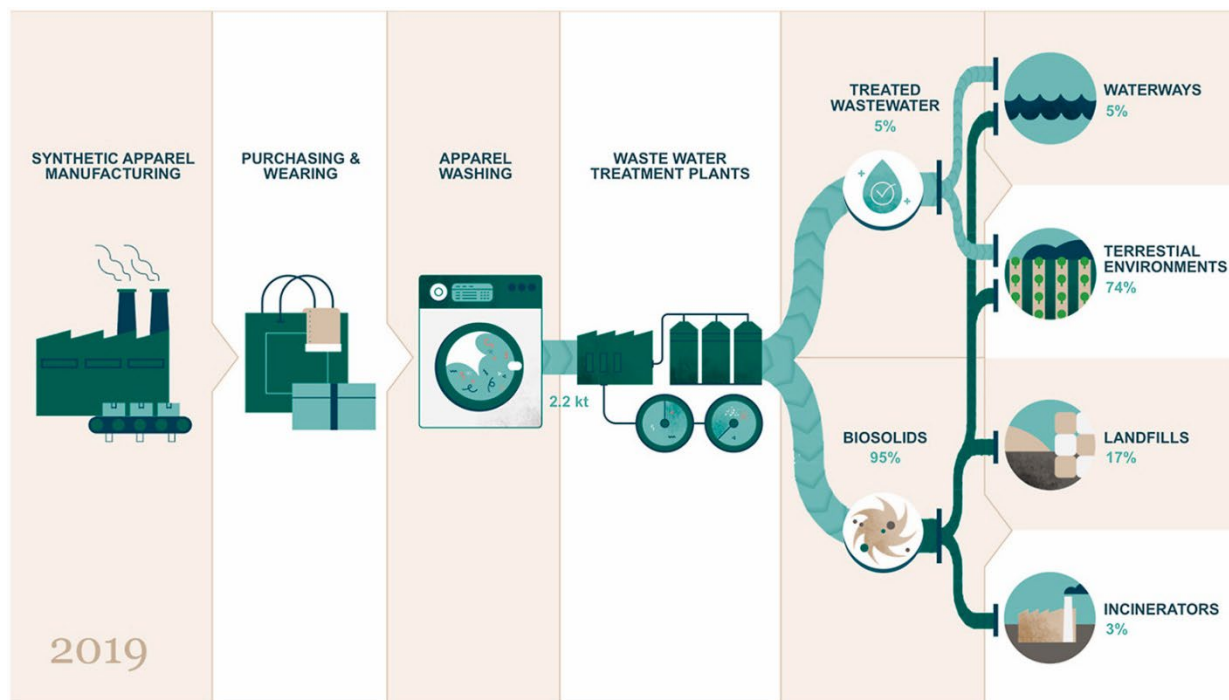


Figure 2.2-3. Microfiber Pathways into the Environment

Once microfibers make their way into the environment, they are difficult to remove; microfiber filters affixed to individual washing machines reduce the flow of microplastics into terrestrial environments, as the microfibers are removed before reaching wastewater treatment plants. Individual behavior such as washing clothing in cold water, using a front-loading washer, and detergent choices can also influence microfiber release, although no single method shows complete removal of microfibers (Erdle et al. 2021).

Microfiber filtration systems¹⁹ available include the following:

- External Filter Systems: These systems use a physical barrier with very small pore sizes to capture microfibers, which can pass through larger barriers. Additional filtration materials include activated carbon, synthetic polymers, and nano-coated filters that capture microfibers.
- Commercial Filter Systems - Commercial filtration systems are designed for industrial levels of laundry and may already include some form of microfiber capturing filtration. Microfiber filtration systems at this scale are typically in-line installations, as individual filters would not be feasible. The filtration methods are the same as other technologies used. Filtration systems at this level tend to be highly efficient at capturing particles within size range and may require less maintenance than individual home filters.

Maintenance of microfiber filters is required, and collected microfibers must be properly disposed of to avoid reentering the water or air. Many of the filter companies on the market have instructions to collect microfibers in a closed container, which are then landfilled. Other brands of microfilters provide a cartridge exchange program where spent filters are sent back to the manufacturer where they are cleaned and refurbished for reuse. The microfibers are not removed completely from the environment, but effectively kept out of waterways, reducing the levels of microplastics being released specifically into aquatic environments. The lifespan of many of these reusable filters is also not known and will eventually require disposal. One existing manufacturer reports that the cartridges can be used up to six times (approximately 120 loads of laundry equivalent to a lifespan of roughly 5 months based on a household average of 300 loads of laundry per year) (Martinko 2020).

2.2.4 PFAS Ban

2.2.4.1 Proposed Measure(s)

The City is considering banning or limiting PFAS from some categories of products and uses that are not currently covered by state law (see Appendix A, Section 1.1.5 for a summary of state laws pertaining to PFAS), including, but not limited to the following:

- Additional food contact items not covered by AB 1200 (e.g., containers, cups, wraps/wrappers, snack bags (such as those to hold French fries) and boats/or trays);
- Household products such as polishes, waxes, paints, cleaning products, cookware;
- Electronics;
- Expand limitations to PFAS contained within carpets, furniture, and rugs;
- Nonstick cookware; and

¹⁹ Other methods of reducing microfibers include in-washer methods, such as placing clothing in washing bags that capture microfibers, have been shown to reduce microfiber shedding by 50 to 78% (Napper 2020). This method does not require any permanent installation or continued maintenance of a washing machine unit.

- Molded plastic made of fluoropolymers²⁰ or HDPE²¹.

2.2.4.2 Rationale for Proposed Measure(s)

PFAS²² are a large and diverse group of man-made chemicals that repel water, grease/oil, and dirt and are resistant towards aggressive chemicals as well as physical strain (i.e., they are durable). These properties have made PFAS extremely useful in industrial and commercial products such as coatings on metal, paper, stone, leather, and textiles, in plastics like Teflon, for hard chrome plating, as lubricants, oils and waxes, dispersion agents in plastics, paints, pesticides, and even in pharmaceuticals. They have been used in industry and consumer products since Teflon was first discovered in 1938.

There are thousands of different PFAS, some of which have been more widely studied and used than others. The two most well-known chemicals in the PFAS group are perfluoro-octane sulfonic acid (PFOS) and perfluoro-octanoic acid (PFOA). Little attention was paid to this group of chemicals until about 20 years ago when PFOS and PFOA were discovered to occur widely in biota and humans. PFOS and PFOA, which belong to a group of perfluoroalkyl acids (PFAAs) have been found to be toxic, as have other PFAAs and precursors of PFAAs (Rosenmai et al. 2014). In recent years, PFOS and PFOA have been replaced with other PFAS in the U.S. (USEPA 2022b).

²⁰ Fluoropolymers are a class of PFAS that are widely used in the semiconductor and electronics industries, in addition to the chemical manufacturing of other plastics with desirable qualities including high durability to corrosion, heat, chemicals, and ultra-violet (UV) light. The use of fluorinated surfactants is especially widespread in the manufacturing of plastics and rubber. Plastic goods can be produced through a process of injection molding, where the feedstock material is processed and shaped into a final product. Fluoropolymers are used throughout this process as mold release agents, polymer processing aids, anti-blocking agents for rubber, and as curatives in the production of plastic. The presence of PFAS in molded plastic goods and materials is the result of either post-manufacturing fluorination process or an “in-mold” extrusion process. According to the Office of Science and Technology Policy (OSTP), there are currently no identified alternatives for these industrial uses of fluoropolymers in the molding of plastics and rubber (OSTP 2023). While not intentionally added at any step, PFAS present in fluorinated packaging is an emerging area of study. It has not been clearly demonstrated that fluoropolymers that are produced by emulsion polymerization can be produced without the use of PFAS as processing aids (Lohmann 2020).

