



State of Oregon Department of Environmental Quality

Rule Concept: Recycling Material Acceptance Lists, Part Two

Plastic Pollution and Recycling Modernization Act (SB 582, 2021)
Rulemaking Advisory Committee Meeting 4 of 5, Rulemaking 1

Dec. 28, 2022

Background

The current rulemaking will establish Oregon's first statewide recycling material acceptance lists. Two separate acceptance lists will be developed:

1. The **Local Government Recycling Acceptance List**, containing materials that regulated local governments providing recycling service under the Opportunity to Recycle Act must provide recycling opportunities for (potentially through on-route collection, at depots, or both), and
2. The **PRO Recycling Acceptance List**, containing materials that producer responsibility organizations commonly known as/or PROs must provide additional collection and recycling opportunities for, such as at depots.

DEQ provided a partial set of [recommendations](#) to the Rulemaking Advisory Committee for discussion at its meeting on Nov. 9, 2022. At that time, several materials remained under evaluation and DEQ had not yet prepared recommendations for including them on acceptance lists. This memo updates the earlier document by describing DEQ's recommended placement of those outstanding materials.

Appendix 1 consolidates the recommendations from the two memos into a comprehensive recommendation for both acceptance lists. For illustrated versions of these lists in [English](#) and [Spanish](#) see a background document from the Dec. 15, 2022 Recycling Council meeting.

Concepts for discussion at Jan. 11, 2023 RAC meeting

DEQ seeks feedback from Rulemaking Advisory Committee members on the following:

I. Rule concept for discussion: Additions to the Local Government Recycling Acceptance List

DEQ is recommending that the Environmental Quality Commission, as authorized under ORS 459A.914(1)(a), designate the following materials as "materials collected to provide the opportunity to recycle." Such a designation will require regulated local governments to provide recycling opportunities for them. These materials are in addition to those recommended in a prior rule concept (dated Oct. 27, 2022). See Appendix 2 of this document for more detail about individual materials.

1. [Nursery \(plant\) packaging \(e.g., pots, trays\) made of HDPE \(#2\) or PP \(#5\)](#)
Recommended as required for on-route and depot collection; suitable for commingled collection (USCL)
2. [Paper "cans" with metal ends](#)
Recommended as required for on-route and depot collection; suitable for commingled collection (USCL)

3. [Large appliances, including those with refrigerants](#)
Recommended as required for depot collection only; not suitable for commingled collection
4. [Glass packaging \(e.g., bottles and jars\)](#)
Recommended as required for on-route collection from non-residential generators only, and only in the Metro watershed. Separately, also recommended for inclusion in the PRO Recycling Acceptance List (see Rule Concept II below).

Materials designated by the Commission as suitable for commingled recycling are automatically placed on the Uniform Statewide Collection List (USCL). That designation *allows* local governments to collect them in a commingled manner, although commingled collection is not required. The consequences to local governments of these designations are detailed further in DEQ background paper “[Oregon’s Opportunity to Recycle Requirements Relative to Proposed Materials Acceptance Lists](#)”.

II. Rule concept for discussion: Additions to the Producer Responsibility Organization Acceptance List

DEQ is recommending that the Commission, as authorized under ORS 459A.914(1)(b), designate the following materials as “covered products of which a producer responsibility organization must provide for the collection through recycling depot or mobile events as provided in ORS 459A.896.” These materials are in addition to those recommended in a prior rule concept (dated Oct. 27, 2022). See Appendix 3 of this document for more detail about individual materials.

1. [Glass packaging \(e.g., bottles and jars\)](#)
2. [Block white expanded polystyrene](#)
3. [PE and PP lids](#)
4. [HDPE package handles \(e.g., 6-pack handles\)](#)
5. [Single-use pressurized cylinders \(e.g., propane\)](#)

Additional topics for potential discussion at Jan. 11, 2023 RAC meeting

Two materials that were noted as “still under active consideration” in the prior rule concept memo (Oct. 27, 2022) are not recommended for inclusion in acceptance lists at this time. See Appendix 4 for more detail about these materials.

Nursery (plant) containers made of resins other than HDPE (#2) or PP (#5).
DEQ is not recommending acceptance of these types of plastic nursery packaging.

PET thermoform packaging (e.g., berry clamshells), not included in other recommended classes of materials.

DEQ is not recommending acceptance of most PET thermoform packaging at this time.

