



# Glass Recycling Alternatives Analysis Report

October 2022



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## Key Definitions and Acronyms

City	The City of Walla Walla Washington
Commission	Washington State Utilities and Transportation Commission.
Commingled	Paper, cardboard, glass, metal, and plastic can be placed in the same cart or bin for collection to be recycled.
Cullet or Glass Cullet	Glass that is crushed or imploded and ready to be remelted is called cullet.
Disposal Site	Means the location where any final treatment, utilization, processing, or deposit of solid waste occurs.
Glass Recycling	The processing of waste glass into new or reusable glass products.
Greenhouse Gases	<p>Greenhouse gases are gases in the Earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere. The main greenhouse gases are:</p> <ul style="list-style-type: none"> <li>• Water vapor</li> <li>• Carbon dioxide</li> <li>• Methane</li> <li>• Ozone</li> <li>• Nitrous oxide</li> <li>• Chlorofluorocarbons</li> </ul>
Greenhouse Gas Emissions	Greenhouse gas emissions from human activities strengthen the greenhouse effect, contributing to climate change. Most are carbon dioxide from burning fossil fuels: coal, oil, and natural gas.
Landfill	A disposal facility or part of a facility at which solid waste is placed in or on land and which is not a land treatment facility.
Multi-family	Any structure housing two or more dwelling units.
Recyclable Materials	The materials from the solid waste stream that are separated for recycling or reuse, such as papers, metals, and glass, which are identified as recyclable materials pursuant to the city's local comprehensive solid waste plan.

Recycling	Transforming or remanufacturing waste materials into usable or marketable materials for use other than landfill disposal or incineration.
Residence	The regular dwelling place of an individual or individuals.
Solid Waste or Wastes	All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, and recyclable materials.
Solid Waste Handling	The management, storage, collection, transportation, treatment, utilization, processing, and final disposal of solid wastes, including the recovery and recycling of materials from solid wastes, the recovery of energy resources from solid wastes, or the conversion of the energy in solid wastes to more useful forms or combinations thereof.
Source Separation	The separation of different kinds of solid waste and/or recyclable materials at the place where the waste originates.
Waste reduction	Reducing the amount or toxicity of waste generated or reusing materials.
Yard debris	Plant material commonly created in the course of maintaining yards and gardens, and through horticulture, gardening, landscaping, or similar activities. Yard debris includes but is not limited to grass clippings, leaves, branches, brush, weeds, flowers, roots, windfall fruit, vegetable garden debris, holiday trees, and tree prunings four inches or less in diameter.

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## Executive Summary

In April of 2022, the Walla Walla City Council voted 4-3 to retain and enter into a contract with WIH Resource Group (WRG) to conduct a study to analyze available alternatives for glass recycling for the City. This report assesses the available options for glass recycling within the City of Walla Walla. It is based on the information obtained by the WRG Project Team from data provided by the City, independent research, various industry interviews conducted, and the team's experience with other similar client projects in waste management and recycling in Washington and Oregon with other jurisdictions. Should the City of Walla Walla elect to implement a glass recycling program for the City residents, the WRG Project Team makes the following recommendations for the City's consideration.

The City should implement a residential glass curbside collection program by contracting with Basin Disposal, Incorporated (BDI). Residents will receive one 18-gallon bin (see Figure ES.1) to store their recyclable glass. The bins would be collected by BDI every-other-week and on the same day as their curbside commingled recycling collection. To provide same-day collection utilizing the same truck, BDI will purchase new trucks with two compartments to separate the glass and commingled recycling. Collecting recycling on the same truck provides the residents with the highest level of convenience and the highest potential for waste diversion while minimizing the environmental impacts and monthly fee (cost of service) to residents. The estimated additional cost to collect and recycle glass from residential customers is \$0.89 per month.



Figure ES.1: Gallon Bin

BDI will store the collected glass locally in a glass bunker, or roll off containers, until enough volume has accumulated to generate a full truckload (approximately 32 tons payload), and deliver the collected glass to Strategic Materials, Incorporated (SMI) in Seattle, where it will be sorted by color, crushed, and recycled into glass bottles at the Ardagh glass factory. Many local wineries purchase bottles from Ardagh, which means their glass will close the recycling loop. Because the glass will be source separated by the customers at the time of collection, SMI will pay the City of Walla Walla \$15 per ton for the clean glass material stream.

The service change would commence in Spring 2024 after the renewal of the contract between the City and BDI and the delivery of the new trucks and glass bins. If the City elects to follow these recommendations, detailed in Section 10 of this report, no significant "lump sum" capital program funding costs will be required by the City. Instead, the additional costs of implementing the glass recycling program will be incorporated into the residential recycling collection fees.



## Section 1 – Introduction

In a 2021 survey administered by the City of Walla Walla, only 44% of the City of Walla Walla residents believed there were adequate recycling services, and the lack of glass recycling, in particular, has been brought up by residents in similar surveys in recent years. In response, the City issued a Request for Proposals (RFP) for a glass recycling study to be completed.

In April of 2022, the Walla Walla City Council voted 4-3 to retain and enter into a contract with WIH Resource Group (WRG) to conduct a study to analyze available alternatives for glass recycling. The study came in response to frequent questions from residents asking City officials why they do not have a glass recycling program as outlined further in Section 2 of this report.

This document provides an assessment of the available alternatives for glass recycling within the City of Walla Walla. It is based on the information obtained by the WIH Resource Group Project Team from data provided by the City, independent research, various industry interviews conducted by the Project Team, and the team's experience with other similar client projects in waste management and recycling in Washington and Oregon with other jurisdictions.

### 1.1 Glass Recycling in Walla Walla

The City currently contracts with a private service provider, Basin Disposal Inc. (BDI), for recycling services. The service is mandatory (see Walla Walla Municipal Code 8.20.196) for residential customers up to ten units. Recyclable materials are collected on an every-other-week basis by way of a 90-gallon roll cart. The current contract ends on January 31, 2024.

Washington State mandates that solid waste planning requires that every municipality and county develop recycling service programs to divert waste from landfills. As part of the 1994 Walla Walla County Solid Waste Management Plan update, city residents were surveyed on how they would like recycling implemented – curbside pickup or a depot drop-off system. The majority of respondents indicated curbside recycling was preferred and the City began the curbside collection of commingled recycling in 1996. To make the program affordable, the City Council elected to make the monthly rate applicable for all residential customers in dwellings up to 10 units in size.

The glass was collected with the curbside mix until May 2007 when it was deemed necessary to remove it from the collected recycling stream to preserve the value of the material. Depots were established to collect glass which was taken to a bottle manufacturer in Portland until 2008 when it became too costly to transport the material to market due to the low commodity price.

Between 2008 and 2011, glass collection continued to grow in Walla Walla, averaging approximately 500,000 pounds per year. On July 27, 2012, the city elected to end the glass recycling program due to expense and the inadequacy of the recycling program as it existed.<sup>1</sup>

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<sup>1</sup> [City of Walla Walla Website: Recycling history and facts](#)

The glass was stockpiled at the Sudbury Landfill until July 2012, when the collection program was suspended because no beneficial and economical reuse could be found for the material. According to City staff, this created numerous problems. First, the material could be hazardous if roadways had to be dug up, and it also could make the road reflective if used in the asphalt. Second, the environmental benefit was nominal, perhaps nonexistent, as glass is an inert material, so it does not create air pollution when it sits in a landfill. Transporting the material from depots to the landfill or across the state to a glass recycling processing facility does have a carbon footprint.

The City's practice of crushing the collected glass with a bulldozer at the landfill for "beneficial reuse" as construction fill material is not what most people want when they think of glass recycling. It is not being recycled in the sense of glass collected being transported to a glass recycling processor to be made back into glass bottles.

## Section 2 – Research Methodology and Project Approach

The WRG Project Team's research methodology and project approach were centered on researching, exploring, developing the alternatives, and analysis of the alternatives based on their long-term viability, program costs, and environmental and greenhouse gas emissions impacts, for the development of a sustainable glass recycling program for the City of Walla Walla.

### 2.1 Research Methodology

To determine which alternatives are the best fit and optimal for any future program recommendations for the City of Walla Walla, we completed the following tasks:

1. Reviewed and collected data from the City's staff,
2. Conducted in-depth industry research, including interviews with a variety of sources from a wide range of experts from public sector agencies, industry associations, and private sector companies involved with glass recycling and reuse,
3. Maintained ongoing communications with representatives from Basin Disposal Inc. (BDI) to identify collection methods, storage, transportation, and alternative glass use, and
4. Held ongoing communications with City staff about our progress and collected their input on the alternatives and information on other critical decisions.

Future input from the City's Solid Waste Advisory Committee (SWAC) and the Sustainability committee will provide the necessary feedback for the study outcomes. The summary from the industry interviews is included in the Appendix of this Report.

The goal of the outcomes of the research and findings of this report is to address the key questions as follows:

1. What are the best, economical alternatives that provide the City the ability to divert glass from the City's waste stream?
2. Do the alternatives consider the key components necessary for an effective glass recycling program, i.e., the collection (curbside collection or via drop-off depots), aggregation and

- storage of collected glass, the transportation to a recycling processing facility, the actual processing, recycling, or the beneficial reuse for recycled glass?
3. What are the costs for the various alternatives, including all key components?
  4. What are the greenhouse gas emissions associated with each of the alternatives?
  5. Does the selected alternative support the City's recycling objectives/goals and comply with state laws?
  6. Is the selected alternative proven in other areas providing proof and validity of its performance and reliability?
  7. What is the impact on the ratepayers, and can the City support the costs?
  8. Can the alternatives be integrated with other systems to reduce costs or increase efficiencies?
  9. Does the selected alternative have significant adverse environmental impacts or constraints that will be more difficult to permit, site, or implement?
  10. What are the end markets for recycling the collected glass?
  11. Can all contracted alternatives be integrated with the City's current curbside recycling service provider, Basin Disposal's collection operations?