²¹ HDPE is frequently fluorinated to make plastic containers less reactive and dissolvable. Fluorination surface treatment improves the resistance of polyethylene to a variety of organic chemicals. Direct fluorination involves exposure of plastic to a fluorine-inert gas mixture, which in turn creates a fluorine-modified layer on the plastic surface; this process allows for cheaper production of durable plastics (Whitehead 2023). In a study conducted by the USEPA, perfluoroalkyl carboxylic acids were measured in high levels in HDPE containers containing pesticides. Those containers that were exposed to a variety of typical conditions showed the increased leaching of PFAS into pesticides that would then be transferred to a terrestrial environment (USEPA 2022a). An additional study showed a variable range of HDPE containers with characteristics that readily allow PFAS to leach, and specifically identified post-mold fluorinated containers to contain the maximum values recorded within the studied products (Vitale 2022).

²² The OECD defines PFAS as “fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any Hydrogen/Chloride/Bromide/Iodide atom attached to it), i.e., with a few noted exceptions, any chemical with at least a perfluorinated methyl group (–CF₃) or a perfluorinated methylene group (–CF₂–) is a PFAS” (OECD 2021).

The State of California defines PFAS as “a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.”

PFAS are of concern because they do not break down in the environment; can move through soils and contaminate drinking water sources; bioaccumulate in fish and wildlife; and have been shown to cause adverse health effects in animal studies (Centers for Disease Control and Prevention [CDC] 2022). PFAAs enter the environment via direct routes from uses where PFAAs are the main ingredient such as PFOA as a formerly used dispersion agent in Teflon or PFOS in hard chrome plating. PFAAs can also enter the environment via other sources (PFAA precursors). These include perfluorinated compounds that are taken up from food and transformed in the body into PFAAs. Other routes include residuals or impurities of PFAAs in other PFAS-containing products, such as fluorinated food contact material coatings.

PFAS can be present in our water, soil, air, and food, as well as in materials found within homes or workplaces. PFAS are known components or contaminants in the following (USEPA 2022b).

- Drinking water – public drinking water systems and private wells
- Soil and water near waste sites
- Fire extinguishing foam
- Manufacturing or chemical production facilities
- Food – fish from contaminated water or dairy products from livestock exposed to PFAS
- Food packaging – such as grease resistant paper, microwave popcorn bags, butter wrappers, pizza boxes, etc.
- Household products and dust – common component of stain and water-repellent products applied to carpets, upholstery, clothing, and other fabrics; used for non-stick cookware, etc.
- Clothing treated to add hydrophobic and hydrophilic properties that allow them to resist water, oils, and stains (e.g., outdoor clothing, menstrual underwear, etc.)
- Personal care products – some shampoos, dental floss, and cosmetics
- Biosolids – fertilizers can be contaminated and affect ground and surface water as well as animals grazed on pasture where contaminated fertilizer has been applied.

People are typically exposed to PFAS through food, food packaging, consumer products, house dust, and drinking water. Major sources of PFAS in drinking water are fire training and response sites, industrial sites, landfills, and wastewater treatment plants and biosolids. The potential for human exposure to PFAS from drinking water is of particular concern because once PFAS enter groundwater, they are easily transported large distances. Because PFAS do not break down, their concentrations continue to increase and can contaminate drinking water wells, lakes, and rivers (SWRCB 2023a). As of March 2023, maximum contaminant levels (MCLs²³) for PFAS in California have not yet been established. The development of standards for PFOA, PFOS, and other PFAS are priorities for the Division of Drinking Water. These are discussed in greater detail in Section 3.10, Hydrology and Water Quality.

The California Environmental Protection Agency (CalEPA) has been coordinating with the USEPA and other governmental agencies over PFAS issues and concerns since 2012 (SWRCB 2023b). The Office of

²³ The MCL is the maximum level allowed of a contaminant in water that is delivered to any user of a public water system.

Environmental Health Hazard Assessment (OEHHA) has been evaluating the health effects of PFAS compounds. Numerous state laws aimed at reducing or removing PFAS from the supply chain as well as reducing exposure of end users have been passed in recent years. Some of these bills form the basis of additional or more restrictive actions that could be proposed by the City (see Appendix A, Section 1.1.5 for a summary of state laws pertaining to PFAS).

2.2.4.2.1 Alternatives to PFAS

Although functional alternatives to PFAS are available, phasing these products or components out requires additional consideration. It cannot be assumed that alternatives will be less harmful to human health and the environment than the PFAS they are replacing. Alternatives analysis for a given use should be conducted using established processes and best practices to identify, evaluate, compare, and select safer alternatives to chemicals of concern based on hazards, performance, and economic viability. Reasonable alternatives are described below for a number of PFAS use categories. Where possible, information about the known hazards or fate of these alternatives is included.

An international group of researchers has proposed phasing out the use of PFAS according to whether the chemicals provide properties that are necessary for health and safety (Cousins et al. 2019). The phase out recommendations are based on the example of the Montreal Protocol, which phased out the use of ozone-depleting chlorofluorocarbons except for certain essential uses. The concept of “essential uses” hinges on the use being “necessary for health, safety, or is critical for the functioning of society” and that “there are no available technically and economically feasible alternatives”. For example, some products containing PFAS are essential and have no substitutes (e.g., perfluorosulfonic membranes that confer flame resistance to protective clothing worn by workers in the oil and gas industry). Cousins et al. (2019) considered the definition of essentiality for several categories of PFAS uses. Their definitions and examples and several examples are provided in Table 2.2-2.

Table 2.2-2. Three Essentiality Categories to Aid in the Phase-out of PFAS

Category	Definition	Examples
Non-essential	Uses that are not essential for health and safety, and the functioning of society. The use of substances is driven primarily by market opportunity.	Dental floss Cosmetics and personal products Ski waxes Nonstick coatings for kitchenware
Substitutable	Uses that have come to be regarded as essential because they perform important functions, but where alternatives to the substances have now been developed that have equivalent functionality and adequate performance, which makes those uses of the substances no longer essential.	Most uses of aqueous film-forming foams Certain water-resistant or repellent textiles (e.g., surf shorts) Food packaging
Essential	Uses considered essential because they are necessary for health or safety or other highly important purposes and for which alternatives are not yet established.	Certain medical devices Occupational protective clothing/textiles

Source: Cousins et al. 2019

The existing alternatives to PFAS in the types of products the City may consider under this measure are described below and shown in Table 2.2-4.