Appendix 1: Consolidated Recycling Acceptance Lists

Combining the rule concepts from this memo with those in the Oct. 27, 2022 memo generates the first complete look at DEQ’s recommended rule concepts for recycling acceptance lists.

The consolidated Local Government Recycling Acceptance List, as currently proposed, includes the following materials:

Materials	Required for On-Route Collection	Required for Depot Collection	Suitable for Commingled Collection (USCL)
Corrugated cardboard: uncoated or coated with recycle-compatible coating. Includes pizza boxes.	✓	✓	✓
All kraft paper (such as paper bags, mailers)	✓	✓	✓
Uncoated paperboard packaging (e.g., cereal, cracker, and medicine boxes)	✓	✓	✓
Polycoated cartons (e.g., milk cartons), aseptic cartons, and polycoated paper cups	✓	✓	✓
Molded pulp packaging (but not food serviceware or flower pots)	✓	✓	✓
Tissue paper (packaging, not sanitary)	✓	✓	✓
Non-metalized gift wrap	✓	✓	✓
High-grade office paper	✓	✓	✓
Newspaper/newsprint	✓	✓	✓
Magazines, catalogs and similar glossy paper	✓	✓	✓
Telephone directories	✓	✓	✓
Other printing and writing paper (e.g., envelopes, “junk mail”, cards)	✓	✓	✓
Paperback books	✓	✓	✓
Aluminum food and beverage cans	✓	✓	✓
Steel and bi-metal cans, including empty/dry metal paint cans	✓	✓	✓
Scrap metal less than 10 pounds in weight and 18” in length – no sharp items (e.g., knives) or “tangles” (bicycle chains, wire, etc.)	✓	✓	✓
Other scrap metal, including appliances such as clothes washers, refrigerators, and stoves		✓	
Paper “cans” with metal ends (e.g., snack, nut and coffee cans)	✓	✓	✓
Plastic bottles and jugs, 6 ounces and larger: PET (#1) (clear only); natural and colored HDPE (#2) and LDPE (#4); clear and colored PP (#5). Caps OK if screwed on.	✓	✓	✓
Plastic tubs (e.g., cottage cheese), 6 ounces and larger: PET (#1), HDPE (#2), LDPE (#4) and PP (#5)	✓	✓	✓

Materials	Required for On-Route Collection	Required for Depot Collection	Suitable for Commingled Collection (USCL)
Nursery (plant) packaging: HDPE (#2) and PP (#5)	✓	✓	✓
Plastic buckets, pails, storage containers and other packaging that fits loosely in the generator's provided on-route collection container: HDPE (#2) and PP (#5)	✓	✓	✓
Clear plastic cups: PET (#1) and PP (#5)	✓	✓	✓
Glass packaging (bottles, jars): Metro washed only	✓ (non-residential sources only)		
Motor oil		✓	

The consolidated PRO Recycling Acceptance List, as currently proposed, includes the following materials:

- Glass packaging
- Steel and aluminum aerosol packaging
- Single use pressurized cylinders (e.g., propane)
- Aluminum foil and pressed foil products
- Shredded paper
- Polyethylene film
- Plastic buckets, pails and storage containers (HDPE and PP)
- Block white expanded polystyrene
- PE and PP lids
- HDPE package handles (e.g., 6-pack handles)

Appendix 2: Additions to the Local Government Recycling Acceptance List

Nursery (plant) packaging (e.g., pots, trays) made of HDPE (#2) or PP (#5)

Recommended as required for on-route and depot collection; suitable for commingled collection (USCL)

Nursery pots and trays are generated by both households and some nonresidential waste generators. Users would be asked to remove dirt and plant materials prior to recycling, although it should be noted that residual dirt or soil stuck to the inside of a pot is readily removed through the washing process used by most plastics reclaimers.

Most nursery packaging is made from one of three resins: HDPE (#2), PP (#5) and PS (#6). DEQ is recommending inclusion of HDPE and PP nursery packaging in the Uniform Statewide Collection List, but not PS (#6) or other materials (LDPE, black PET, molded pulp, and other materials are also sometimes used). This is consistent with many of DEQ's other recommendations specific to plastics; users of Oregon's future recycling system would, in the future, sort plastics primarily according to resin code.