## Section 3 – Glass Recycling and Reuse

Here are some basic facts about glass provided by the Glass Packaging Institute (GPI)<sup>2</sup>:

- Glass is 100% recyclable and can be recycled endlessly without loss in quality or purity. Over a ton of natural resources are saved for every ton of glass recycled. One ton of carbon dioxide is reduced for every six tons of recycled container glass used in the manufacturing process.
- Glass is made from readily available domestic materials, such as sand, soda ash, limestone, and “cullet,” the industry term for furnace-ready recycled glass.
- Some recycled glass containers are not able to be used in the manufacture of new glass bottles and jars or to make fiberglass. This may be because there is too much contamination or the recycled glass pieces are too small to meet manufacturing specifications. Or it may be that there is not a nearby market for bottle-to-bottle recycling. This recovered glass is then used for non-container glass products. These “secondary” uses for recycled container glass can include tile, filtration, sandblasting, and concrete pavements.
- The recycling approach that the industry favors is any recycling program that results in contaminant-free recycled glass. This helps ensure that these materials are recycled into new glass containers. While the curbside collection of glass recyclables can generate high participation and substantial amounts of recyclables, drop-offs, and localized collection programs tend to yield higher-quality recovered container glass.
- Recycled glass is always part of the recipe for glass, and the more that is used, the greater the decrease in energy used in the furnace. This makes using recycled glass profitable overall, lowering costs for glass container manufacturers—and benefiting the environment.
- Glass containers for food and beverages are 100% recyclable, but not with other types of glass like windows, ovenware, Pyrex, crystal, etc., which are manufactured through a different process. If these materials are introduced into the glass container manufacturing process, they can cause production problems and defective containers.
- Color sorting makes a difference, too. Glass manufacturers are limited in the amount of mixed color-cullet (called “3 mix”) they can use to manufacture new containers. Separating recycled container glass by color allows the industry to ensure that new bottles match the color standards required by glass container customers.
- In 2018, 39.6% of beer and soft drink bottles were recovered for recycling, according to the U.S. EPA - 39.8% of wine and liquor bottles and 15.0% of food and other glass jars were recycled. In total, 33.1% of all glass food and beverage containers were recycled. Energy costs drop about 2-3% for every 10% cullet used in the manufacturing process.
- States with container deposit legislation have an average glass container recycling rate of just over 63%, while non-deposit states only reach about 24%, according to the Container Recycling Institute. Beverage container deposit systems provide 11 to 38 times more direct jobs than curbside recycling systems for beverage containers. (Source: *The Container*

<sup>2</sup> [Glass Packaging Institute – Glass Recycling Facts](#)

Recycling Institute, "Returning to Work: Understanding the Jobs Impacts from Different Methods of Recycling Beverage Containers").

The recycling process or "loop" involves quite a bit of logistics and can be costly to collect, transport, sort, separate, process, and fully recycle. Figure 1 provides an overview of the process.



### 3.1 Environmental Impacts of Glass

Glass is a material that stands the test of time; its uses are diverse and varied. The glass bottle and jar industry started in the 1600s and was industrialized in 1903 in North America with the first automatic glass bottle-blowing machine. Modern glass production remains high and so does the importance and necessity of recycling glass. Recycled glass can substitute for up to 95% of raw materials and extend manufacturing equipment's life<sup>3</sup>.

Use of glass containers to manufacture new glass containers saves<sup>4</sup>:

- 1,300 pounds of sand per ton of recycled glass used
- 410 pounds of soda ash per ton of recycled glass used
- 310 pounds of limestone per ton of recycled glass used
- 160 pounds of feldspar per ton of recycled glass used

<sup>3</sup> Glass Containers – NCD Corporation

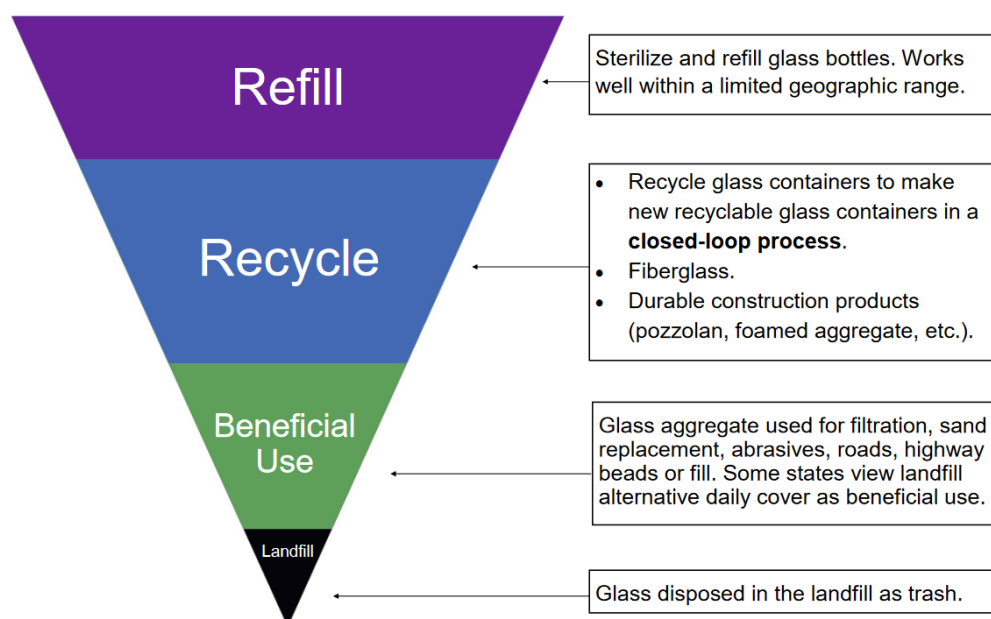
<sup>4</sup> [2019 Recycling Industry Yearbook](#)

- Two to three percent in energy cost for every 10% of recycled container glass used in the manufacturing process.
- One ton of carbon dioxide is reduced for every six tons of recycled container glass used in the manufacturing process.

### 3.2 Glass Recovery Hierarchy

Once a glass bottle has been used for its original purpose, there are four recovery hierarchy options. Figure 2 below provides a visual of the hierarchy for glass recovery from the waste stream. This hierarchy prioritizes common uses for glass, including reuse, recycling, and substitution for raw materials.

**Figure 2: Glass Recovery Hierarchy**



The following provides greater details on each of the four recovery hierarchy options:

1. **Refill/Reuse:** Refillable bottles can be used about 25 times. Sterilizing and refilling a bottle use about 93% less energy and 47% to 82% less water than making a new bottle.
2. **Recycle:** Use recycled glass cullet<sup>5</sup> to make glass bottles and jars.
3. **Other Beneficial Reuses:** Glass can be substituted as aggregate for filtration, sand replacement, abrasives, road/highway bed or fill, and alternative daily cover for landfills.
4. **Landfill:** Glass is disposed of as trash.

With specific reference to the City of Walla Walla and in consideration of a glass recycling program for its residents, the WRG Project team utilized the four recovery hierarchy options and researched how each one might be used by the City. The following subsections provide some details on each one.

<sup>5</sup> Glass cullet: recycled broken or waste glass used in glassmaking.

### 3.2.1 Glass Container / Bottle Refilling Recovery Hierarchy Option

As part of the research and interviews completed by WIH, several identified bottle reuse and filling as an alternative recycling method. In the examples from research interview sources, the existing programs are in Portland, Spokane, Missoula, California<sup>6</sup> (Conscious Container just for specific sizes, colors, and types of wine bottles), and Pennsylvania. Except for the program in California (Conscious Container - see link below in footnotes to their website), and Revino<sup>7</sup> in Newberg, Oregon, all focus on refilling glass beer bottles. The bottles must be uniform in size, shape, and color. The glass bottles are embedded with a bar code identifying it as a "co-op" bottle only for use with brewers that participate in the reuse program. This program has a specific application that could be administrated by the Walla Walla Wine Alliance, not the City.

The applicability to refilling wine bottles is only in select areas. Our research found only one program in California (Conscious Container) and one in Oregon (Revino) that requires local sponsors, such as the Walla Walla Wine Alliance, for the glass wine bottle refilling and reuse program to be effective and successful. Additionally, the reuse program may not be viable since wineries are particular in the glass bottle color, size, style, and branding based on their respective wine varieties.

Of critical importance for bottle reusing/refilling is using a bottle washer (see Figure 3). These come in various sizes and processing capacities (volume of glass bottles cleaned simultaneously). Larger units are fully automated, and the costs vary by size. Research has shown that few of these machines exist that are not used for dedicated operations. In discussions with representatives from Akomag<sup>8</sup>, where their bottle washers are produced in Italy, their primary customers are beverage bottling companies, not governmental jurisdictions.



Figure 3: Akomag Bottle Washer

### 3.2.2 Recycle into New Glass Bottles Recovery Hierarchy Option

This alternative is a recycling program involving collecting, storing, and transporting the collected glass for processing to be made back into new glass bottles. Mixed glass from Walla Walla could be delivered to Glass to Glass (G2G) in Portland, where it would be cleaned, sorted by color, and crushed into cullet to make bottles at either the Owens-Illinois (O-I) glass plant in Portland or the wine bottle plant in Kalama, Washington. G2G does not charge a fee for glass delivered to the Portland facility nor provides a rebate for the glass.

<sup>6</sup> [Conscious Container](#)

<sup>7</sup> [Revino Website](#)

<sup>8</sup> [Akomag Website](#)

The alternative to G2G is transporting the collected glass to Strategic Materials Incorporated (SMI) in Seattle, where it would be cleaned, sorted by color, and crushed into glass cullet to make new bottles at the adjacent Ardagh glass factory. Unlike G2G, SMI would pay Walla Walla \$15 per ton. The reason for the payment is that SMI does not have clean bottle glass sources because Washington does not have a Bottle Bill law, and the crushed glass from the four MRFs in the Seattle/Tacoma area has a lot of contamination due to the mixing of glass with commingled materials.

### 3.2.3 Beneficial Reuse / Glass Crushing-Pulverizing Recovery Hierarchy Option

Glass can be substituted as aggregate for filtration, sand replacement, abrasives, road/highway bed or fill, and alternative daily cover for landfills. In Washington, a few jurisdictions utilize glass crushing at a local level instead of fully recycling their residents' glass bottles. While it is considered beneficial reuse, it is better than landfilling the glass.

- In Kittitas County, the Ellensburg Glass Recycling Cooperative (EGRC)<sup>9</sup> operates a glass crusher. The EGRC is responding to the October 2019 decision by the county's waste and recycling contractor to stop accepting glass as part of its curbside program. EGRC purchased a small glass-crushing machine and has a network of volunteer glass ambassadors that work to collect the glass, crush it, and offer it back to the community to use in landscaping. EGRC also collaborates with Central Washington University to explore the use of glass ground to sand in a concrete mix.
- Lake Chelan Rotary operates a pulverizing system that can crush up to two tons of glass per hour, turning it into fine sand and aggregate. 911 Glass Rescue<sup>10</sup> is a community service operated by the Rotary of Lake Chelan. Through help from their partners, the City of Chelan, County of Chelan, and Washington Department of Ecology, as well as numerous generous sponsors, they purchased a state-of-the-art glass pulverizing system, the Andela 05L system. It crushes 1 to 2 tons of glass per hour, turning it into fine sand and an aggregate with rounded edges. They repurpose all types of used glass into useful products, which they provide to the City of Chelan for public works projects, and also sell to local residents for a modest fee to help fund their costs of operation. The City collects curbside recycling without glass. However, the City and the Washington Department of Ecology each contributed \$50,000 to assist the Rotary Club of Lake Chelan with partial funding for an Andela 05L glass pulverizing system. Julie McCoy is the primary point of contact for 911 Glass Rescue. Since the commencement of operations in July 2021, the group of volunteers has recycled over 90 tons of glass. Julie explained that the Andela glass pulverizer screens out the contaminants such as the paper label, corks, and lids. The sand produced by the pulverized glass is safe to pickup with bare hands and can be used as regular sand. The sand does not have an electrical charge; therefore, it attracts and holds water, which makes it particularly useful as a soil amendment in dry climates. There is currently a waiting list for the finished end product. The City also provided a covered space for the crusher at the city recycling center. The cost of the crusher and the set up was approximately

<sup>9</sup> [Ellensburg Glass Recycling Cooperative](#)

<sup>10</sup> [911 Glass Rescue](#)



\$150,000 (transport, set up, equipment, and electrical upgrades)<sup>11</sup>. The facility is staffed by volunteers every Saturday. Jake Youngren, the Public Works Director at the City of Chelan said a majority of the inbound glass delivered to the crusher is from the local wineries in the Chelan area. The glass is pulverized into sand and is provided to the public for \$5 for a 5-gallon bucket. A fee of \$0.02 per pound is assessed to residents and \$0.04 is charged to commercial customers to defray the cost of the program. The cost of waste disposal at the Dryden Transfer Station in Chelan is \$113 per ton, which is \$0.057 per pound, the alternative to pulverizing the glass for the Chelan area.