- **Food contact materials** are a wide array of materials that at some time contact food, including industrial food production equipment and machinery, food packaging, and kitchen utensils like non-stick forms and pans. Consumer concern over the environmental and health impacts of plastic packaging has led to market pressure for alternative packaging, including paper. Paper food packaging often features a coating to protect the paper and increase durability. Molded fiber bowls are often marketed as green or compostable and may also contain PFAS to help repel grease and water and prevent spoilage. In the past, long-chain PFAS were used but were phased out in the 2000s. Currently, fluorinated paper and cardboard products are largely based on short-chain PFAS (Cousins et al. 2019).
- **Class B fire-fighting foams** (aqueous film-forming foams, fluoroprotein foams, or film-forming fluoroprotein foams) are formulated to extinguish fires of flammable liquids such as hydrocarbon fuels. Aqueous film-forming foams containing PFAS historically contained long-chain PFAAs, but since 2015, the foam manufacturers have eliminated long-chain PFAAs and their precursors from their products (Cousins et al. 2019).
- **Durable water repellents** are applied in textile finishing to impart water and sometimes oil and stain resistance. Avoiding garment saturation with water is a non-essential but much enjoyed comfort feature in situations like biking or walking in rain. Manufacturers also often recommend re-application of aftermarket or impregnation treatment products to converted textiles and leather products every few years to ensure optimal stain and soiling resistance, suggesting that these products migrate out of the fabrics (California Department of Toxic Substances Control [DTSC] 2021). It can also be an essential protection in more extreme conditions such as marine environments or in hospitals where biohazards are present from bodily fluids. Medical textiles are an example of a product where technical standards to protect human life require performance that may be difficult to meet without the use of PFAS. Fabrics containing PFAS have properties that help prevent the transmission of infectious agents by resisting liquid penetration (e.g., bodily fluids). Clothing standards set by the U.S. National Fire Prevention Association for protective clothing for firefighters and other emergency responders require water repellency, oil/stain repellency, and breathability. These are examples of textiles where there are presently no suitable replacements for PFAS. Effective, safe alternatives may become available in the future.
- **Coatings, paints, and varnishes** may contain PFAS (Table 2.2-3). There are many alternatives to fluorinated components in paints, varnishes, and coatings (Table 2.2-4); although some of these alternatives work better than others. Anti-reflective coatings used in semiconductor industries do not yet have viable alternatives to PFAS.

Table 2.2-3. Uses of PFAS in Coatings, Paints, and Varnishes

Product	Product Type	Application	Examples of Use
Coatings	Powder coatings	Architectural	Exterior surfaces of bridges and buildings
		Chemical industry	Lining of reaction vessels, metal surface coatings
	Radiation curable coatings	Electronics	Phone and tablet screens
	Other coatings	Cables and wiring	Commercial indoor local area network cables, aircraft cables
		Anti-reflective coatings	Semiconductor coatings
		Anti-graffiti coatings	Walls, public transport, bridges
		Renewable energy	Solar panels, wind turbine blades
Paints	Aerosol spray paint	Automotive paint	Car coatings
		Architectural, chemical industry	Bridges, construction, metal surface protections
	Water-based paints; solvent-based paints	Architectural, chemical industry, domestic	Bridges, construction, lining of vessels, metal surface protection, doors and walls in homes
Varnishes	Floor and surface finishes/lacquers and stains	Domestic, construction, printing	Protection for stone and tiles, work surfaces, polish for floors, waxes for tables and floors, reflective night paint for roads, pavement and traffic signs, reflective sheetings, printing inks, wood and cellulose shrink/swell protectors

Source: OECD 2022.

Table 2.2-4. Non-fluorinated Alternatives to PFAS in a Variety of Uses

PFAS Use	Concern	Alternatives	Current Uses and Limitations of Alternatives
Food Contact Materials	Food contact materials need to be durable and repel oil for weeks to months (e.g., butter wrappers) or only for a few minutes (e.g., fast food wrappers).	Naturally grease-proof paper and vegetable parchment. These are made from cellulose paper pulp wherein the dense cellulose structure prevents the grease from soaking into the paper.	Offers a high barrier to water and fat and is suitable for use as food wrappers and liners (OECD 2020).
		Rhamnolipids, a microbial bio-surfactant produced by <i>Pseudomonas</i> bacteria (Teli et al. 2020).	Rhamnolipids are currently used in eco-friendly alternatives to commercial cleaning products, pesticides, and antifungal agents (Chong and Li 2017).
		Pectin is a biopolymer that occurs naturally in the starch of ripening fruits such as apples, citrus, cranberries, gooseberries, and plums. Pectin is one of the most significant renewable natural polymers and is both ubiquitous in nature and a byproduct of the horticulture industry (Teli et al. 2020).	Pectin does not perform as well as many alternatives under high temperatures or heavy content loads.
		Cellulose is the primary material used to make paper products and the most abundant natural polymer on earth (Teli et al. 2020). When the crystalline regions of natural cellulose are isolated and recrystallized at the nano-scale, cellulose gains hydrophobic properties without loss of degradability. These features make them useful as bio-composite films (Teli et al. 2020).	Cellulose nanocrystal films perform well in grease resistance but are not as effective at preventing water permeation compared to plastics and PFAS.
		Lignin is a biopolymer in plant biomass that is also potentially useful for creating rigid food packaging such as bowls.	Lignin takes more energy to extract and use compared to cellulose nanocrystal or cellulose. Lignin has good thermal resistance and tensile strength similar to some plastics (Teli et al. 2020).
		Plastic coatings	Does not contribute to the goal of reducing plastic waste
		Aluminum coatings	Difficult to recycle, possibly more expensive than standard options

PFAS Use	Concern	Alternatives	Current Uses and Limitations of Alternatives
Food Production	In food production, PFAS are mainly used to create nonstick surfaces that lower the friction and minimize adhesion, thus creating a surface that is less easily scratched and also easier to clean. They are also used as non-stick or heat- and acid-resistant membranes on conveyor belts and as lubricant oils and greases in machinery. Nonstick pans and kitchenware are either sprayed or rolled with layers of the PFAS polytetrafluoroethylene.	Enameled iron, ceramic, and anodized aluminum coatings.	Ceramic and enamel are easily cleaned and can be heated to fairly high temperatures. These materials may contain minor components used in making, glazing or decorating them, such as pigments, lead, or cadmium. These may be harmful and must be controlled during the manufacturing process (Health Canada 2015). Anodized aluminum cookware conducts heat well and has a hard, non-stick surface that is scratch-resistant and easy to clean. Anodization reduces leaching of aluminum into foods, particularly acidic foods (Health Canada 2015).
Class B Fire Fighting Foams	Current fluorotelomer-based aqueous film-forming foams formulations contain fluorosurfactants that may transform into short-chain PFAAs such as perfluorohexanoic acid and shorter-chained PFAAs in the environment. These are thought to be less bioaccumulative and less toxic compared to long-chain PFAAs. Nonetheless, short-chain PFAAs are extremely persistent and mobile in the environment.	3M developed fluorine-free class B foams in the early 2000s. Since then, many companies have marketed fluorine-free class B foams, many of which meet the standard fire-fighting performance certifications applicable to PFAS-containing aqueous film-forming foams and related foams.	In some scenarios (e.g., military bases), the use of these alternative products may be disallowed; however, other users may be able to phase out PFAS-containing foams (Cousins et al. 2019).
Durable Water Repellents in Textiles	Essential protection in more extreme conditions such as marine environments or in hospitals where biohazards are present from bodily fluids.	Plastic laminate coating for surgical gowns, drapes, and clean air suits	Offer sufficient protection against biological fluids containing bacteria and viruses but may not be sufficiently breathable (Cousins et al. 2019).