Processing

HDPE and PP packaging tends to be more rigid and travels through a material recovery facility (MRF), with less flattening. In contrast, PS and LDPE plant packaging is more likely to flatten and end up on the fiber line, where it can contaminate the quality of fiber bales. The rigid shape of smaller HDPE and PP nursery packaging also makes it easier to be separated on a container line. Large HDPE and PP containers (e.g., pots for large trees) are very similar to plastic buckets and would be manually separated in the pre-sort area of the MRF where materials are first screened.

Black pigments used in most nursery packaging poses a significant challenge to commingled processing facilities, because conventional optical sortation technology currently installed at some Oregon MRFs cannot effectively recognize resin types for black plastics. However, recent advancements in optical sortation technology and artificial intelligence/robotics are starting to change that. Bulk Handling Systems (Eugene) reports availability of a technology that can effectively sort approximately 80 percent of black nursery plastics. Other technology vendors also have solutions under development or on the market today. Technology effectiveness is expected to improve over time. Like other plastics, DEQ expects that only some Oregon MRFs would separate these plastics into commodity grades, while others would pass them on with other mixed plastics (unsorted) to another MRF or a plastics reclaimer for additional sortation.

Markets

Markets are also stronger for HDPE and PP than they are for PS. Regional reclamation capacity for these materials includes Denton Plastics (Portland), Merlin Plastics (British Columbia) and EFS (Alberta). All three companies have encouraged DEQ to expand collection of these materials. While Denton also expressed interest in accepting PS nursery packaging in the future, neither Merlin nor EFS recycle the PS nursery packaging they receive at present.

Environmental Health and Safety

HDPE and PP nursery packaging also scored a "3" against the criteria of environmental health and safety considerations. This largely reflects the potential for improper management during reclamation, especially if exported. New disposition requirements in the Recycling Modernization Act coupled

with proposed standards for “responsible end markets” significantly reduces the potential for harm associated with exports of plastic.

Additional Considerations

DEQ’s recommendation is informed by consultation with multiple Oregon MRFs, as well as several discussions with the Association of Oregon Nurseries. The MRFs generally expressed a technical ability to separate HDPE and PP and send it to a plastics re-processor for additional sortation. The economic value is relatively low for the MRF, but those costs can be recouped through the new Processor Commodity Risk Fee (paid by the PRO(s) to the MRFs). The Association of Oregon Nurseries expressed a preference for on-route collection over exclusive reliance on depot collection.

Nursery packaging is already accepted by on-route programs in Bend and the Metro region. These programs would discontinue acceptance of polystyrene nursery packaging, while programs in other areas of the state would expand collection to accept these materials.

Paper “cans” with metal ends

Recommended as required for on-route and depot collection; suitable for commingled collection (USCL)

This packaging format is used in certain food product applications, including ready-to-bake rolls, chips, nuts, coffee and tea. Non-food applications (e.g., caulk tubes) would not be accepted unless the packaging can be prepared clean and dry.

Both the steel and paper fractions are recyclable, but there is no readily available and convenient method of separating those fractions.

Processing and Markets

Sonoco, the largest domestic manufacturer of this packaging format, has commissioned [testing](#) of this material at several MRFs and also provided DEQ with [multiple letters](#) from steel end markets indicating a willingness to accept this material.

If Oregon places this material on the Uniform Statewide Collection List, an expected outcome is that a significant percentage of the packages will sort onto the container (3-D) sortation line, where many will be removed via magnet and shipped out with the ferrous metal bale (steel cans). From there, materials will either be shredded (with most paper removed and sent to landfill) prior to being sent to a steel mill, or will be sent directly to a steel mill, where any remaining fiber will be burned off.

Paper cans that end up on the fiber recovery line are accepted by some paper mills and prohibited by others; a growing number of mills are capable of recovering the fiber fraction. A life cycle assessment commissioned by Sonoco suggests that for most environmental outcomes, the steel recycling pathway is preferable. Fortunately, the three-dimensional shape of these packages support Sonoco’s claim (as evidenced through field testing) that most of these containers will flow to the container line, and from there go to steel recovery.

Additional Considerations

One outstanding challenge with this material is a potential trade-off between environmental benefits and veracity. DEQ expects that less than 40% (by weight) of this packaging format, once properly prepared and placed in a commingled cart, will actually be recycled. Relatively high yield loss is due primarily to the paper fraction of the can being landfilled or burned, as well as some loss of materials in the MRF (not all sort onto the 3-D container line, and not all that do are captured by magnets).