- In San Juan County, on Orcas Island, the nonprofit Exchange reuse and recycling center<sup>12</sup> installed a glass crusher to collect and grind glass into sand for use in landscape and construction. Crushing and re-using the glass on the island reduces what has to be sent back to the mainland—so less transportation, carbon, and cost.

### Pulverized into Sand or Glass Aggregate Reuse

If the City were to acquire a pulverizer and pulverize the glass into sand-like material, they could sell it to the public and landscapers as a substitute for sand as a glass reuse, similar to what 911 Glass Rescue is doing in the Chelan area with locally collected glass.



Figure 4: Pulverized Glass

Pulverized glass (see Figure 4) can be repurposed as an engineered aggregate, as a soil amendment for non-food production, and as a substitute for sand. Clean pulverized glass requires specialized equipment that will crush the glass into a safe to handle consistency and screen out the labels and other debris. From the estimated glass volumes in Table 2, the City could generate the following estimated amount of sand or glass aggregate.

Table 2: Pulverized Materials Yield Estimates

Estimate	Annual Glass Tons	Sand/Gravel Tons	Sand/Gravel Cubic yards
Low	624	562	468
High	1,144	1,030	858

### Andela Products Pulverizer

One manufacturer, Andela Products<sup>13</sup>, manufactures a machine that will pulverize and screen glass into usable sand or aggregate. The Andela GTP-1HD (Figure 5) can process up to five tons of glass per hour.



Figure 5: Andela GTP-1HD Pulverizer

<sup>11</sup> Interview with Julie McCoy of 911 Glass Rescue

<sup>12</sup> [Orcas Island Exchange Reuse and Recycling Center](#)

<sup>13</sup> [Andela Products Pulverizer](#)

The cost of the machine plus the setup costs is \$277,000<sup>14</sup>. It has an expected ten-year life and has a run cost of \$2.96 per ton. Table 3 details the annual and unit costs of operating the GPT-1HD.

**Table 3: Andela Glass Pulverization System Costs**

Description	Note	Low Tons	High Tons
Machine Annual Fixed Cost (\$277,000 / 10 years)	A	\$27,700	\$27,700
Annual Throughput Glass Tons	B	624	1,144
Annual Fixed Cost per Ton (A / B)	C	\$44.39	\$24.21
Machine Run Cost per Ton	D	\$2.96	\$2.96
Annual Throughput Glass Tons	B	624	1,144
Machine Annual Run Cost (D x B)	E	\$1,847	\$3,386
Machine Throughput Tons per Hour	F	5	5
Annual Machine Hours (B / F)	G	124.8	228.8
Labor Cost per Hour	H	\$45.00	\$45.00
Labor Cost per Ton (G / F)	I	\$9.00	\$9.00
Annual Labor Cost (G x H)	J	\$5,616	\$10,296
Total Annual Cost (A + E + J)	K	\$35,163	\$41,382
Cost per Ton (C + D + I) or (K / B)	L	\$56.35	\$36.17
Gravel Value per Ton	M	\$11.98	\$11.98
Net Cost of Glass Sand/Gravel (L-M)	N	\$44.37	\$24.19
Total Annual Net Cost (N x B)	O	\$27,688	\$27,678
Recycling Customers	P	10,335	10,335
Cost per Customer per Month (O / P / 12 months)	Q	\$0.22	\$0.22

**Ground2Ground Glass (G2G Glass)**

An alternative to the high cost of a pulverizer/glass crusher like the Andela, and in an interview on August 17, 2022, with Mr. Chris Lueck of Ground2Ground Glass (G2G Glass), a local glass pulverizing company, Mr. Lueck expressed interest in working with the City to crush or pulverize glass collected within the City for grinding and reuse. G2G is a not-for-profit business, and 100% of the money generated by their fees, donations, and grants goes toward paying for new equipment, maintenance/repair, transportation costs, insurance, utilities, and the cost of some professional labor<sup>15</sup>.

G2G is already providing service to some of the local wineries, collecting the wineries' glass and crushing it into fine particles for use as a substitute for sand and other beneficial reuses of the collected glass. G2G offers the wineries monthly subscription services for \$15.00 per month for one or two 17-gallon plastic bins with weekly pick up for 1-2 bins (more during the busy season at no charge). G2G currently

<sup>14</sup> Cost estimates provided by Andela Company Representative.

<sup>15</sup> [G2G Website](#)

partners with 25 wineries and has produced a working model to divert 50,000 pounds of winery glass from the landfill year to date in 2022. G2G requirements and program offerings are as follows:

- Glass bottles must be rinsed, and everything removed but the paper label;
- G2G Glass picks up the full bins and replaces them with empty bins once a week;
- Bottles are processed in an approved facility (Chris Lueck's garage);
- Glass sand is stored according to DOE/County Health guidelines at a winery partner facility.

Their pulverizer (see Figure 6), the Expleco GL Sand,<sup>16</sup> is a hand-fed single bottle machine that can pulverize a 750 ml bottle in about 10 seconds, resulting in ¼" - grit size particles with about 10% paper in the mix. Further sifting to 1/8" - removes 95% of leftover paper and sifting further to 1/16" - results in clean sand similar to playground or beach sand. While it is impressive what G2G Glass is doing, it would not be cost-effective or efficient in being able to handle and process all of the glass collected within the City of Walla Walla.

Since WRG's interview with Mr. Lueck on August 17, 2022, additional information has been gathered from G2G's website in a written statement that "We at Ground2ground Glass have made the tough decision to pause this project for the time being." See:

<https://www.ground2ground.com/project-update-letter.pdf>



Figure 6: Expleco Pulverizer

### Beneficial Reuse Materials and the City of Walla Walla Public Works

While beneficial reuse appears feasible, it technically is not considered recycling glass, where it is being processed and made back into glass bottles. Based on the WRG Project Team's research, the beneficial reuse of glass has not been widely adopted or implemented throughout the U.S., nor in Washington State.

For the City of Walla Walla, pulverized glass reuse would add complexity to its operations and projects in that it would require using and handling two materials to do a job previously done with one (e.g., glass sand for pipe zone and crushed aggregate for backfill above the pipe zone; currently crushed aggregate is used for both). According to the City's Public Works Department, the City uses ¾" minus crushed rock for public works projects, and it is delivered at just \$11 per ton plus 8.9% sales tax. This is a very low cost compared to non-virgin materials created by pulverizing glass collected within the City, as shown in the Table above.

### 3.2.4 Landfilling Recovery Hierarchy Option

As implied, this simply disposes of the collected glass in the landfill at the City's standard cost for disposal.

<sup>16</sup> [Expleco Website](#)

## Section 4 – Glass Recycling Alternatives

Several alternatives for how to develop an effective glass recycling program for the City were investigated by the project team. Three primary alternatives were identified and are detailed in this section. These alternatives include:

- Curbside Glass Recycling Collection Alternatives (Options 1 and 2 below)
  - Alternative/Option 1 – Dedicated glass-only collection route
  - Alternative/Option 2 – Split body truck for dual collection – glass and recyclables
- Alternative 3 - Glass Recycling Collection Depot

The following subsections provide the details of three alternative programs for glass recycling collection for the City.

There are four key and necessary components for consideration in each of the glass recycling alternatives for the City of Walla Walla as follows:

1. Collection Method (Curbside or Depot Drop-off)
2. Storage of glass – Aggregation of collected glass until transportation to a processor
3. Transportation of glass to Processor (Trucking)
4. Processor (Vendor and Location)

### 4.1 Curbside Glass Recycling Collection Alternatives (Options 1 and 2)

These alternatives could be collected either by the City fleet or BDI. The program cost estimates provided are based on the cost of collection services with BDI, the City's current recycling collections service provider. Costs could vary slightly if the City elected to collect the recycled glass with its equipment, containers or bins, and labor.

There are two methods to collect glass from residential and commercial customers. The first option is to add a dedicated monthly (collection once or twice a month) glass recycling route, and the second is to add a recycling truck with a collection body that has a separate compartment for glass (referred to as dual-stream recycling below).

#### Alternative 1 - Dedicated Glass-Only Collection Route

For residential curbside collection, BDI estimated a once-per-month glass collection service would require the use of two automated side load (ASL) collection trucks. Residential customers would be furnished with a 32-gallon roll cart to store glass until collection day. The collection frequency for commercial customers would vary depending on the amount of glass and is dependent on whether the City would want to extend glass recycling collection to commercial businesses such as restaurants, bars, and other businesses that generate glass. The cost for the commercial collection was not contemplated as part of this study as the focus is based on a residential glass recycling program.

## Alternative 2 - Dual Stream Recycling Collection

Dual stream recycling would require two Labrie Expert ASLs with a separate glass compartment. Residents would be furnished with an 18-gallon bin to store glass until collection day. Glass would be collected every-other-week on the same day as commingled recycling. The following video is the dual stream collection by Waste Connections in Vancouver:

<https://www.youtube.com/watch?v=2fjLTcql5dM>

Most residents will not collect, store, or transport their collected glass to a depot. The research found through interviews with Preston Peck of the City of Tacoma confirmed this. When Tacoma recently switched from a curbside collection of glass to a depot drop-off program for its residents, the amount of glass collected and recycled decreased by 32%. However, it has been determined that most residents that have a two-stream recycling program will store glass in a bin or a roll cart until collection day. Glass collection data from the City of Vancouver and Clark County, Washington report the average set out weight per residential customer per month for glass is 9.25 pounds. Rounding up to 10 pounds per customer per month, Walla Walla should expect to collect 52 tons of glass per month, or 620 tons annually from the 10,335 customers that currently have curbside recycling service.

If glass collection service is also provided to commercial customers such as wine-tasting rooms, restaurants, taverns, and other customers that generate large quantities of glass, it is assumed that an additional 10 tons per week of glass could be collected. Table 4 summarizes the estimated tons of glass that may be collected.

**Table 4: Walla Walla Annual Glass Tonnage Range Estimates**

Estimate	Annual Glass Tons
Low	624
High	1,144

## Alternative 3 - Glass Recycling Depot Collection

The program would need to be set up for Walla Walla citizens to properly prepare, sort, and haul their acceptable recyclable items to one glass recycling depot. Figure 7 shows a glass depot roll-off container. The depot would need to be staffed or monitored during operating hours to ensure that only the accepted glass items are deposited in the appropriate receptacles.



**Figure 7: Example of Glass Depot Roll Off Container**

The glass depot could be either waste containers or roll-off drop boxes that would be located in a strategic area of the City to provide easy access to people who want to recycle glass. The collected glass would be transported either using a roll-off truck or compactor truck to a designated storage area, most likely at the Sudbury Road Landfill, based on discussions with City staff. The primary reasons are that there is

space available at the landfill and city personnel based there that could monitor the recycling drop-off activity of members of the public to ensure minimal contamination. In addition, if the depot were located there so would be the glass storage bunker necessary for the storage of the glass for aggregation until a full truckload of glass is ready for transport to the selected processing facility for recycling.