PFAS Use	Concern	Alternatives	Current Uses and Limitations of Alternatives
	Durable water repellents are applied in textile finishing to impart water and sometimes oil and stain resistance. Avoiding garment saturation with water is a non-essential but much enjoyed comfort feature in situations like biking or walking in rain.	Silicone-based polymers	Alternative repellents based on silicones are both hydrophobic and soft feeling to the skin. The majority of these durable water repellent types have only moderate durability to laundering and no (unmodified) silicone durable water repellents can deliver oil repellency (Holmquist et al. 2016). The degradation products of silicone durable water repellents are an important consideration when assessing these alternative products as they may be toxic (Lehmann et al. 2000).
		Hydrocarbon-based polymer	Crystallized linear n-alkyl chains are used to achieve water repellency. The result resembles the natural low energy surface of plant leaves that develop repellency with crystalline wax tubules. Unfortunately, these materials have poor durability when laundered. Other durable water repellent developments are the encapsulation of waxes or fatty acids from plant extracts. While these newly developed hydrocarbon durable water repellent finishes have good water repellency, they cannot prevent oil saturation (Holmquist et al. 2016).
		Dendrimeric durable water repellents	This type of repellent is based on hyperbranched polymeric structures that consist of ester or polyurethane segments (Holmquist et al. 2016). During drying on the surface of the textile, these highly branched polymers self-organize to form a continuous polymeric film. The surface of dendrimers can be modified with fatty acids, per- or polyfluoroalkyl groups, or polyalkylsiloxanes to achieve repellent properties.
		Inorganic nanoparticle durable water repellents	This type of repellent mimics the repellent nanostructures of the lotus plant’s leaves. Inorganic nanoparticle surfaces are also modified to provide hydrophobicity and adherence to the fiber surface (Holmquist et al. 2016).
Coatings, Paints, and Varnishes**	PFAS are added to coatings to provide resistance to corrosion, weathering, abrasion and scratching, UV resistance, and durability. They are used in roof coatings to lower the temperature of roofs and aid in energy efficiency	Polyurethane	Coatings, Paint, Varnish Wind turbine blade coating, polyurethane also protects the blades from sand and rain erosion, bird fouling, and help maintain the efficiency of the blades

PFAS Use	Concern	Alternatives	Current Uses and Limitations of Alternatives
	of buildings. PFAS in varnishes are used on floors and countertops. They can be applied to wood or PVC surfaces and natural stone (marble, travertine, granite).		
		HDPE-based products that contain ceramic and nano aluminum oxide	Coatings
		PVC	Coatings
		Polyolefin	Coatings
		Epoxy powders	Coatings, Paint, Varnish Wind turbine blade coating, epoxy powders also protects the blades from sand and rain erosion, bird fouling, and help maintain the efficiency of the blades
		Silica-based coatings	Paints Coatings in electronics, however, fluoropolymers can be applied in thinner layers compared to non-PFAS alternatives and are more water repellent
		Polyamides and polyethylene terephthalate	Solar panel coatings, however, these coatings do not confer the same degree of UV and moisture protection as the fluoropolymers currently in use
		Acrylic	Water-based latex paint, Varnish
		Vinyl	Paint, Varnish
		Propylated naphthalenes	Marine paint
		Polystyrene-based formulations	Paint, Varnish

Sources: Lehmann et al. 2000; Holmquist et al. 2016; Chong and Li 2017; Cousins et al. 2019; Teli et al. 2020; OECD 2020, 2022, Health Canada 2015.

** Additional detail about the applications of PFAS in coatings, paints, and varnishes is provided in Table 2.2-3 above.

2.2.5 Additional Product Bans

2.2.5.1 Plastic Bag Clips

2.2.5.1.1 Proposed Measure(s)

The City may ban the manufacture, distribution, offer, provision, and sale of plastic bag clips to reduce the input of these products into the City’s waste stream.

2.2.5.1.2 Rationale for Proposed Measure(s)

Plastics bag clips or tags (also called bread tags) come in the form of small, flat, hard plastics that are commonly used to keep bread, bakery goods, and produce bags closed²⁴. Single-use plastic bag clips are very common in food packaging, and are used as a surface to print prices, dates, and codes. Small format grocery packaging including caps and other items smaller than 40 mm accounts for 10% of the plastic packaging market by weight and poses an issue for grocery store waste reduction efforts (UNEP 2022). Single-use plastic bag clips are most often made of polystyrene (resin identification code 6), although some are made of materials that are technically recyclable. However, regardless of plastic type, most MRFs are not equipped to sort items smaller than 3 inches and therefore the plastic bag clips are not sorted to a recycling stream. Therefore, these plastic clips are not recyclable within the City.



There are several alternatives to a single-use plastic bag clips currently on the market, including the following:

- Paper-based single-use bag clips. Kwik Lok’s FibreLok is the predominant replacement, made from 100% post-consumer paper-based material (U.S. Plastics Pact 2023).
- Twist-ties. Twist-ties are flexible strips made from steel wire and a covering made of plastic and/or paper (metallic or plain), bound by an adhesive. Wireless polymer twist-ties are also available. The covering of a twist tie may be dyed, and additional tags may be attached.
- Bag seal tape. Tape composed of either paper or plastic (often PP) is wrapped several times by machine around the plastic bag. Once the seal of the tape is broken, the bag cannot be completely closed without another form of closure.
- Heat sealing. A tamper-resistant seal is formed with two edges of the plastic bags with food items. Once the seal is broken, the bag cannot be completely closed without another form of closure.

²⁴ The small, single-use plastic bread clips are not the same product as “chip clips”, which are significantly more durable, larger, typically operated with a hinging mechanism, and are meant for repeated use.

2.2.5.2 Aerosol String (Silly String)

2.2.5.2.1 Proposed Measure(s)

Aerosol string was specifically banned per Los Angeles Municipal Code (LAMC) Section 56.02 in Hollywood on Halloween due in part to environmental concerns. The City may expand the existing ban to apply year-round to the entire City.

2.2.5.2.2 Rationale for Proposed Measure(s)

Aerosol string (trademarked name Silly String), a colorful aerosol foam made of plastic derivatives, is not biodegradable and is a source of microplastics in stormwater when used in outdoor settings.

Silly String was patented in the 1970s by Wham-O Manufacturing (Drahl 2016). The current formula (e.g., the solvent and surfactant within the can) is proprietary information. Shaking the can mixes the solvent and the rest of the ingredients to form a temporary blend of plastics, minerals, deionized water, and propellants. Generally, aerosol string products contain the following ingredients:

- Surfactant. Surfactants are detergents and are amphiphilic (e.g., both hydrophobic and hydrophilic). The attraction-repulsion combination helps glue the molecules in the solution together so that the string is both solid and cohesive, but also sticky. The surfactant in Silly String is a trade secret ingredient. A possible surfactant is sorbitan trioleate (Drahl 2016).
- Deionized water, solvent. The water and trade secret solvent are mixed with the rest of ingredients during shaking. Both the water and the solvent evaporate quickly outside of the can, but the foamy solids are left behind in string form (Palmer 2015).
- 1,1,1,2-Tetrafluoroethane is a propellant and compressed liquid. When the nozzle on the can is pressed, the pressure drop inside the can causes the liquid to boil and vaporize, thus expanding and pushing the other ingredients out of the can.
- Polyacrylic resin is the plastic component of aerosol string. The resin is mixed into the can as a powder to create a viscous solution. Once the plastic is propelled into the air, it immediately forms a sturdy exoskeleton which will last for weeks if not disturbed (Palmer 2015).
- Talc, made up of primarily magnesium, silicon, and oxygen, is an absorbent mineral that fills the resin skeleton giving the string its fluffy body. Silicone fluids such as dimethyl siloxane make the finished streamers of string easy to peel off their ultimate landing place (Drahl 2016).
- Isopropyl alcohol and ammonia create shelf-life stability by preventing the growth of bacteria and can erosion.