Acceptance of this material exposes Oregon’s recycling system to some reputational risk if recycling outreach or promotion is overly broad and implies that everything placed in the cart will be recycled. However, if the material is *not* accepted for recycling, very little of the steel fraction will be recycled. DEQ explored the potential trade-offs between environmental benefits and veracity with members of the Oregon Recycling System Advisory Council at its October 2022 meeting. Members that voiced an opinion were generally supportive of including this material on the Uniform Statewide Collection List, but asked for additional documentation regarding MRF testing ([provided](#)). Clear and factual disposition reporting and program promotion can mitigate concerns that the recycling system might be accused of misleading the public.

Large appliances, including those with refrigerants

Recommended as required for depot collection only; not suitable for commingled collection

Large appliances contain significant quantities of ferrous (and sometimes non-ferrous metal), benefit from a moderately robust network of private recyclers, and are already banned from landfill disposal in Oregon (ORS 459.247). They are not suitable for commingled collection, and are not a covered product. Some appliances contain refrigerants, which require additional handling.

Collection

DEQ delayed preparing a recommendation for this class of materials while it researched existing recovery infrastructure, focusing on current acceptance lists at recycling depots providing the opportunity to recycle at a disposal site or another location more convenient to the population being served (ORS 459A.005(1)(a)(A)). While most of these locations appear to accept appliances without refrigerants, there are several that exclude appliances with refrigerants. For example, many solid waste transfer stations in Douglas County do not accept appliances, and a handful of facilities in Oregon, such as the Lake County Landfill and Vernonia Transfer Station, appear to accept appliances but not if they contain refrigerants.

In cases where a recycling depot does not accept appliances (with or without refrigerants), DEQ conducted additional research to see if there was “another location more convenient to the population being served” that accepts them. With only a few exceptions, DEQ identified such a location. Thus, with very few exceptions, the residents and businesses of Oregon are provided with a location to safely and properly recycle this material. Formally designating this material to the local government acceptance list (depots only) will impose a small regulatory burden on a small number of disposal site operators. However, they are allowed to recover their expenses by charging a fee to accept the material. Indeed, this is how practically all other recycling depots in Oregon accept refrigerators and other appliances containing refrigerant.

Glass packaging (e.g., bottles and jars)

Recommended as required for on-route collection from non-residential generators only, and only in the Metro wasteshed

Collection

Glass bottles and jars are currently accepted for recycling by most local government programs. While practically all accept them at depots, not all communities collect them on-route. Collection programs operated by local governments or their service providers do not typically distinguish between deposit (e.g., beer) and non-deposit glass.

Although DEQ is not recommending that any local government be required to offer on-route residential glass collection, local governments will continue to be able to do so voluntarily.

Glass poses several unique challenges in the recycling system. Glass is easily broken, and regional paper mills have expressed strong concerns regarding receiving broken glass. Glass is also expensive to remove if commingled with other materials, and suffers higher yield loss if collected commingled. For these reasons, most collection programs in Oregon have kept glass separate from other materials. Oregon MRFs interviewed by DEQ expressed a strong desire to maintain that separation.

End Markets

Glass is also heavy, making it relatively expensive to transport for processing or to end markets. Most glass collected in Oregon goes to a beneficiation plant (Glass-to-Glass) in Portland, which removes contaminants and fines (very small fragments), and sorts the remaining glass cullet by color. Color-sorted cullet is sold primarily to Owens-Illinois (dba O-I Glass) for use in bottle plants in Portland and Kalama, although significant quantities are shipped to end markets in California and other states. Payments to collectors for this glass are very low, and do not cover most costs associated with collection or transport. For this reason, glass has been one of the more challenging materials for local governments to justify collecting, especially where transportation distances are high.

Environmental Considerations

DEQ and others have conducted extensive modeling of the life cycle environmental impacts for a variety of glass recycling and disposal options. Screening-level results from a recent (2022) DEQ analysis can be viewed [here](#). Compared to most other recyclables, the environmental benefits of recycling glass (on a per-ton basis) are relatively low.

One notable exception would be if glass were recycled into pozzolan, a material that can displace cement in the production of concrete. Several studies suggest that recycling of glass into pozzolan can yield significantly higher environmental benefits (especially reduction of greenhouse gases) than conventional bottle-to-bottle or bottle-to-fiberglass recycling. This is largely due to the very high impacts associated with producing cement. Pozzolan production also suffers lower yield loss and operates at lower temperatures (requiring less energy and resulting in lower emissions).