WRG Team project research has shown that staffing the depot collection locations reduces contamination and illegal garbage dumping; however, there is a cost to staffing the depots. For example, the Sudbury depot location could be open daily and coincide with the landfill operating hours, and other locations could be open for receiving glass on a limited schedule, 4-5 hours per day, 3-4 days per week.

The City previously used depots for glass recycling until the program ended in July 2012. During the last full year of the program, the City reported 264<sup>17</sup> tons of glass deposited at the depots. Approximately 75% of the collected glass was comprised of wine bottles. Accounting for the 5.6% population growth since 2010<sup>18</sup>, the estimated tons that would be collected from a similar program is approximately 280 tons of glass.

The Depot collection method only works if funded by the City's landfill and only if it is supported by SWAC and City Council. Quality control of the recyclable material being dropped off at the depot is also an issue if it is unsupervised. As stated, the idea would be only to provide a depot at the City's landfill. A charge for this service, such as a disposal fee, for glass drop-off at the landfill might be an option for the city since this is similar to tire recycling.

## 4.2 Recycled Glass Storage

Once the glass is collected, either through curbside collection or via a depot drop-off center, the glass would need to be aggregated and stored in a storage bunker (similar to the one pictured in Figure 8) until enough volumes were collected to warrant transporting it to the selected glass recycling processing facility.

The City's engineer estimated the cost to construct a concrete pad that could accommodate the high collection estimate is \$85,000. If this cost is depreciated over a ten-year life, the annual \$8,500 cost has a monthly rate impact to each recycle customer of \$0.07 (\$8,500 / 10,335 customers/ 12 months).

In terms of permitting a glass storage bunker, the City could be covered by an exemption, which would involve adding "materials recovery" to their existing permit if the City meets the following criteria:

- Accept single stream only (i.e., glass that is separated out and not commingled with other materials in loads);



Figure 8: Glass Storage Bunker

<sup>17</sup> City of Walla Walla Glass Recycling Evaluation by Sustainability Committee, page 13

<sup>18</sup> Washington State Office of Financial Management, Forecasting and Research Division

- The incoming stream does not generate more than 5% of incidental solid waste (i.e., garbage/non-recyclable materials);
- The City must recycle/ship out 50% of the materials annually.

The City will have a roll-off drop box (see Figure 9) exemption if it accepts glass in containers/drop boxes at depots intended for hauling the material as long as the glass never touches the ground at the landfill (remains in the drop box). No forms for this exemption would be required to be filed with the WA State Department of Ecology (DOE).<sup>19</sup> For exempted activities, the City must meet the performance requirements of WAC 173-350-040 as follows. The owner or operator of any solid waste facility subject to this chapter must:



**Figure 9: Glass Collection Drop Box**

- Design, construct, operate, close, and provide post-closure care as applicable, at any solid waste facility in a manner that does not pose a threat to human health or the environment;
- Not conflict with the approved local comprehensive solid waste management plan prepared in accordance with chapter 70.95 RCW, Solid waste management—Reduction and recycling, and/or the local hazardous waste management plan prepared in accordance with chapter 70.105 RCW, Hazardous waste management; and
- Comply with all other applicable local, state, and federal laws and regulations.

One City-owned site to consolidate the collected glass from either the depot(s) or collection routes is the Sudbury Road Landfill due to the available land, secure area, and permitting that is required for glass storage.

BDI expressed interest in providing the storage of the collected glass from the City until volumes necessitate transporting to the selected processor. This option allows the City to avoid having to construct a storage bunker at Sudbury Road Landfill or other City-owned properties. If the City elects to implement a curbside recycling collection program as part of the new contract with BDI, this would be a topic of discussion for inclusion in the new recycling collection agreement.

<sup>19</sup> Email correspondence between Leah Rohan (City of Walla Walla) and Martyn Quinn (WA State DOE) dated 5/23/2022.

### 4.3 Glass Transport to Processor

Transporting the collected glass from Walla Walla to either Portland or Seattle to be recycled into new glass containers would be accomplished using a dump truck and trailer combination or single end-dump type truck and trailer that can haul a 32-ton load (see Figure 10). This method maximizes the legal highway payload limits in Washington and Oregon States and provides the potential opportunity to backhaul materials from Portland or Seattle.



Figure 10: End Dump Trailer

### 4.4 Cost of Glass Alternatives

This section provides the cost analysis of the alternatives, including collection, storage, transportation, and glass recycling/processing.

#### 4.4.1 Glass Depot Costs

Glass depots should be located in an area such that they can be monitored to ensure that only glass is placed in the drop boxes. Glass would be collected in drop boxes and hauled to the glass storage area; therefore, depot cost consists of the glass collection drop box(es), attending labor, and the haul costs to the glass storage area. Since depots are open to the public, the cost of the depots should be funded through the landfill as the service would be available to all county residents and not just limited to city sanitation customers.

Table 5 on the following page, details the depot costs if two drop boxes are located somewhere other than the landfill.



**Table 5: Estimated Annual Cost of the Glass Depot**

Glass Depot Table	Amount		Note
Drop Box Costs	\$10,000	A	Cost per drop box
Depot Sites	2	B	Required boxes
Total Box Cost	\$20,000	C	A x B
Annual Cost (10 yr. life)	\$2,000	D	B divided by 10 years
Glass Pad Cost	\$85,000	E	City engineer's estimated cost
10-year life Cost	\$8,500	F	E divided by 10 years
Annual Glass Tons	280	G	Previous City program performance
Tons per Haul to Glass Pad	7	H	Approximate load per drop box
Annual Glass Hauls	40	I	G / H
Cost per Haul	\$150	J	Approximate cost per drop box haul
Annual Glass Box Haul Cost	\$6,000	K	I x J
Annual Glass Tons	280	G	Previous City program performance
Tons per Haul to be Recycled	32	L	Average payload per haul
Annual Recycle Hauls	9	M	G / L
Hours to Load Dump Truck	2	N	Consultant's estimate
Annual Hours	18	O	M x N
Labor Cost per Hour	\$45.00	P	City Labor Cost
Loader Cost per Hour	\$46.45	Q	FEMA cost
Total Loading Cost	\$1,646	R	O x (P + Q)
Transport Cost to Seattle	\$1,853.10	S	Basin Disposal Estimate
Total Hauls to Seattle	9	M	
Transport Cost to Seattle	\$16,678	T	S x M
Glass Value per Ton	\$(15.00)	U	Strategic Material
Total Glass Value	\$(4,200)	V	G x U
Total Annual Depot Cost	\$30,624	W	D + E + K + R + T + V
Annual SW Tons	48,000	X	Annual MSW tons to Sudbury LF
Cost per Ton for Glass Depots	\$0.64	Y	W / X

#### 4.4.2 Cost of Glass Curbside Collection Alternatives

Basin Disposal, the City's contracted hauler for recycling, priced out two collection alternatives for glass recycling. The first alternative is a glass-only monthly, mandatory collection route for residential customers and as needed for commercial customers. Customers would get a second cart (32-gallon) for glass.

The second alternative is a dual-stream collection system using a Labrie Expert with two separate components on the collection body (see Figure 11). The larger compartment is for the City's commingled material, and the second is for glass. Glass would be collected at the same frequency as recycling (every other week); therefore, customers would get an 18-gallon bin for glass storage and collection. Both of these alternatives assume a seven-year life for the new collection trucks and ten-year life for the carts and bins. Table 6 compares the cost of the collection alternatives.



Figure 11: Labrie Expert Recycling Truck

Table 6: Comparing Glass Collection Monthly Costs (Excluding Depots)

Collection Alternative	Status Quo	Glass Route (1x/mo.)	Dual Stream (2x/mo.)
Monthly Collection Cost	\$52,511	\$68,423	\$58,680
Total Customers	10,335	10,335	10,335
2022 Recycling Rate	\$6.01	\$6.62	\$5.68
Increase		\$1.54	\$0.60

#### 4.4.3 Cost of Glass Transportation to Processors

The current cost to transport glass to market is \$3.55 per mile, while diesel fuel is \$4.50 per gallon. Table 7 compares the transport cost of delivering a 32-ton payload to Portland and Seattle to be recycled into glass bottles. The transportation costs include the truck, driver's wages, fuel, insurance, and vehicle maintenance costs.

Table 7: Transportation Cost Comparison

Description	Note	Portland	Seattle
Round Trip Miles	A	484	522
Haul Cost per Mile	B	\$3.55	\$3.55
Total Roundtrip Cost (A x B)	C	\$1,718.20	\$1,853.10
Tonnage Payload	D	32	32
Cost per Ton (C / D)	E	\$53.69	\$57.91
Glass Value per Ton	F	\$-	\$(15.00)
Total Glass Value	G	\$-	\$(480.00)
Total Cost per Haul		\$1,718.20	\$1,373.10

Table 8 combines and summarizes the glass recycling collection alternative use costs as previously described. The tonnage volumes presented in Table 4 use the low tonnage assumption because the costs are calculated as a monthly rate for the City's 10,335 recycling customers.

**Table 8: Walla Walla Glass Curbside Collection Recycling Alternatives Costs**

Collection Method	Note	Glass Route	Dual Stream
Monthly Collection Cost per Customer (Table 6)	A	\$1.54	\$0.60
City Glass Storage Cost (Section 4.2)	B	\$0.07	\$0.07
Cost to Transport to Seattle <sup>1</sup>	C	\$0.22	\$0.22
Total Monthly Cost (D = A + B + C)	D	\$1.83	\$0.89
Monthly Collection Cost per Customer (Table 6)	A	\$1.54	\$0.60
City Glass Storage Cost (Section 4.2)	B	\$0.07	\$0.07
Cost to Transport to Portland <sup>2</sup>	E	\$0.28	\$0.28
Total Monthly Cost (F = A + B +E)	F	\$1.89	\$0.94
Monthly Collection Cost per Customer (Table 6)	A	\$1.54	\$0.60
City Glass Storage Cost (Section 4.2)	B	\$0.07	\$0.07
Glass Pulverization Cost (Table 3)	G	\$0.22	\$0.22
Total Monthly Cost (H = A +B +G)	H	\$1.83	\$0.89

**Table 8 Notes**

1. Haul Cost to Seattle (Table 7) is \$1,373.10 multiplied by 20 loads per year and then divided by 12 months per year and then by the 10,335 recycling customers ( $\$1,373.10 \times 20 \text{ loads} = \$27,462 / 12 \text{ months} / 10,335 \text{ customers}$ ). The 20 loads per year is the estimated 624 tons from Table 4 divided by 32 tons per payload.
2. Haul Cost to Portland (Table 7) is \$1,718.20 multiplied by 20 loads per year and then divided by 12 months per year and then by the 10,335 recycling customers ( $\$1,718.20 \times 20 \text{ loads} = \$34,364 / 12 \text{ months} / 10,335 \text{ customers}$ ). The 20 loads per year is the estimated 624 tons from Table 4 divided by 32 tons per payload.