Aerosol strings are not a recyclable form of plastic waste and are not biodegradable. If the strings are cleaned up at all, they are generally treated as trash. Any aerosol string that is not collected as trash is subject to environmental degradation whereby the plastic components break down to become microplastics that run off into storm drains and other waterways. Alternatives to silly string include biodegradable confetti poppers, paper decorations, or bubbles.

2.2.5.3 Plastic Sandbags

2.2.5.3.1 Proposed Measure(s)

In order to reduce this source of plastics and microplastics in the environment, the City may ban the manufacture, distribution, offer, provision, rental, and sale of plastic sandbags and instead allow only sandbags that can readily decompose into natural materials in the environment without causing harm.

2.2.5.3.2 Rationale for Proposed Measure(s)

Sandbags are used for a variety of purposes including stormwater erosion and sediment control, flooding, and general construction. Due to their low cost and small storage footprint, sandbags made from woven polypropylene fabric are the most commonly used type of sandbags. Sandbags are typically left in the environment to degrade and are a source of plastic debris and microplastics in the environment. When exposed to sunlight for extended periods, plastic sandbags will degrade into microplastics where they remain in terrestrial and aquatic environments. These bags also cause aesthetic damage in coastline areas; temporary erosion structures made of plastic sandbags are prone to becoming litter.

The City of Malibu banned the distribution, sale, and use of plastic sandbags under the Malibu Municipal Code, Chapter 9.30 with exemptions for protection of property from hazards on an emergency basis and for emergency purposes by first responders as needed to abate the emergency until other means of protection can be employed.

Substitute materials for plastic sandbags include the following:

- Burlap is made from plant fibers, mostly commonly from the jute plant, but also hemp or flax. Burlap sandbags can provide the same erosion and flooding protection provided by polypropylene and other plastic based sandbags. Natural fibers deteriorate over several months when exposed to sunlight and can be composted or placed in the organics bin for curbside collection. Jute has been used far longer than synthetic materials in sandbag construction.
- Cotton/canvas.
- Combinations of the above materials are increasing: the use of composite fibers provide high performance qualities with a mix of benefits from natural and synthetic sources.

The Los Angeles Fire Department (LAFD) provides up to 25 PP plastic sandbags per household in the City; all City fire stations have sandbags ready year-round, and many also provide free sand to fill the bags. There are no current guidelines in the City or other local municipalities for post-storm sandbag disposal.

2.2.5.4 Lighter-than-air Balloons

2.2.5.4.1 Proposed Measure(s)

The City of Los Angeles may ban the distribution, offer, provision, sale, and release of lighter-than-air balloons (e.g., those filled with helium).

2.2.5.4.2 Rationale for Proposed Measures

Lighter-than-air balloons pose a threat to wildlife and livestock, and those made of conductive material can also be a fire hazard when contacting transmission lines. Lighter- than- air balloons travel hundreds or even thousands of miles when released and eventually fall back to land or water as litter (O’Brien 2020). California state law has been recently amended to phase out conductive balloon materials (AB 847; see Appendix A, Section 1.1.8 for a full description).

Other cities in California have also addressed balloon pollution, including Laguna Beach, Encinitas, Malibu, Glendale, Hermosa Beach, and Solana Beach. These actions range from restricting the release of balloons to full bans on all types of balloons. For example, the Encinitas City Council passed an ordinance to prohibit the sale, distribution, and intentional release of lighter-than-air balloons within the city (Ordinance 2022-01). The City of Glendale passed a prohibition on the sale of Mylar® balloons except when they are filled with air (not helium) and affixed or mounted to a post at the point of sale (Ordinance No. 5953; passed in 2020).

The City of Laguna Beach passed an ordinance prohibiting the sale, public use, and distribution of all balloons, which was modified from the original staff recommended ordinance that restricted only certain types of balloons. Thus, balloons filled with air instead of helium are covered by the ordinance. The new ordinance bans the sale, public use, and distribution of all balloons within the city and bans the use of any balloon at any city facility or city-sponsored event, or any event held in a public area. The ordinance does not apply to balloons being used on private property and does not prohibit the purchase of balloons from outside of the city (Hall 2023).

Modern balloons are made from materials such as rubber, latex, polychloroprene, metalized plastic, or nylon fabric. The two most common types of balloons are a polyester film (biaxially-oriented PET, known more commonly by the trade name Mylar® (owned by DuPont)) and latex (O’Brien 2020). Mylar® balloons cause thousands of power outages every year when they come into contact with power lines or circuit breakers (Scauzillo 2019). The metallic coating on current balloons is highly conductive when it contacts electrical equipment leading to short circuits, outages, and explosions that can bring down power lines and potentially lead to severe injuries, fires, and property damage. Southern California Edison (SCE) recorded 802 balloon-related power outages in 2022, impacting 1.1 million customers (SCE 2023).

While Mylar®/foil balloons are known to be non-biodegradable, latex balloons are often marketed as being “green” or “biodegradable” due to being made of natural products of rubber-producing plants. However, this can be misleading, because even though latex balloons contain natural latex, pure latex needs to be vulcanized with sulfur and requires the addition of many other compounds to manufacture high-quality, long-lasting balloons. Therefore, latex balloons still take years to break down. Gilmour and Lavers (2021) demonstrated that latex balloons do not meaningfully degrade in freshwater, saltwater, or compost conditions within 16 weeks²⁵.

²⁵ Industrial composting standards (ASTM D6400-23) require that a material completely disintegrate after 12 weeks, and that the product not be distinguishable from the surrounding soil to be considered biodegradable (Gilmour and Lavers 2020).

One of the most common reasons for releasing balloons intentionally is as a remembrance of someone. Alternatives to this use include floating flowers or flower petals down a calm stream; planting trees or gardens; sponsoring a bench or memorial at a local park; or lighting candles or luminarias.

Parties and events often feature brightly colored, eye-catching, kinetic, or otherwise vibrant aesthetics to capture the festive mood. There are many alternatives to lighter-than-air balloons that provide similar visuals, including the following: flags, banners, kites, pinwheels, tissue paper pompoms, bubbles, chalk decorations, paper chains, and eco confetti (e.g., made of petals, leaves, paper bits).

2.2.5.5 Single-use E-cigarettes and Vape Cartridges

2.2.5.5.1 Proposed Measure(s)

To reduce the entrance of these products into the City’s waste stream, the City may prohibit the sale of single-use e-cigarettes and vape cartridges within the City. Replacement products for single-use e-cigarettes and vape cartridges would include rechargeable and refillable cartridges, which are designed to be reused.