Unfortunately, there is no commercial pozzolan production (from glass) in Oregon or Washington at this time. DEQ's analysis also shows that "recycling" of glass into an aggregate displacement, as is currently practiced in a few parts of Oregon, generates few if any environmental benefits relative to landfilling.

Societal Costs

Even as current recycling of glass (to bottles or fiberglass) generates relatively low benefits to the environment, collection of glass is not without impact – particularly in communities where glass is collected in a dedicated truck. Some collection companies prefer to collect glass in a dedicated truck because of the operational flexibility compared to a split truck. Split truck collection (with one compartment for glass and a larger compartment for commingled recyclables) can create logistical challenges and inefficiencies when one side of the truck fills before the other, forcing the collection provider to stop operations and leave the route to empty its truck before it is full.

DEQ's environmental assessment found that, outside of the Metro region, on-route collection of glass from residential sources in a dedicated truck may result in social costs (costs to society associated with pollution and resource depletion) roughly equal to the social costs associated with collecting the glass in a garbage truck and delivering it to landfill. Collecting the glass in a split truck is likely preferable to landfilling, although there is variability based on route dynamics and relative sizes of the split compartments. In the Metro region, collection and recycling fares marginally better, as an end market is closer and landfills more distant.

Among all on-route collection options, the scenario that resulted in the lowest social costs (highest benefit) involved collection of glass from nonresidential sources in the Metro region. This option ranks well because the transport distances to end markets are low, and on-route collection can fill a truck with fewer vehicle miles, given the propensity of bars and restaurants to be in close proximity to each other and to generate larger volumes of glass at each site.

Trade-Offs Between On-Route and Depot Collection

Importantly, DEQ's assessment also found that depot or drop-off options for glass provided superior reductions (relative to on-route collection) in social costs for each ton of material collected. Depot scenarios with more locations generated the best results, as their higher convenience translates into fewer vehicle miles driven by users, and higher overall recovery. While depot collection results in lower tonnages collected for recycling than on-route collection, evidence from Tacoma and Medford suggests that a moderate density of conveniently located depot sites can collect 70-90% of the glass that on-route collection would. The higher benefits per ton compensate for the lower tonnage to make depot collection of glass appear to deliver superior environmental outcomes.

This finding, coupled with numerous Oregon communities not currently collecting glass on-route, leads DEQ to recommend requiring inclusion of glass in the PRO Recycling Acceptance List (for collection at depots) in most areas of Oregon. One exception to this recommendation involves nonresidential generators in the Metro region, for which DEQ recommends requiring local governments provide on-route service as part of their Opportunity to Recycle service.

Additional Considerations

In making this recommendation, DEQ also recognizes several other important dynamics:

- Local governments are free to collect glass on-route even if not required by administrative rules, as long as they do not commingle the glass with other materials. DEQ expects that, due to public demand, many local governments currently collecting glass on-route might continue to do so.
- As a covered product, local governments are eligible for compensation from the PRO for transporting glass more than 50 miles to a processor or responsible end market, even if there is no mandate on local governments to collect. MRFs will be separately compensated by PROs for the removal of glass that enters the commingled system as a contaminant.
- MRFs might prefer that local governments maintain on-route collection of glass, in anticipation of households losing the convenience of on-route service placing their glass in the commingled cart, thereby increasing contamination. This dynamic, were it to happen, is largely one of economic consequence (as opposed to environmental), and would be compensated by the PRO(s). MRFs could also encourage on-route collection by offering a price premium for loads from communities that collect glass on-route.
- Similarly, PROs might prefer local governments to collect glass on-route if this would reduce their obligation to collect glass at PRO depots. Please see the discussion of glass under Section II of this rule concept document for more discussion of this topic.
- The potential expansion of Oregon's bottle bill to include wine and liquor bottles would further reduce the cost-effectiveness of both on-route and depot glass collection, with more pronounced impacts for on-route service. If wine and liquor bottles are added to the bottle bill and redeemed at moderate to high rates, less will be separated for collection via local government (or PRO) programs. Less collection translates into less recycling, and lower environmental benefits associated with that recycling. But lower volumes do not reduce the impacts of on-route collection by a proportional amount. For example, a 30% reduction in glass set-outs will reduce environmental benefits by 30%, but may reduce the impacts of collection (fuel use, etc.) by a smaller degree.

- The eventual development of a pozzolan end market would improve environmental and social outcomes from recycling glass, and might justify an approach that seeks to maximize tonnage collected. In this case, DEQ might consider recommending universal on-route collection in the future.