## Section 5 - Greenhouse Gas (GHG) Emissions Impacts of Alternatives

This section provides an analysis of the potential Greenhouse Gas Impacts (GHG) of the various alternatives developed for glass recycling and reuses for the City of Walla Walla by summarizing the estimated changes in greenhouse gas (GHG) emissions associated with:

- Collection – increased fuel usage for three alternatives to collect the glass for recycling.
- Recovery – changes in greenhouse gas emissions associated with recycling the glass from the residential and commercial collection and reusing glass from wineries and tasting rooms.

Collecting glass for recycling increases GHG emissions (reported as metric tons of carbon-dioxide equivalent, or MTCO<sub>2</sub>E), as shown in Table 9. Collecting glass dual-stream on the same truck as commingled recycling has the smallest impact while collecting it through self-haul at depots has the largest impact. Recovering glass reduces GHG emissions (see Table 10), and the savings from recycling and pulverizing would more than offset the collection impacts of dual-stream collection. Avoiding the impacts of manufacturing glass bottles through reuse has the largest GHG impact, though some of this impact would be offset by impacts of bottle sanitizing.

**Table 9: Glass Transport Impact Summary**

Collection Alternative	Estimated Tons	Net GHG Impact (MTCO <sub>2</sub> E)
Glass Collection Route	624	+77.47
Dual Stream Recycling	624	+9.50
Depot Collection	294	+168.64

**Table 10: Glass Recovery Impact Summary**

Recovery Alternative	Estimated Tons	Net GHG Impact of Alternative Compared to Landfilling (MTCO <sub>2</sub> E)
Recycle Glass in Portland	624	-160
Recycle Glass in Seattle	624	-158
Pulverize Glass	624	-61
Reuse Wine Bottles (1)	390	-5,129

## 5.1 Glass Recycling Collection GHG Impact Model

The glass collection alternatives include:

- Glass Collection Route. A new dedicated monthly (collection once a month) glass recycling route.
- Dual-Stream Recycling. Glass collection every other week on the same day as commingled recycling by switching to a recycling truck that has a second compartment for glass.
- Self-Haul to a Glass Recycling Depot. The glass depot(s) would be established in strategic areas of the City to provide easy access to people who want to recycle glass.

Because dual-stream recycling uses the existing commingled recycling route, only the additional mileage from the recycling center to the glass storage area at the landfill is considered a GHG impact of glass recycling. For glass depot collection, the model estimates the GHG impact of individual users driving to the depot, making assumptions for average pounds delivered and miles driven per user. This approach focuses solely on emissions from fuel use as the primary driver of GHG emissions from transport.

We identified each fuel type's emission factors for mobile combustion from the US EPA GHG Emission Factors Hub. First, direct emissions from transportation were calculated in metric tons for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrogen dioxide (NO<sub>2</sub>). These values were then converted to metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>E) using the most recent global warming potential (GWP) Constants from IPCC Fifth Assessment Report, 2014 (AR5).

The input values, assumptions, and calculated emissions for the glass collection are summarized in Table 11 on the following page.

**Table 11: GHG Impact for Walla Walla’s Glass Collection Alternatives**

Collection Alternative	Glass Route	Dual Stream	Collection Depot	Collection Depot	Collection Depot
Tonnage and Fuel Estimate Inputs (1)	Totals	Totals	Commercial	Residential	Totals
Vehicle type	Recycle Truck	Recycle Truck	Light Duty Trucks	Passenger Car	Varies
Fuel type	Diesel	Diesel	Gasoline	Gasoline	Gasoline
Estimated recycling tons	624	624	132	162	294
Estimated recycling depot pounds (2)	NA	NA	264,609	323,411	588,020
Pounds delivered per depot trip (3)	NA	NA	380	20	Varies
Number of trips (total depot pounds divided by pounds delivered per trip)	NA	NA	696	16,171	Varies
Roundtrip mileage per depot trip (3)	NA	NA	20	7	Varies
Additional annual miles driven	12,721	1,560	13,927	113,194	127,121
Average miles per gallon	1.7	1.7	10	25	Varies
Additional annual gallons of fuel used	7,573	929	1,393	4,528	5,921
Fuel Type Factor - Kg CO2/gallon of fuel	10.21	10.21	11.21	11.21	11.21
CH4 Factor (gram/mile driven)	0.0095	0.0095	0.008	0.0051	Varies
N2O Factor (gram/mile driven)	0.0431	0.0431	0.0013	0.0015	Varies
Additional Estimated Emissions (5)					
MTCO2	77.32	9.49	15.62	50.76	66.37
MTCH4	0.0001	0.0000	0.0001	0.0006	0.0007
MTNO2	0.0005	0.0001	0.0000	0.0002	0.0002
CO2 100-Year GWP	77.32	9.49	15.62	50.76	66.37
1 time as potent as CO2	0.0034	0.0004	0.0031	0.0162	0.0193
CH4 100-Year GWP	0.1453	0.0178	0.0048	0.0450	0.0498

**Table 11 Notes:**

1. Inputs provided by WIH, except as noted.
2. From City depot data from 2011, apportioned based on WIH estimates.
3. Despite receiving glass from outside the city, the number of trips from outside the city will be much lower. Most of the population of Walla Walla County lives in Walla Walla and College Place and anyone making a trip to deposit glass will likely combine the trip with some other trip (i.e., not a standalone trip to drop-off glass).
4. From US EPA GHG Emission Factors Hub.
5. Calculated using AR5 100-Year GWP Constants.

## 5.1 Glass Recovery GHG Impact Model

The glass recovery alternatives include:

- Recycling at a facility in Portland
- Recycling at a facility in Seattle
- Pulverizing into sand or aggregate locally
- Reusing wine bottles locally from wineries and tasting rooms

Emission factors were estimated using the EPA's Waste Reduction Model (WARM) and relevant associated guidance from the EPA<sup>20</sup>. The WARM tool provides GHG emission factors for baseline and alternative waste management practices, including source reduction and recycling compared to landfilling. The GHG results from modeling in WARM indicate life-cycle benefits from avoided upstream manufacture of new material plus the avoided downstream disposal emissions, offset by emissions from remanufacturing materials into new products.

For reusing wine bottles (source reduction), emission factors assume bottles are reused 25 times, followed by landfilling. Emission factors for reuse do not consider emissions associated with removing labels or sanitizing glass bottles because energy and water requirements vary substantially depending on label types and adhesive, bottle size and shape, and other factors. We applied these GHG emission factors to the estimated tonnages recovered from residential and commercial customers. Table 12 on the following page summarizes the results of the recovery analysis.

<sup>20</sup> US EPA WARM Tool and relevant guidance, <https://www.epa.gov/warm>  
[https://www.epa.gov/sites/default/files/2016-03/documents/using\\_warm\\_efs\\_for\\_materials\\_and\\_pathways.pdf](https://www.epa.gov/sites/default/files/2016-03/documents/using_warm_efs_for_materials_and_pathways.pdf)  
[https://www.epa.gov/sites/default/files/2016-03/documents/warm\\_reuse\\_approach\\_20100817.pdf](https://www.epa.gov/sites/default/files/2016-03/documents/warm_reuse_approach_20100817.pdf)

**Table 12: GHG Impact for Walla Walla’s Glass Recovery Alternatives**

Baseline End of Life Disposition	Alternative End of Life Disposition	WARM one-way mileage input (1)	Tons (2)	WARM GHG Emissions Factor Change per ton of Material (MTCO <sub>2</sub> E)(3)	Net GHG Impact of Alternative (MTCO <sub>2</sub> E)
<b>Residential Glass</b>					
Landfill Glass	Landfill Glass	1	624	0	0
Landfill Glass	Recycle Glass - Portland	242	624	-0.257	-160
Landfill Glass	Recycle Glass - Seattle	261	624	-0.254	-158
Landfill Glass	Pulverize Glass (4)	20	624	-0.098	-61
<b>Commercial Glass</b>					
Landfill Glass	Landfill Glass	1	520	0	0
Landfill Glass	Recycle Glass - Portland	242	520	-0.257	-134
Landfill Glass	Recycle Glass - Seattle	261	520	-0.254	-132
Landfill Glass	Pulverize Glass	20	520	-0.098	-51
Landfill Glass	Reuse Wine Bottles (5)	1	390	-0.548	-5129

**Table 12 Notes:**

1. WARM calculates the round-trip mileage for emissions. GHG emission impacts for alternative curbside or depot collection methods are presented under the glass collection alternatives. Values shown represent additional miles compared to current the current disposal site; WARM does not allow zero (0) miles, so the landfill mileage input is 1.
2. Input data on tons provided by WIH. For reuse, 75% of commercial glass was assumed to be wine bottles.
3. WARM emission factors were calculated based upon the Pacific Regional Electricity Grid.
4. Emission factors for sand (aggregate) production were developed by proxy using GHG emission factors for concrete recycling into aggregate, per EPA’s guidelines for pathways not available for modeling in WARM.
5. Emission factors for reuse are categorized as source reduction in WARM. GHG benefits of reuse are calculated by multiplying the number of tons originally discarded (390 tons) by one less than the number of times it is reused (25-1= 24) by the per-ton change in WARM’s GHG emission factor (-0.548). This value does not consider emissions associated with removing labels or sanitizing glass bottles.



## Section 6 - Financial Assistance Opportunities

Given the costs for the collection equipment, bins or roll carts (curbside collection for alternatives 1 and 2), roll-off containers (for the depot alternative), glass storage bunker, as well as additional costs outside of what has been identified in this report and not anticipated, the WRG Project Team researched possible funding mechanisms to assist the City in financing options available for the development of a glass recycling program. This section highlights the information and data gathered.

Other sources of financial assistance may be available to the City that the WRG Project Team is not aware of at this time. If the City elects to implement a glass recycling program, now or in the future, it should research available funding at that time since grants and other funding mechanisms from public agencies and private sector sources are ever-changing.

Here are the organizations the WRG Project Team identified, their website, and a summary of their funding offerings (in no particular order).

### Washington State Department of Ecology (WA DOE)

The Washington State Department of Ecology's Solid Waste Management Program administers four grant programs for governments and nonprofit organizations. Below outlines some basic information about each. They are focusing on solid waste outreach & education, recycling operations, planning, and litter pick-up.

- **Waste Reduction Recycling & Education**
  - Solid Waste education projects and implementation of local gov't contamination reduction outreach plans (CROP)
  - Nonprofit organizations and local governments may apply
  - Website: <https://ecology.wa.gov/WRRED>
  
- **Public Participation**
  - Solid waste and contaminated site education projects
  - Nonprofit organizations and individuals
  - Website: <https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Public-participation-grants>
  
- **Local Solid Waste Financial Assistance**
  - Solid waste enforcement and Implementation of local solid waste plans
  - Local governments (primarily counties, but they can defer some of their funds to other local governments such as cities)
  - Website: <https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Coordinated-prevention-grants>

- **Community Litter Cleanup Program**

- Litter cleanup
- Local governments
- Website: <https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Community-litter-cleanup-grants>

**Website:** <https://ecology.wa.gov/About-us/Payments-contracts-grants/Grants-loans>

### **Environmental Protection Agency (EPA)**

The Solid Waste Infrastructure for Recycling grant program is a new grant program authorized by the [Save Our Seas 2.0 Act](#) and initially funded through the Infrastructure Investment and Jobs Act. The Infrastructure Investment and Jobs Act also referred to as [the Bipartisan Infrastructure Law](#), provides \$275 million for Solid Waste Infrastructure for Recycling grants authorized by the Save Our Seas 2.0 Act. This is allocated as \$55 million per year from Fiscal Years 2022 to 2026 to remain available until expended. EPA was provided an additional \$2.5 million in the Fiscal Year 2022 funding to implement the program.