2.2.5.5.2 Rationale for Proposed Measure(s)

The term “e-cigarettes” encompasses a wide variety of devices that are known as vapes, mods, tanks, and pod systems, as well as a variety of brands. A variety of e-cigarette types are available, some which are designed to be used only once (disposable) and others which are rechargeable and/or refillable. These product types are described below:

- Disposable e-cigarettes/vape pens are designed to be used one time only. These devices are not rechargeable or refillable and are discarded when the product runs out of charge or e-liquid. A typical disposable vape pen contains plastic, copper, and a lithium-ion battery. The lifespan of a disposable e-cigarette depends on the e-liquid capacity and the battery life, which is designed to provide power for the duration of the e-liquid capacity. Once either is depleted, the disposable e-cigarette cannot be recharged or used further. A typical disposable vape pen comes ready-filled with 2 milligrams of e-liquid, approximately 600 puffs, and a maximum of 2% nicotine (House of Commons Library 2022).
- E-cigarettes with prefilled or refillable cartridges are a type of rechargeable e-cigarette or vaping product designed to be used multiple times. E-liquid comes in prefilled or refillable cartridges, which may contain various substances including nicotine, cannabis, flavoring, and solvents. The cartridge is attached to a battery pen which contains the battery. Prefilled cartridges vary in volume and are not designed to be refilled; and depending on customer use, the lifespan of these also varies. Prefilled cartridges would be considered single-use, and therefore not allowed under the Program.
- Tanks or Mods: A type of rechargeable e-cigarette or vaping product designed to be used multiple times. These allow users to customize the substance in the device (U.S. Department of Health and Human Services n.d.).

The concentrated nicotine and e-waste residuals present in e-cigarettes pose potential biohazard risks. The hard plastics, lithium-ion batteries, and electronic circuit boards require disassembly, sorting, and further recycling and disposal. When littered or improperly discarded, broken devices can leach heavy metals (including mercury, lead, and bromines), battery acid, and nicotine into the environment

(Hendlin 2018). The disposable, single-use e-cigarettes contain e-waste elements that are similar to those of reusable e-cigarettes but are used only for a short period of time before becoming spent (about 400 puffs or 20 to 40 cigarettes' worth of vapor). The e-waste from disposable and refillable devices is similar in terms of the primary components, but refillable ones last much longer, and require changing out only the e-liquid cartridge or flavored pod (Hendlin 2018).

Disposable e-cigarettes contain electronic components. As a result, they are considered e-waste and should not be disposed of in regular waste bins. The U.S. Food and Drug Administration states that all e-cigarette waste and e-liquid waste should be handled as household hazardous waste (Earth911 2023). However, e-cigarettes and vape pens are not allowed at the City's Household Hazardous Waste Collection Centers, also known as S.A.F.E. Centers (Solvents/Automotive/Flammables/Electronics), which are where batteries would normally be recycled (LASAN 2023b). Because most disposable e-cigarettes are not designed to be taken apart easily, the lithium-ion batteries are generally not removed and recycled at the proper battery recycling locations, and instead end up as hazardous waste in landfills or as litter in the City. Under certain conditions, lithium-ion batteries can catch fire or explode, therefore improper disposal of batteries can harm consumers and sanitation workers.

The U.S. Food and Drug Administration issued an enforcement policy, which became effective February 2020, prohibiting the sale of flavored prefilled e-cigarette cartridges. This policy does not apply to tobacco-and menthol-flavored prefilled cartridges, e-liquids, or single-use disposable e-cigarettes (CDC Foundation 2023). Following this enforcement policy, between February 2020 and March 2023, unit shares of disposable e-cigarette devices increased from 26 to 53%, and those for prefilled cartridges decreased from 74 to 47%.

Between February 2020 and March 2023, the monthly sale of disposable e-cigarette/vape cartridges increased from 4 million units to 11.9 million units. Disposable e-cigarettes make up over half (51.1%) of the e-cigarette/vape market with approximately 166.1 million units sold in 2022 (CDC Foundation 2023). These single-use cartridges are not recyclable and end up in the City's landfills and are littered.

2.2.5.6 Single-use Printer Cartridges

2.2.5.6.1 Proposed Measure(s)

Single-use printer cartridges are not recyclable within the City. Therefore, the City may prohibit the distribution, offer, provision, and sale of single-use printer cartridges within the City. The sale of printer cartridges made by manufacturers that have a take-back program as well as those that are remanufactured (i.e., reused) would be allowed.

2.2.5.6.2 Rationale for Proposed Measure(s)

Printer cartridges vary based on the type of printer supported. Laser printers, which are common in offices, use toner cartridges, and inkjet printers, which are commonly used at home, use inkjet cartridges. A third type of printer, called an ink tank printer, does not require the use of cartridges and instead includes integrated ink tanks that are refillable (HP 2023). Those are not included in the Program and are not discussed further.

Printer cartridges fall into the following three general categories based on how they are produced:

- Original equipment manufacturer cartridge: These are name brand cartridges that are produced by the same manufacturer as the printer being used. Some examples include brands like Hewlett Packard, Canon, Epson, and Xerox. Most large printer manufacturers have take-back programs for their brand of cartridge, but do not accept other brands (Ding et al. 2020).
- Remanufactured cartridge: These are original equipment manufacturer cartridges that have been professionally cleaned, refilled, and tested by a third-party remanufacturer for comparable print quality as the branded original cartridge. Remanufacturers rely on recycling programs to obtain the original spent cartridges, which reduces the number of cartridges that are disposed of and end up in landfills. Remanufactured cartridges typically cost less than original equipment manufacturer ones because they require less new components to produce. Remanufacturing is also referred to and sometimes better known as “refilling” (Sahni et al. 2010).
- Generic, compatible cartridge: This is a new printer cartridge built by a manufacturer other than the printer manufacturer, which uses new materials and/or components for production. These cartridges are designed to be compatible with a specific brand name product. These non-branded compatible cartridges are not accepted at printer manufacturer take-back recycling programs, which generally only accept their brand of cartridges.

Large printer and cartridge manufacturers have developed collection programs that allow customers to return used original equipment manufacturer printer cartridges at local collection locations and postal networks (Ding et al. 2020). In the case of Hewlett Packard, the recycled plastic from empty cartridges is used to create new original HP branded products, although the range of post-consumer recycled content in the Hewlett Packard toner cartridges is highly variable, from 0 to 80% (HP Planet Partners 2023). Canon USA collects Canon-branded ink cartridges with the help of FedEx offices, where customers can recycle used cartridges for free, and provides a mail back option if customers choose to provide postage (Canon USA 2023). Printer cartridges produced by major printer manufacturers with take-back recycling programs would be allowed under the Program.

In addition to manufacturer recycling programs, there is also a printer cartridge remanufacturing industry that serves to reduce downstream waste through recycling and remanufacture of printer cartridges. However, these remanufacturing companies are reliant on recycled cartridges in order to continue producing remanufactured cartridges. The generic, compatible cartridges are not used in the remanufacturing industry and therefore limit the supply of available recycled cartridges those remanufacturers have available to them²⁶.

The original printer cartridge manufacturer designs cartridges to be used once by the consumer, and the number of times a cartridge can be refilled by the manufacturer varies. One estimate is that printer cartridges can be refilled an average of between five and seven times before replacing, and up to 97% of the materials that make up a printer cartridge can be recycled or reused (A Greener Refill 2009 as cited in Ding et al. 2020). A used toner cartridge can be remanufactured up to four times depending on the type and condition (State of Washington Department of Ecology 2009). However, even with many

²⁶ Planet Green Cartridges, a remanufacturing company, provided a scoping comment, noting that the remanufacturing industry is being affected by the proliferation of single-use generic, compatible cartridges, which must be thrown away after use.

available recycling options, an estimated 375 million empty printer cartridges are thrown away in the United States every year (Vasudevan et al. 2012).

Unlike original equipment manufacturer and remanufactured printer cartridges, the generic compatible printer cartridges may not be able to be recycled for reuse. Unless a third-party company labels a printer cartridge as recyclable and accepts it in a take-back recycling program, these compatible cartridges would be considered single-use and would not be allowed under the Program. Once spent, single-use printer cartridges become plastic waste that ends up in landfills. Only printer cartridges with company take-back programs or those that are reused as part of the remanufacturing process would be allowed under the Program.