Appendix 3: Additions to the Producer Responsibility Organization Acceptance List

Glass packaging (e.g., bottles and jars)

As described in Appendix 2, [screening-level modeling](#) by DEQ suggests that depot collection of glass may deliver superior social benefits (per ton of glass collected) to on-route service. Achieving these benefits requires a network of drop-off sites more convenient than existing depots (solid waste transfer stations, etc.) can provide.

DEQ expects that many local governments will prefer to maintain on-route collection of glass in their communities. In rule concept "[Convenience Standards, Collection Targets and Performance Standards for PRO Recycling Services](#)" (see rule concept V(2)) DEQ details a mechanism that would allow PROs to satisfy their convenience standard with a smaller number of depots if alternative collection opportunities are provided, as described in an approved program plan. PROs could choose, for example, to offer an incentive payment to cities that consider voluntarily offering on-route collection of glass, in lieu of establishing a robust network of depot sites in those communities.

Block white expanded polystyrene

Block white expanded polystyrene (EPS) is a high-volume material that poses some particular challenges to the solid waste system. Its low density means that transport (in a recycling or garbage vehicle) can be very inefficient (high impacts per ton) relative to most other materials. Densification of the material can allow higher tonnages to be transported in a single truck. The large volume of some EPS packaging also creates practical challenges for households and businesses who may find it difficult to fit into their garbage container. The material is also somewhat brittle and easily broken into small pieces that can readily become windborne litter.

End Markets: Mechanical Recycling (Tillamook County example)

Recycling options for EPS are limited but emerging. From the mechanical recycling standpoint, recovered EPS can be ground (or pulverized), reheated and reformed into new products. End markets utilizing mechanical recycling will typically handle material in densified form. Tillamook County has supplied a mechanical recycler of EPS with densified post-consumer materials for several years. The materials are collected at three solid waste recycling depots in different areas of the county. The County drives a trailer-mounted mechanical densifier to these sites and periodically densifies them into "bricks". Once a cargo container is filled with palletized bricks, they are shipped to a mechanical recycler in Malaysia. This recycler reclaims the EPS into polystyrene for use in manufacturing products such as picture frames. This particular company also has a similar operation in southern California.

End Markets: Chemical Recycling

A closer chemical recycling option involves the Agilyx pyrolysis facility in Tigard. Agilyx recovers EPS from its own on-site depot, as well as a network of collection locations that include the Metro South Transfer Station in Oregon City and St. Vincent de Paul in Eugene. The pyrolysis unit converts the EPS to styrene monomer and some co-products.

The Recycling Modernization Act requires that PROs, where practicable, manage materials "according to the hierarchy of materials management options under ORS 459.015(2)" (ORS 459A.896(2)). That hierarchy gives preference to options that deliver the greatest net reduction in environmental impacts where quantified. Where impacts are not quantified, it gives preference to mechanical recycling over non-mechanical recycling methods such as pyrolysis. A PRO wishing to direct material to a non-mechanical recycling pathway is required to provide an assessment of the

environmental impacts as part of its program plan or program plan amendment (ORS 459A.875(2)(a)(I)).

Environmental Considerations

DEQ has conducted a screening level lifecycle assessment of many different methods of managing this material at end of life. Study results can be viewed [here](#). For most types of environmental impacts, this analysis found that mechanical recycling is preferable to chemical recycling, even when the higher impacts associated of transporting densified EPS to California (by truck) or Malaysia (by truck and ocean freighter) are taken into account. DEQ's analysis found that the reasons for this are twofold. First, the mechanical recycling process itself uses less energy and produces fewer emissions than pyrolysis (mechanical grinding requires less energy than depolymerizing polystyrene back into a monomer). Second, mechanical recycling produces and thereby displaces polystyrene, which is more impactful to produce than styrene monomer. Additionally, the chemical recycling process suffers from higher rates of yield loss, as not all of the polystyrene is converted back into styrene.

Collection and Densification

EPS is not well-suited to commingled collection, given its propensity to break into small fragments when subject to mechanical forces. Depot collection appears to be a preferred collection option. Given potential contamination with a look-alike material (expanded polyethylene), depots are best staffed, in order to screen out potential contaminants. Alternatively, screening can occur just prior to densification at the hopper.