### **The Solid Waste Infrastructure for Recycling program**

This program provides grants to implement a strategy to improve post-consumer materials management and infrastructure; support improvements to local post-consumer materials management and recycling programs; and assist local waste management authorities in making improvements to local waste management systems.

### **Recycling Education and Outreach Grant Program**

The Bipartisan Infrastructure Law provides \$75 million (\$15 million per year from Fiscal Years 2022 to 2026 to remain available until expended) to fund a new Education and Outreach Grant Program. Projects funded through the grant program will inform the public about residential or community waste prevention or recycling programs; provide information about the recycled materials that are accepted and increase collection rates and decrease contamination across the nation. The entities eligible to apply for both grant programs are as follows:

- The U.S. States and political subdivisions of states.
- Puerto Rico, Virgin Islands, Guam, American Samoa, Commonwealth of Northern Mariana Islands.
- District of Columbia.
- Federally recognized tribal governments.
- Former tribal reservations in Oklahoma (as determined by the Secretary of the Interior).
- Alaskan Native Villages as defined in Public Law 92-203.
- Intertribal Consortia consistent with the requirements in Title 40 of the Code of Federal Regulations, Section 35.504(a).

**Website:** <https://www.epa.gov/rcra/recycling-education-and-outreach>

## NextCycle Washington

The NextCycle Washington program helps develop equitable local economies while reducing waste, keeping materials in use longer, and regenerating natural systems. They focus on helping nurture projects that incorporate waste prevention, repair, reuse, recycling, and/or composting models. Participants can be entrepreneurs/start-ups, small businesses, established corporations, nonprofits, or a collaboration of entities. By providing technical and business support, NextCycle Washington helps accelerate projects that will improve the state's circular economy to an investment-ready status.

NextCycle is a program that the State of Washington is also promoting heavily through the Recycling Development Center. You can find all of their information from the link, but the quick description is that they support business and program building in the sustainable/circular economy areas. They currently have two types of programs in Washington.

- Circular Accelerator, which helps accelerate existing businesses and projects.
- Renew Seed Grants, which can help fund innovative ideas and projects. This is the route I think will be most helpful for Walla Walla.

While the City directly may not qualify, BDI would be able to apply for grant funding for the carts or bins.

Website: <https://www.nextcyclewashington.com/renew-seed-grant>

## Recycling Development Center

The Recycling Development Center (Center) is a program at the Washington State Department of Ecology (Ecology) created by a 2019 law ([Chapter 70A.240 Revised Code of Washington](#)). The Center was formed to provide or facilitate marketing, policy analysis, research, and development to strengthen recycling markets and processing in Washington. The Center's work is an effort between Ecology, the Washington State Department of Commerce, and the Recycling Development Center advisory board. The advisory board represents public agencies, private industry, universities, and nonprofits. The Center's goal is to improve recycling markets.

The Recycling Development Center (Center) will be hosting an Eastern Washington Glass Summit in Spring 2023. Citing in an email announcement from the RDC in August of 2022, they state that *"In recent months, the Center has noticed momentum growing in Eastern WA around alternatives for container glass besides landfilling. Given the growing local interest, we wanted to help by bringing together the various community groups, wineries, municipalities, haulers, and manufacturers together to share obstacles, opportunities, and support the community in finding solutions."*<sup>21</sup>

<sup>21</sup> Email from Mya Keyzers of the Washington State Department of Ecology & The Recycling Development Center dated August 31, 2022.

The tentative plan is for a one-day, hybrid (in-person and virtual) meeting in Eastern WA after the passes are clear in early Spring 2023. In an effort to keep this community focused on what could be of most service to you we need your feedback. Here are the tentative topics:

1. Data presentation – latest Ecology data, what is collected, where it goes
2. Counties collection panel – county reps and haulers update on current glass collection status
3. Glass Packaging Institute – innovative recycling solution examples
4. Wine Industry panel- current needs and efforts or interests in recycling, reuse, lighter bottles
5. Community-led efforts panel – reps from the glass crushers
6. End Markets
7. Policy Ideas
8. Q & A & Discussion

Websites: <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Strategic-policy-and-planning/Recycling-Development-Center> and [https://www.ezview.wa.gov/site/alias\\_1962/37596/recycling\\_development\\_center\\_advisory\\_board.aspx](https://www.ezview.wa.gov/site/alias_1962/37596/recycling_development_center_advisory_board.aspx)

### **Washington State Department of Commerce / Washington State Public Works Board**

The Department of Commerce is the one agency in Washington state government that touches every aspect of community and economic development: planning, infrastructure, energy, public facilities, housing, public safety and crime victims, international trade, business services, and more. They work with local governments, tribes, businesses, and civic leaders throughout the state to strengthen communities so all residents may thrive and prosper.

### **Washington State Public Works Board**

The Legislature created the Public Works Board in partnership with local governments to assist in addressing infrastructure needs. They use a dedicated funding pool to offer low-interest financing in a revolving loan program. A citizens' board of infrastructure representatives manages the program. The Public Works Board (Board) is authorized by state statute ([RCW 43.155](#)). Its purpose is to loan money to counties, cities, and special purpose districts to repair, replace, or create infrastructure.

#### **Eligible Applicants**

- Cities
  - Counties
  - Special Purpose Districts
  - Quasi-Municipal Organizations
- Tribes, school districts, and port districts are ineligible for this program.*

#### **Eligible Infrastructure Systems**

- Domestic Water
- Roads/Streets
- Bridges
- Sanitary Sewer
- Solid Waste/Recycling
- Stormwater

Website: <https://www.commerce.wa.gov/building-infrastructure/pwb-home-page/>

## Washington Fund Directory

The Washington fund directory claims to be a one-stop shop for sourcing project funding in Washington State. The State of Washington has many resources available to help finance diverse projects, from environmental cleanup to building better schools, to improving pedestrian access in cities and towns. It can be unclear how to access these sources of financing, as they exist across various state agencies. Additionally, many agencies can provide grants or loans for similar project areas. The Washington Fund Directory compiles these state programs into a single depository that is user-friendly and easy to navigate. This resource finder is designed to help users find the right type of funding for their project and get the much closer to their goals.

Users can sort and search 140+ programs by project type to find a funding source that fits their needs and parameters. To find funding for your project, choose the project category, sort columns by alphabetical order, or do a keyword search. Expand rows for additional program information by clicking and learning what opportunities are out there. The Washington Fund Directory is part of the [Office of the State Treasurer](#)

Website: <https://www.wafunddirectory.wa.gov/environmental/>

## The Recycling Partnership (TRP)

The Recycling Partnership is a leading, national force for improving recycling, The Recycling Partnership puts private dollars to work in communities, investing in systems to protect resources, empower sustainable action and unlock opportunity. They drive measurable sustainability through grants, technical assistance, tools, research measurement, and best management practices.

Website: <https://recyclingpartnership.org/>

## Glass Packaging Institute (GPI)

The Glass Packaging Institute is the trade association representing the North American glass container industry by promoting glass as the optimal packaging choice, advocating industry standards, and educating packaging professionals. GPI advances environmental and recycling policies and enables manufacturers to speak with one voice to improve industry standards.

Website: <https://www.gpi.org/>

## Glass Recycling Foundation

The Glass Recycling Foundation is a nonprofit organization established to provide and raise funds for localized and targeted assistance that addresses gaps in the glass recycling supply chain across the United States. *The Glass Recycling Foundation awards grants to support equipment, education, and pilot project activities that improve glass recycling.* The Glass Recycling Foundation's grant program is intended to increase glass recovery and diversion from landfills, and to connect glass generators with end markets.

Website: <https://www.glassrecyclingfoundation.org/grants>

### **Closed Loop Partners**

Closed Loop Partners is a New York-based investment firm that provides equity and project finance to scale products, services, and infrastructure at the forefront of the development of the circular economy. Their Closed Loop Infrastructure Fund provides below-market-rate loans to finance projects that build out circular economy infrastructure in the United States. Established in 2014 and funded by the world's largest retailers, corporate foundations, technology, and consumer goods companies. They fund replicable, scalable, and sustainable recycling and circular economy infrastructure projects across the collection, sortation, processing, and new technologies.

Website: (<https://www.closedlooppartners.com/>)

## Section 7 – Other Considerations

This section includes some other considerations for the City as follows:

- Additional opportunities for glass recycling from the commercial and industrial businesses within the City of Walla Walla;
- Glass recycling opportunities for the regional wineries;
- Consideration of a bottle bill in Washington State;
- The potential for backhauls for the recycled glass loads transported from Walla Walla to either Strategic Materials in Seattle or Glass2Glass in Portland. In both cases, the backhauls from those areas could help reduce the overall transportation costs to the City of Walla Walla.

### 7.1 Commerical Glass Recycling within Walla Walla

While not part of the scope of work for this project, the collection of glass for recycling from commercial businesses and other industries within Walla Walla could be an additional service provided by the City or through BDI, this could help to bolster the City's glass recycling and increase public awareness. Initially, target businesses would include those that are serving beverages in glass bottles, such as restaurants, bars, nightclubs, wineries, and coffee shops.

### 7.2 Glass Recycling Collection from Wineries

Recognizing that local and regional wineries in the Walla Walla area generate significant amounts of glass bottles, the WRG Project Team contacted the Walla Walla Winery Alliance's Executive Director and developed a survey that they agreed to distribute to the Winery Alliance members. The Alliance represents 90 winery members, 21 vineyard members, and 62 industry and community partners<sup>22</sup>. The survey asked questions intended to collect the thoughts and feedback from the various member wineries about the possibilities of glass recycling if a program were made available to them. The survey respondents varied; however, there was support from respondents to the survey stating that they would be interested in a program and willing to pay for wine bottle recycling. Most cited that their willingness was dependent on the cost to them of participating in a glass recycling program. The survey questions and results from the survey respondents are in the Appendices of this report. Of interest and as of June 28, 2022, there is a new Executive Director at the Winery Alliance, Liz Knapke, so if the City is interested in pursuing glass recycling for wineries, new conversations would need to be established.

### 7.3 Washington Bottle Bill Potential

According to research and sources interviewed for this project, the WRG Project Team heard from Scott DeFife of the Glass Packaging Institute that the potential for a bottle bill in Washington State could become a reality soon. The aluminum can industry is behind this effort, and three items would be included which are aluminum cans, PET bottles, and glass containers.

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<sup>22</sup> [Walla Walla Winery Alliance Website](#)

Washington legislature has a history of attempting to pass a bottle bill dating back to 1970<sup>23</sup>. Since then, three more attempts were made to pass a bottle bill in 1979, 1982, and 2011. In the last effort, the details of the bill included that Washington's proposed deposit system would have dealers/distributors responsible for initiating the 5¢ deposit, picking up empty containers, and reimbursing retailers and redemption centers. The bill sets daily limits on the number of containers a person may return: 144 at larger stores and 50 at smaller stores.