2.2.6 Formation of Working Groups and Additional Studies

As aspects of the Program are implemented, the City may form various working groups to evaluate the efficacy of implemented policies for reducing waste and explore additional ways to eliminate single-use products and waste in the City, including conducting additional studies to support implementation of additional regulations or projects not currently contemplated as part of the Program.

At this time, none of the working groups or studies described in this section are subject to CEQA and are not analyzed further in this PEIR. They are identified to clearly disclose that there may be additional elements in the future similar in nature to those currently proposed under the Program, and if they require CEQA analysis, they may tier from this PEIR.

2.2.6.1 Zero Waste in Food or Beverage Facilities

City departments may establish a working group along with external stakeholders to facilitate zero waste measures in restaurants. These measures may include, but not be limited to, the following:

- Review and revise Los Angeles building codes;
- Provide space planning guidelines to allow adequate storage space for reusables;
- Mandates for dishwashers or sufficient sinks for hand washing, garbage disposals, and on-site food waste processing equipment;
- Evaluate options for shared dishwashing and storage spaces and other equipment within malls, food courts, and areas with a high concentration of restaurants as a means of reducing costs; and
- Evaluate funding sources for building retrofits - to add dishwashers, sinks, storage space, etc.

2.2.6.2 Extended Producer Responsibility Program Support

The City may coordinate with EPR organizations, other jurisdictions, and businesses to review single-use reduction proposals; to design and help implement take-back programs that are adopted; and offer management/oversight services for take-back programs as needed.

2.2.7 Public Outreach and Education

The City may launch a city-wide public outreach and education campaign to raise awareness of plastic pollution and the impact of single-use products. The public relations campaign would educate residents and businesses on how to reduce their waste, encourage other sustainable practices such as reusing and

fixing products, and how to recycle and compost properly. The campaign would engage residents through various media to reinforce knowledge and behavior.

At this time, public outreach and education are not subject to CEQA and are not analyzed further in this PEIR. They are identified to clearly disclose that there may be additional elements in the future similar in nature to those currently proposed under the Program, and if they require CEQA analysis, they may tier from this PEIR.

2.3 Downstream Measures

As the City implements the various upstream measures to reduce the production and use of single-use products within the City as described in Section 2.1, it is anticipated that use of alternative reusable, compostable, and recyclable materials to plastics would increase throughout the City. Therefore, while the City anticipates a decrease in single-use materials entering the City's waste stream and requiring disposal in landfills, it also anticipates that it would need to increase its capacity to handle compostable and recyclable replacement materials. The City may also seek to develop new facilities to handle trash/waste to avoid landfill disposal; expand or upgrade existing facilities to increase and/or improve processing capabilities; and/or develop new facilities to enable the repair and reuse of materials (e.g., washing stations for reusable foodware, table linens). Therefore, the City may have the need to develop, expand, or upgrade the following new facilities and infrastructure:

- Facilities to handle compostable materials (i.e., "green bin facilities");
- Facilities to handle recyclable materials (i.e., "blue bin facilities");
- Facilities to handle trash/waste disposal (i.e., "black bin facilities");
- Bottle refilling/hydration stations; and
- Foodware and linen washing facilities.

The City may also coordinate with other local jurisdictions, agencies, and businesses to establish new and/or improved recycling and composting capabilities for currently unrecyclable single-use items (e.g., plastic films) and establish regional consistency for composting and recycling. At this stage of the Program, specific locations for these facilities have not been identified. For the purposes of the analysis of construction-related impacts provided in this PEIR, the City assumes that only one downstream facility would be constructed at a time (i.e., multiple sites would not be constructed simultaneously).

As part of the development of the *City of Los Angeles Solid Waste Integrated Resources Plan: A Zero Waste Master Plan* (SWIRP; City of Los Angeles 2013), LASAN conducted an intensive stakeholder-driven process that included 256 public outreach meetings with over 3,000 stakeholders. The Recovering Energy, Natural Resources, and Economic Benefit from Waste for Los Angeles Plan (also known as the RENEW LA Plan) set the City on the path to zero waste, leading to the development of the SWIRP. The SWIRP included detailed assessment of the City's current solid resources facilities, and through numerical modeling and facility analysis, projected the likely range and size of new facilities that may be required to obtain the City's goal of becoming zero waste. The downstream Program description provided in this section draws from the SWIRP for the types, sizes, and capacities for facilities that may be required by successful implementation of the Program. Specifically, Section 4 of the Phase 2 Report in the SWIRP is used as the source supporting the description of downstream Program elements, and as

substantial evidence supporting the analysis of impacts of construction and operation of downstream facilities (Catalyst 2024). The SWIRP is incorporated by reference in this PEIR according to the State CEQA Guidelines Title 14 Section 15150. It is available online at www.lacitysan.org/ceqa, and a hard copy is available in the City of Los Angeles, Public Works Building, 1149 S. Broadway Los Angeles, CA 90015.

2.3.1 Green Bin Facilities

Green bin facilities are those that process items that are allowed in the City’s green bins, including yard trimmings, food scraps, and other compostable materials (i.e., food-stained paper; paper egg cartons, napkins, towels, plates, and to-go boxes; pizza boxes; and wooden and 100% fiber-based utensils).

2.3.1.1 Anaerobic Digestion Facilities

Anaerobic digestion converts organic waste to energy using bacteria to break down waste to produce biogas, which consists primarily of methane and carbon dioxide. These facilities process food scraps, food-soiled paper, and other organics. With a proper feedstock, these reactions can reduce the volume of waste by 70%, provide energy, and residuals can be sent to a compost facility. A typical anaerobic digestion facility would process 200 to 500 tons of waste per day. A new facility would have a footprint of approximately 5 to 10 acres (City of Los Angeles 2013).

2.3.1.2 Aerobic Composting and Mulching Facilities

An aerobic composting facility collects, grinds, mixes, piles, and supplies sufficient moisture and air to organic materials to speed natural decay. The finished product of a composting operation is compost, which is suitable for incorporating into topsoil and for growing plants. Compost technologies include the following:

- Windrow – compostable material is piled in long rows and regularly turned to enhance aerobic activity and control temperature and moisture.
- In-vessel – compostable material is placed in enclosed reactors (metal tanks, concrete bunkers or plastic tubes or “ag bags”) where airflow and temperature can be controlled through perforated pipes buried in the material.
- Aerated static pile – compostable material is placed in piles on perforated pipes under removable covers, and fans are used to push or pull air through the pipes to control the composting process.

Yard trimmings can be processed into mulch²⁷ at a chip-and-grind/mulching facility. This type of facility typically includes minimal processing (chipping, grinding, and possibly screening) of the feedstock to produce a mulch product or to prepare wood as fuel for biomass power plants.

A typical composting and mulching facility processes 100 to 1,000 tons of material per day. A new facility would have a footprint of approximately 15 to 60 acres (City of Los Angeles 2013).

²⁷ Mulch is a shredded or chipped organic material placed on top of soil as a protective layer.

2.3.2 Blue Bin Facilities

Blue bin facilities are those that process source-separated recyclables, including materials recovered from LASAN’s blue bin program and source-separated commercial recycling. Acceptable items in the City’s blue bins include glass bottles and jars, aluminum/tin foil, cardboard boxes, steel and tin cans, scrap metal, mixed paper, and plastics with resin identification codes 1, 2 and 5. Other facilities for source-separated materials are also included in this category, including Resource Recovery Centers for self-hauled materials and construction and demolition debris processing facilities.