DEQ's analysis found that a moderate density of drop-off locations, one that is convenient for the average user to deliver this material, can yield a reduction in environmental impacts, relative to collection in on-route garbage service and landfilling. DEQ's analysis assumed that collected materials would be densified prior to being transported a significant distance and that mechanical densification was used as opposed to thermal densification (which may result in air pollution from the heating and melting of the EPS). In all cases, EPS collection should occur indoors and handling should be conducted in a manner that reduces breaking and release of fragments to land, air, or water.

Economic and Other Considerations

Cascadia Consulting Group conducted economic modeling to include EPS for recycling in a system of depots of approximately 146 location sites spread throughout the state. The modeling estimated increased costs to the PRO(s) at \$550,000 per year. This estimate assumed acceptance at a variety of sites (existing depots, new depots, some return-to-retail), with compensation provided to acceptance site operators for space and labor, and a network of six densifiers (several of which could be mobile) located across the state. Actual costs are acutely sensitive to collection volumes, which can vary greatly and have significant uncertainty. Additionally, the future use of EPS in commerce also remains uncertain. Several large companies including Walmart have committed to eliminate its use in packaging for its private brands. Meanwhile others argue for its continued use due to superior product protection.

PE and PP lids

Polyethylene (both LDPE and HDPE) and polypropylene lids are used to seal tubs such as those containing cottage cheese, sour cream, and yogurt. These resins are highly recyclable. Collection of lids would also increase plastic recycling quantities, and help the PRO(s) achieve plastics recycling goals.

The primary challenge with lids is their flat shape. If collected commingled, many lids would likely flow to the fiber recovery line, potentially contaminating the paper stream and requiring additional removal and separation.

For these reasons, DEQ recommends providing collection opportunities at PRO depots. DEQ acknowledges concerns expressed in the Nov. 9 RAC meeting that user participation in recycling of lids may be lower than for other materials. However, some participation and recovery of these plastics is better than none. Lids could also be co-collected with HDPE can carriers (the packaging format discussed next).

Like many other plastics, DEQ gave lids a score of “3” under the criteria “environmental health and safety considerations”, in part due to concerns involving improper disposition associated with exports. These concerns are reduced due to increasing domestic reclamation capacity, and mitigated by new standards for responsible end markets contained in the Recycling Modernization Act.

HDPE package handles (e.g., 6-pack handles)

Canned beverages are increasingly held together by a rigid HDPE “handle” or “carrier.” Like HDPE lids, these materials are highly recyclable. Expanding recycling opportunities for this material has been strongly encouraged by [PakTech](#), a large producer of this packaging format and a major employer in Lane County.

The flat shape of this format is assumed to pose similar sortation challenges. PakTech is commissioning testing at a local MRF to assess how these materials actually move through a MRF. Pending the results of that testing, DEQ recommends including these materials as a PRO depot obligation. If subsequent testing reveals that the material can be effectively sorted at Oregon MRFs, PROs could propose adding them to the Uniform Statewide Collection List via the mechanism provided in ORS 459A.914(4)(b).

Single-use pressurized cylinders (e.g., propane)

While liquified petroleum gas containers that are designed to be refilled are exempt from the definition of covered products by the Recycling Modernization Act, non-refillable containers for propane and other pressurized gases are not. Pressurized cylinders are used in a variety of applications, including outdoor activities (camping, backpacking), butane stoves, torch cylinders, and helium for party balloons.

Worthington Industries, one of the largest producers of pressurized cylinders and products (including the iconic green Coleman propane canister), has expressed support for some kind of extended producer responsibility system for this packaging format, and a preference that EPR be mandatory (as opposed to voluntary) in order to minimize free-ridership by other producers. Worthington may wish to advance separate legislation that would allow for respective convenience standards and allow it to have greater say in the PRO., Single-use pressurized cylinders remain a covered product under the Recycling Modernization Act until such legislation is adopted.

Hazard Considerations

The potential presence of flammable and explosive content, coupled with the potential for cylinders to be punctured, makes acceptance of these canisters highly undesirable at commingled processing facilities. However, these items are considered stable and safe when sold in retail locations, where the risk of puncturing and release of contents is low. Currently, most of Oregon’s limited network of household hazardous waste programs accept these materials and relatively few other sites, such as

transfer stations, accept them for recycling. Most are destined to be disposed of (e.g., landfilled), despite the valuable steel content of the packaging.