In other WRG project research, King County, through the King County Responsible Recycling Task Force (RRTF) in 2019 and 2020, researched developing a feasible model for beverage container stewardship in Washington similar to the Oregon Beverage Recycling Cooperative model<sup>24</sup>.

A series of three reports were produced for the King County Responsible Recycling Task Force (RRTF) to address Action Item 1E from their Recommendations Report, published in January 2019, which was to: Develop a feasible model for beverage container stewardship in Washington similar to the Oregon Beverage Recycling Cooperative model. The reports build upon the Extended Producer Responsibility (EPR) model developed in the March 2020 report for King County, Extended Producer Responsibility Policy Framework, and Implementation Model: Residential Recycling of Packaging and Paper Products in Washington State.

Bottle bills can increase recycling rates. Currently, ten states in the US have bottle bills, including neighbors in Oregon, California, and British Columbia. The US glass recycling rate has plateaued at around 25%. The glass recycling industry set a national 50% recycling rate goal by 2030<sup>25</sup>.

The highest glass recycling rates in the US occur in bottle bill states, with those in the Pacific Northwest ranging from 61%-78% in 2018<sup>26</sup>. Oregon has been the leader in glass recycling, passing the first bottle bill in 1971. In addition to recycling glass, Oregon's refillable program reported that 407,840 tons of glass bottles have returned to the bottler, avoiding recycling costs<sup>27</sup>. In 2021 California passed Assembly Bill 1311, allowing wineries to sell wine in reusable containers.

The reason for including this information in this report is that glass recycling within Washington State could have a greater emphasis if a bottle bill were enacted.

#### 7.4 Glass Truckloads to Processor Backhauls

The potential exists for backhauls for the full truckloads of recycled glass loads that would be transported from the City of Walla Walla to either Strategic Materials in Seattle or Glass2Glass in Portland. In both cases, the backhauls from those areas could help reduce the overall transportation costs to the City of Walla Walla.

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<sup>23</sup> [Bottle Bill Resource Guide](#)

<sup>24</sup> [King County Container Deposit Study Executive Summary](#)

<sup>25</sup> [GPI Roadmap to U.S. Glass Recycling](#)

<sup>26</sup> [Bottle Bill States and How They Work](#)

<sup>27</sup> [Oregon Bottle Bill Resource Guide](#)



### **Strategic Materials (SMI) Offering**

Through various discussions with Strategic Material (SMI) in Seattle and the WRG Project Team, SMI provided a letter offer in support of being the recycling glass processor for the potential glass recycling collection program for the City of Walla Walla, Washington.

The offer letter states that SMI will gladly accept all glass produced in the City's drop-off centers and curbside programs. SMI is prepared to pay \$15.00 a ton for mixed-color bottles that are produced at drop-off centers and or collection programs. The caveat for their offer is that the collected glass has to be free of any non-glass residual (NGR) and be no smaller than ¼ inch in diameter. If the City of Walla Walla decides to incorporate glass into a single-stream recycling program, SMI's price offering to the City will be determined by the percentage amounts of NGR, and fines material (1/4 inch minus), using a pricing matrix. According to SMI's offering, the recycled glass received from the City of Walla Walla would be primarily used by the glass container industry to manufacture new beverage containers. The City's glass will also be used as feedstock for the fiberglass industry in manufacturing fiberglass insulation. 100% of the glass received will be crushed and recycled.

SMI is also willing to use the City of Walla Walla's Sudbury Road landfill for disposal in an effort to provide a backhaul load of waste that their Seattle facility generates on a load-for-load basis, i.e., glass load to Seattle and waste load returning to Walla Walla for disposal at Sudbury Road landfill. This would reduce the impact of the long and expensive haul to and from Seattle for Walla Walla's collected glass.

Currently, SMI averages 1,800 tons per month of waste and pays \$55.39 a ton (including trucking and landfill tipping fees) to the Cowlitz landfill. This price would have to be matched by the City for disposal for SMI to be able to offer a backhaul.

### **Dietrich Trucking Backhaul for Portland Recycled Glass Loads**

In discussions with Dietrich Trucking, a potential vendor for transporting the full truckloads to either Seattle or Portland, they stated that they could secure and provide backhauls for the recycled glass loads that would go to Glass2Glass in Portland. In addition, they can secure loads of a commodity known as autofluff<sup>28</sup> from Schnitzer Steel in Portland to a landfill along the Columbia River en route when returning to Walla Walla.

Table 13 on the following page, provides a summary of the cost impacts of utilizing the proposed backhaul offers.

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<sup>28</sup> Autofluff is a mixture of non-ferrous materials used in automobiles and is difficult to recycle but approved in most states for use as alternative daily cover (ADC) at landfills.

**Table 13 – Transportation Backhaul Potential Savings**

Description	Note	Portland	Seattle
Round Trip Miles	A	484	522
Haul Cost per Mile	B	\$3.55	\$3.55
Total Roundtrip Cost (A x B)	C	\$1,718.20	\$1,853.10
Tonnage Payload	D	32	32
Cost per Ton (C / D)	E	\$53.69	\$57.91
Glass Value per Ton	F	\$-	\$(15.00)
Total Glass Value	G	\$-	\$(480.00)
Total Cost per Haul		\$1,718.20	\$1,373.10
Potential Backhaul		Yes	Yes
Backhaul Description		Auto Fluff to Finley Buttes	Residual Waste to Sudbury
Backhaul Value	H	\$(704.00)	\$(1,600.00) <sup>1</sup>
Total Glass Revenue and Backhaul Buy-down	I	\$(704.00)	\$(2,080.00)
Net Cost of Transportation (G + H)	J	\$1,014.20	\$(226.90)
Net Cost per Ton (J / D)	K	\$31.69	\$(7.09)
Annual Glass Tons (Low Estimate)	L	624	624
Total Transport Costs (K x L)	M	\$19,777	\$(4,425)
Recycling Customers	N	10,335	10,335
Cost per Customer Per Month (M / N / 12 months)	O	\$0.16	\$(0.04)

**Table 13 Notes:**

1. SMI is currently paying \$55.39 per ton for transport and disposal to the Headquarters Landfill in Cowlitz County to dispose of glass residue waste<sup>29</sup>. If the City is willing to charge match the disposal fee and charge \$55.39 per ton to offset the transport and disposal, the cost of glass transport can be significantly lowered.
2. This opportunity would need to be investigated further by the City through communications with Strategic Materials management to ensure it could be a viable long-term solution where a load-for-load (head haul to backhaul) ratio could be achieved to realize the backhaul savings.
3. Autofluff is a mixture of non-ferrous materials used in automobiles and is difficult to recycle but approved in most states for use as an alternative daily cover (ADC) at landfills.

<sup>29</sup> SMI's landfill waste predominately contains small cardboard/paper, plastics, dust/dirt/organics, and some very fine particle glass.

## Section 8 - Implementation Schedule

To get the most accurate information relative to the manufacturing lead times for the equipment necessary to fulfill the needs of a curbside glass recycling collection program for the City of Walla Walla, BDI helped provide the lead times for both the collection vehicle and for either roll carts or bins for residential collection.

Should the City elect to pursue curbside glass collection, it is essential to note that it makes the most sense, concerning economics, procurement, and contractual matters, to coincide with the new recycling collections contract with BDI.

The current recycling collection contract with BDI expires on January 31, 2024, so from October 2022 until its expiration is 16 months. Table 14 provides key milestones for the Recycling program and the estimated dates for completion. Table 15 provides the new truck production and manufacturer's lead time assumptions.

**Table 14: Recycling Program Assumptions**

Milestone	Date
Receipt of WIH Resource Group Recommendations Collection Contract with BDI	Nov 1 <sup>st</sup> , 2022
City Defines Recycling Collection Program features	Mar 1 <sup>st</sup> , 2023
A new Contract is negotiated and signed	May 1 <sup>st</sup> , 2023
Orders are placed for new equipment (and carts or bins, as applicable)	May 1 <sup>st</sup> , 2023

**Table 15: Recycling Production Manufacture Lead Time Assumptions**

Manufacturer	Estimated Lead Times
Truck Chassis Production	6 months to 12 months ( <i>This is the variable/unknown</i> )
Truck Body Production	5 months from receipt of the chassis. This includes 90-120 days to build and release from the factory and another 30 days for transport from the factory and pre-delivery Inspection of the body and chassis
Collection Cart and/or Bin Production	This is not determined to be a time constraint, as it will certainly fall within the chassis/body production timeline.

### Resulting / Timeline to Program Start Date

According to BDI, the working assumption is that it will take from 10 to 12 months from the execution of the new recycling collection contract with the City of Walla Walla to the receipt of a new truck. Receipt and delivery of the carts and bins to households can happen prior to receipt of chassis, and therefore not a constraint within this timeline.

### BDI Contracting Considerations

According to Darrick Dietrich with BDI, if the new recycling collection contract can be signed by May 1<sup>st</sup>, 2023, the program could be rolled out from March 2024 to May 2024. He also stated that if the above assumptions are agreeable, then he thinks it is incorrect to plan/presume that the new Recycling

Collection Program could be up and running at the time of expiration of the current contract (Jan 31<sup>st</sup>, 2024). And as such, he would propose that the new agreement be signed to allow for the procurement of new equipment and that the new contract has the correct language for program and price changes. These program and price changes can happen as soon as the market allows, and they would happen without conflict with the contract if sufficient planning were undertaken during the negotiation phase.

Considering all this, he stated being uncomfortable planning on a Feb 1<sup>st</sup>, 2024, Recycling Collection Program implementation date. However, if there is no urgency on the part of the City to have the new program in place, then he thinks a smoother/safer transition could be accomplished.

## Section 9 - Public Education and Outreach

Public education and outreach are central to the success of any recycling program. If the city were to introduce a glass recycling program to its residents, the City would be in a unique position to update its educational materials with the anticipated new recycling collection contract with BDI that could include glass recycling, as well as the selection of a new glass commodity processor such as Strategic Materials in Seattle or Glass2Glass in Portland.

While the City has a page on its website dedicated to recycling<sup>30</sup>, Updating the City's recycling education programs provides an opportunity to refresh and expand existing activities and implement the changes associated with a curbside glass collection program. It also offers an opportunity for a more coordinated recycling education program among residents.

The new BDI recycling collection contract and a processing contract would also allow the City to start fresh and establish an effective partnership with both BDI and the recycled glass processor to reduce recycling contamination and facilitate the proper preparation of materials, thereby reducing costs for BDI, Walla Walla Recycling, and the selected recycled glass processor. During WRG's interview with Laura Henneman of Strategic Materials, she offered her time to the City to assist with public education and outreach as part of their services if they are to become the City's recycled glass processor.

This section contains ideas and options that could be implemented in the City's specific education program.

### 9.1 Best Practices for Education

Based on the WRG Project Team's experience in assisting communities with recycling education, the following best practices are for the City to consider as they evaluate their current education program and strive for increased effectiveness. These best practices include:

- **Consistency** – The programs within the City can share information and language, which would help facilitate consistency for both curbside commingled recycling (non-glass items) as well as the new single-stream glass-only recycling program. This is useful as residents from each community may live, work, and/or shop in different places. No matter where they reside within the City, the same consistent recycling messages would be seen and heard.