2.3.2.1 Clean Materials Recovery Facilities

Clean MRFs receive and process source-separated recyclables from residential curbside blue bin recycling programs and commercial recycling programs. Clean MRFs process the materials through receiving, sorting, baling, storing, and shipping of the City-collected materials into recyclable material and contamination and preparing the recyclables for marketing by commodity type. Clean MRFs typically recover traditional recyclable materials, including newspaper, cardboard, mixed paper, aluminum cans, bi-metal cans, plastic bottles, mixed plastics, and glass containers. Typical contaminants include food scraps, auto parts, yard trimmings, wood, dirt, and garbage.

A typical clean MRF would process 50 to 600 tons of blue bin material per day. A new facility would have a footprint of approximately 5 to 10 acres (City of Los Angeles 2013).

2.3.2.2 Resource Recovery Centers/Parks

Resource Recovery Centers are small centers for drop-off of hard to recycle items, including mattresses, large blocks of EPS foam, and textiles. Resource Recovery Parks (neighborhood take-back centers) are places where materials can be dropped off for donation or buyback and co-locates reuse, recycling and composting, processing, manufacturing, and distribution activities. They are often located in industrially zoned areas.

A typical resource recovery center processes 10 to 200 tons of material per day. A new facility would have a footprint of approximately 2 acres (City of Los Angeles 2013).

2.3.2.3 Construction and Demolition Materials Processing Facilities

Construction and demolition materials processing facilities receive and process construction and demolition debris, including asphalt, concrete, Portland cement, brick, lumber, wallboard, roofing material, ceramic tile, plastic pipe, and associated packaging. Typical commodities produced include gypsum, clean wood, ferrous metal, aluminum, and inert material (including engineered fill).

A typical construction and demolition materials processing facility processes 50 to 500 tons of material per day. A new facility would have a footprint of approximately 10 acres (City of Los Angeles 2013).

2.3.3 Black Bin Facilities

Black bin facilities are those that process residual waste from residential black bins, commercial solid waste sources, or residual waste from processing facilities. Black bin facilities process materials that are not recyclable or compostable in the City (i.e., garbage/trash).

2.3.3.1 Mixed Material Processing Facilities

A mixed material processing facility (also known as a dirty MRF) sorts recyclable material from residual waste from residential and commercial sources. These facilities can also be adapted to sort or remove different materials to prepare residual waste for composting, advanced thermal recycling, and other alternative technologies. Desired loads include residual waste from residential and commercial generators, and undesirable loads include concentrated amounts of construction and demolition materials or concentrated amounts of wet materials, such as restaurant food.

A typical mixed material processing facility processes 200 to 400 tons of waste per day. A new facility would have a footprint of approximately 5 to 7 acres (City of Los Angeles 2013).

2.3.3.2 Advanced Thermal Recycling Facilities

Advanced thermal recycling uses complete combustion of organic carbon-based materials in an oxygen-rich environment. The combustion bottom ash and the combustion fly ash, along with the air pollution control system fly ash, are treated to produce products that can be beneficially reused. Specifically, advanced thermal recycling facilities use residual waste from residential or commercial generators, or other solid waste facilities, to produce energy. The hot exhaust gases flow through a boiler, where steam is produced for driving a steam turbine-generator, producing electricity. Exhaust air is treated with advanced pollution control technologies that remove air pollutants to meet clean air emissions standards, and cooled exhaust gas flows through emissions control systems before being exhausted through stacks into the atmosphere. By-products include the recovery of ferrous and non-ferrous metals from the bottom ash. The fly ash and bottom ash can be separated, and the bottom ash can be reused as landfill cover, processed for road base, or other beneficial uses.

A typical advanced thermal recycling facility processes 500 to 2,000 tons of waste per day. A new facility would have a footprint of approximately 5 to 15 acres (City of Los Angeles 2013).

2.3.3.3 Non-combustion Thermal Technologies Facilities

Non-combustion thermal technologies (including plasma arc gasification, gasification, and pyrolysis) treat waste producing a synthesis gas that can be used to produce electricity or can be converted into a transportation fuel. These facilities use an external heat source to heat waste to high temperatures in a low oxygen environment. This causes the waste to decompose and produce synthesis gas. Synthesis gas consists primarily of hydrogen, carbon monoxide, and carbon dioxide. With a proper feedstock, this process can reduce the volume of waste by 80% and produces more energy than is required for processing the materials. Ideal feedstock for these facilities includes mixed paper, plastics, and other dry organics.

Gasification²⁸ is used at the commercial scale for coal, and plasma arc technology²⁹ is used at the commercial scale to treat hazardous and radioactive wastes. These technologies are still emerging as methods to treat residual waste.

A typical non-combustion thermal technology facility processes 100 to 500 tons of waste per day. A new facility would have a footprint of approximately 2 to 7 acres (City of Los Angeles 2013).

2.3.4 Water Bottle Refilling/Hydration Stations

The City may implement measures to require or incentivize the installation of water bottle refilling/hydration stations at City-owned facilities and on City-owned property throughout the City. These stations may include upgrades of existing water fountains to include a water bottle refilling station or installation of new stations.

2.3.5 Foodware and Linen Washing Facilities

The City may implement measures to require or incentivize the development of washing facilities (for foodware, including reusable bottles and linens) within restaurants, food courts, or food truck locations, or at centralized locations throughout the City.

2.3.6 Regional Market Development - Increase Material Reuse and Recycling by Manufacturers and Businesses

The City may coordinate with other local agencies, jurisdictions, and businesses, including material recycling, composting, and disposal companies/facilities, to help establish improved standards and capability for recyclability, composability, and reusability within the City and regionally. This regional market development would expand the City's ability to recycle and reuse currently unmarketable single-use items, such as plastic films, clamshells, and black plastics and implement programs or coordinate with other regional agencies and jurisdictions to improve upon the region's ability to recycle and reuse various items.

The City may form a working group composed of other local jurisdictions, solid resources management organizations, and major economic development organizations to do the following:

- Survey existing regional manufacturers about their current feedstocks, feedstock specifications and purchase volumes, suppliers, and the possibility of converting from virgin to recycled feedstock; identify barriers to conversion; assist in providing feedstock samples/streams and identifying suppliers; coordinating help and support to pilot projects;

²⁸ Gasification is the thermal conversion of organic carbon-based materials that involves the partial oxidation through the use of an indirect, external source of heat, high pressure, and in a limited supply of air/oxygen (less than is needed for complete combustion).

²⁹ Plasma arc technology uses an electrical discharge to heat gas, typically air, oxygen, nitrogen, hydrogen, or argon, or combinations of these gases. The heated gas, or plasma, can then be used for welding, cutting, melting, or treating waste materials.

- Launch pilot programs with small start-up businesses that seek to utilize materials from the City's waste stream into marketable products; identify barriers; and coordinate and help support pilot projects; and
- Allocate funding into uses for major waste stream components such as low-grade plastics (i.e., resin identification codes 3, 4, 6, and 7) that lack markets.

2.3.7 Waste Standards Consistency

Similarly, the City may coordinate with other local agencies, jurisdictions, and businesses, including material recycling, composting, and disposal companies and facilities, to help establish regional consistency in recyclable and compostable standards for all disposable products of any material.