In some regards, pressurized cylinders pose many of the same opportunities and challenges as certain aerosol containers (please refer to Oct. 27, 2022 rule concept for additional details on that material). If single-use pressurized cylinders are included in the PRO Recycling Acceptance List, PROs can choose to co-collect aerosols and pressurized cylinders or keep them separate.

Some pressurized cylinders contain contents that have the potential of being regulated as hazardous waste. However, hazardous waste requirements under RCRA do not apply to containers generated by households or very small quantity generators. Larger generators (small quantity and large quantity generators) should already be managing canisters through separate collection systems.

End Markets

When evaluated against statutory criteria, DEQ assigned pressurized cylinders several scores of “2” and “3”. Scores of “3” for market stability, accessibility, and viability reflect a reluctance on the part of steel mills to accept canisters unless they have been properly punctured and emptied. Collection of canisters at depots allows for that.

Additional Considerations

Scores of “2” for criteria of “contamination” and “ability for waste generators to easily identify and properly prepare material” reflect the potential that some canisters may contain residual fuel. Again, this argues in support of separate collection (such as depots), which allow the containers to be bulked and then shipped to a processor where fuels can be safely removed. Performance standards for such collections can address special requirements related to safe handling, storage and disposition, which can also mitigate against the score of “2” given in the criteria “environmental health and safety considerations”.

Appendix 4. Additional materials not recommended for acceptance at this time

Materials not included in Appendix 1 of this document are not recommended by DEQ, at this time, for recycling acceptance lists. This includes two groups of materials that were under evaluation during the Nov. 9, 2022 RAC meeting. DEQ's justification for not including these materials follows.

Nursery (plant) containers made of resins other than HDPE (#2) or PP (#5).

As described previously, DEQ is recommending inclusion of HDPE and PP nursery (plant) containers on the Uniform Statewide Collection List. At this time, DEQ is not recommending acceptance of other plastic nursery packaging.

Many nursery containers not made of HDPE or PP appear to be made of polystyrene, which is brittle, easily flattened/broken, more difficult to remove in a MRF, and also suffers from less robust recycling end markets. Some nursery packaging is also made of other materials that offer no recycling markets, such as pots made from compostable fibers or plastics with degradable additives.

PET thermoform packaging (e.g., berry clamshells), not included in other recommended classes of materials.

Blow-molded PET (e.g., water and soda bottles) is a highly recyclable material, but thermoformed PET poses several challenges. Differences in intrinsic viscosity (i.e., the measure of a polymer's molecular weight, which includes differences in melting point, crystallinity and tensile strength) make the material more difficult to process alongside bottles without losing significant yield, unless the bottle reclaimer makes changes to operating procedures. Adhesives and glues commonly used on some thermoformed PET packaging (such as berry clamshells) are also frequently difficult to remove, requiring additional washing (water, energy, caustic, wastewater) or other treatments, and producing a finished resin that remains discolored and has limited applications.

Most domestic PET reclaimers are willing to tolerate a limited amount of thermoformed PET (typically up to 10%, although some will accept more). However, Oregon already has less bottle PET to start with, given the state's bottle bill. Acceptance of thermoformed PET could force some MRFs to generate "thermoform rich" bales that would not be accepted by any domestic reclaimers at this time. The existing reclamation options for bales containing high thermoform content are currently concentrated in Mexico, and might not meet DEQ's proposed standards for "responsible end markets" when considering management of discards as well as water demands in communities facing extreme limitations in freshwater access.

Given significant uncertainty involving those disposition pathways, and the ongoing challenge of glues and adhesives (a design challenge best addressed by producers themselves), DEQ recommends against acceptance of most PET thermoform packaging at this time with an expectation that a future PRO may come back and propose solutions to these challenges.

Please note that other materials proposed for acceptance in the Uniform Statewide Collection List do include some PET thermoforms: plastic tubs (e.g., licorice container) and clear plastic cups. Acceptance of these materials will increase the presence of PET thermoforms at Oregon MRFs and thereby stimulate more discussion and responses from the PRO(s) involving the challenges of PET thermoforms. However,

these materials offer some advantages over PET packaging such as berry clamshells. Cups rarely have labels, and acceptance of both tubs and cups bring with them other, higher-value and less problematic materials (such as HDPE tubs and PP cups). For example, bale audits reported by the [Foodservice Packaging Institute suggest](#) that PP cups outweigh PET cups by a factor of three, in part as some major retailers have committed to replace PET with PP in their clear plastic cups.

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