<sup>30</sup> [City of Walla Walla Website Page on Recycling](#)

- **Clarity** – Clear educational materials that provide relevant information on accepted recyclable materials and proper preparation guidelines give residents the information needed to successfully participate in the program. The City should refrain from using industry jargon or acronyms in recycling education materials. Language and visuals used should only include simple, clear text.
- **Visual Appeal** – The City should use simple, visually appealing graphics to reinforce recycling messages. Graphics must also be clear and often can be used to supplement or compliment narratives describing acceptable recyclable materials or proper preparation instructions. Appendix B includes sample recycling graphics that were created using the tools and resources from the Recycling Partnership.
- **Concise** – Recycling education materials should be concise and not contain added words or information that could make understanding the material's message more difficult. Oftentimes, educational materials can become cluttered and busy when too much information is provided. The City should aim to produce educational materials that are concise and easy to read and understand.
- **Accessible** – A good practice for recycling education is to make materials accessible. This includes providing recycling information in easy-to-locate places on a website, newsletter/flyer, or social media. Additionally, the City may consider producing educational material, such as a refrigerator magnet, which can be distributed to residents for placement in an easy-to-find or convenient location. Recycling information that is hard to find will result in residents giving up and deciding on their own how to participate in a recycling program.
- **Multi-Media** – If not doing so already, the City should use multiple media outlets such as newsletters, social media, billing and newspaper inserts, and websites to communicate about recycling education. Using a variety of media to educate the public about recycling increases the impact of the recycling education program by reaching more residents who obtain information in diverse ways.
- **Face-to-Face Interaction** – The City should identify opportunities to meet face-to-face with residents and business owners (if or when applicable) to encourage glass recycling. Similar to why politicians hold rallies and knock on doors, face-to-face interaction is effective at prompting people to action. Meeting with residents face-to-face is an important way to educate City residents on how to separate and recycle glass. Face-to-face interaction can be at community events or festivals, presentations in schools, or participation in meetings held by local nonprofit entities such as the local Rotary Club or Chamber of Commerce.

## 9.2 Example Program Elements

The subsection provides some ideas that have proven to be both standard and beneficial for municipal recycling programs throughout the U.S.

- Recycling Guide** - A recycling guide is an easy-to-understand tool that communities can use to encourage recycling. Recycling guides can take on many different forms, but should be simple, visually attractive, and convey concise messages. To keep recycling guides concise, the guide can direct residents or business owners to other sources (i.e., the City's website) for more detailed recycling information. Some cities develop a simple visually-attractive one-page recycling guide to distribute to residents. The guide provides the list of materials that are accepted as part of the City's curbside glass recycling program along with a list of materials that are not acceptable. The guide provides the contact information for the City if there are questions and a link to the City's website<sup>31</sup> for additional information on recycling.

Figure 12 includes a screenshot of some of the City of Walla Walla's current recycling education communication tools, which include a lot of information.

**Figure 12: City of Walla Walla Recycling Education Brochures and Stickers**



## Notification Systems

Another method for increased communication is a notification system that allows residents to sign-up to receive alerts and information about waste and recycling. Residents can opt-out of the notification system at any time. These types of systems facilitate the accessibility of information.

<sup>31</sup> [City of Walla Walla Recycling Website Page](#)

## Mascots

One of the more creative public education tools available to communities is to adopt a mascot to promote recycling. Mascots are entertaining, visually appealing, and leave an impression on a community's recycling program. Mascots are particularly effective at engaging children and young people on the importance of recycling. This is particularly important as oftentimes children and young people have an outsized influence on encouraging recycling in homes, particularly if adults are not engaged or interested in recycling.

Mascots can be deployed in many different settings, including at schools for recycling presentations, in public TV announcements, and at community events or fairs. Recycling mascots can come in all shapes and sizes, but their purpose remains the same: impact and influence people to recycle.

As an example, another WRG client, the City of Flagstaff Arizona created "Albert the Squirrel,"<sup>32</sup> as the City's recycling mascot (Figure 13), several years ago. Albert is used to promote recycling throughout the community. The City has used Albert to produce some videos promoting the City's recycling program. Additionally, Albert is brought into schools and other community events to promote recycling.

With the establishment of a new recycling collection and glass processing contract for the City of Walla Walla, WRG believes there may be an opportunity for a more coordinated recycling education program to include a mascot.

Figure 13: Albert the Squirrel Mascot



## Social Media

Social media is a key component of an effective recycling education program. The opportunity exists for Consortium members to expand their presence on social media to reach younger residents who increasingly rely on social networking sites to get information. Social media platforms include Facebook, Twitter, Instagram, YouTube, TikTok, and Snapchat. Each social media functions differently and WRG encourages the City to consider using a variety of sites to reach multiple audiences. Social media is designed to communicate quickly and often instantaneous messages to recipients. The City should use these platforms to educate constituents on recycling issues. Social media can also be used for "human interest" stories about recycling and waste diversion. For example, the City could report the annual tons of glass and other materials that were collected and recycled and connect the energy savings to what it takes to power a TV. The opportunities to share information on social media are endless.

<sup>32</sup> [Albert the Squirrel on Flagstaff's Website](#)

## Face-to-Face Interaction

Face-to-face interaction with the public is one of the most effective ways to promote and encourage participation in recycling programs. Identifying community events that solid waste and recycling staff can participate and share information about recycling is useful in spreading the word about recycling.

This would be especially important if the new collection recycling and processing contract for the City with BDI and a glass recycling processor (SMI or Glass2Glass) result in changes to the types of materials accepted for recycling in the curbside programs. Opportunities to meet with residents and provide information on recycling might include hosting a booth at local special events. Additionally, the City might consider hosting an annual "Recycling Day" to celebrate recycling in their communities. The event could include entertainment, kid activities, the City's recycling mascot, and food. Planned participation in such events can be advertised in newsletters and on social media.

## Recycling Apps

Recycling applications (Apps) have grown in popularity and can be useful tools to promote and educate residents on recycling. Subscribing to or developing the City's recycling app does not take the place of traditional public education activities but having an app can complement existing public educational efforts and provides another opportunity to connect and communicate with residents about recycling.

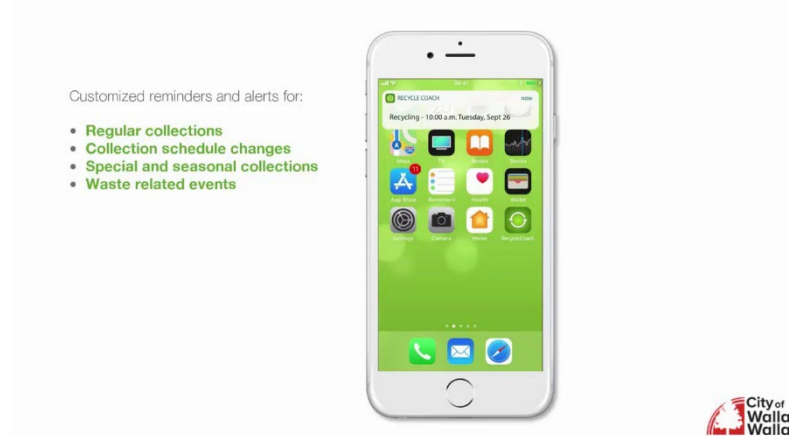
Many of the larger waste and recycling companies have developed their app for use by their customers to help them recycle better. This section describes some of the more common recycling applications that the City may wish to explore further and encourage its residents to use.

According to the City's website, the City of Walla Walla already utilizes and provides residents with an App, the Recycle Map App<sup>33</sup> which is through the Recycle Coach App, a company and App that allows users to find the recycle schedule by entering an address location. Not having used the City's App so not knowing fully what services are being used by the City to communicate with residents if the City were utilizing the App's expanded capabilities (as outlined below) and further to provide users (residents of Walla Walla) with more information, the App could serve the City to enhance recycling education and outreach. Figure 14 on the following page is a screenshot from the City's website of the App.

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<sup>33</sup> [Walla Walla Recycle Map App](#)



**Figure 14: City of Walla Walla Recycle Coach Recycle Map App**

Further details on the Recycle Coach App's available services and resources follow.

### Recycle Coach App

Recycle Coach<sup>34</sup> is a communication tool that makes it easy for residents to get fast information on their local recycling program. Municipalities subscribe and enter into a contract with Recycle Coach to provide the recycling app service to residents. Residents can use the app for free to get personalized collection schedules, acceptable materials lists, and activities to make recycling fun and engaging. The following details the steps and features of the Recycle Coach app:

- 1) Initial Set-up – Community uploads the details of their recycling program into the Recycle Coach database. The Recycle Coach team sets up schedules and a "What Goes Where" database. Communities review the data to confirm accuracy. Upon confirmation program specifics are accurate the app is launched.
- 2) Web App – Recycle Coach staff collaborate with each community to place the web app on their website to maximize usage and app downloads. Residents can simply install the app directly from the website to access all local recycling program information.
- 3) Mobile App – The app is also available for download to a mobile phone giving residents recycling information at their fingertips. Each resident gets a customized schedule and recycling tips based on their community's recycling program.
- 4) Recycle Coach Website – The Recycle Coach website serves as a resource for recycling information, which includes a dedicated webpage for each community's recycling program that participates.
- 5) Admin Portal – Communities that subscribe to Recycle Coach receive access to an administration portal where information on the community's recycling knowledge and challenges are tracked. This background information allows a community to tailor its education program around the most common

<sup>34</sup> [Recycle Coach Website](#)

recycling challenges. The community can also use the admin portal to send emergency or non-emergency messages to their users as required.

Other Apps are available in the marketplace for recycling education and outreach, as well as other related services, however, the WRG Project Team omitted them since the City has already invested in the Recycle Coach App.

### **Education and Outreach Summary**

Recycling education remains a critical component of the City's recycling program. The City is in a unique position to retool its education programs to make residents aware of a forthcoming glass recycling program, and to conform to both the collection recycling requirements of BDI, as well as the anticipated new glass recycling processor. With education having an important impact on recycling contamination and the price the City residents will pay for material processing and residual disposal, WRG recommends an education and outreach program that involves both BDI and the selected glass recycling processor.

Finally, implementing a recycling app has the potential to increase recycling, reduce contamination, and improve program efficiencies. The City should further evaluate the use of the current recycling app to make sure all of the key communication functions are enabled for users of it and promote it more widely to make sure residents are aware it is available.

In addition to these suggestions, the Recycling Partnership offers online tools to develop recycling campaigns, see: <https://recyclingpartnership.org/pdf-builder-login/>

## Section 10 - Recommendations

Should the City of Walla Walla elect to implement a glass recycling program for the City residents, the WRG Project Team makes the following key recommendations for the City's consideration. This information is based on the in-depth and intense research conducted for this study by the WRG Project Team, interviews with key industry sources and experts, data collected, and industry-related experience.

The key drivers of these recommendations are focused on the City's residents' interest in having a glass recycling program, one where the glass collected curbside is fully recycled and turned into glass cullet and used in making new glass bottles. Another key driver is that the collection of glass allows for the highest quality of collected glass. This goal is to achieve the highest probability of marketability of the glass over the future, as well as the highest rebate value.

### Recommendation One – Preferred Glass Collection Method of the Alternatives

Alternative / Option 3 is the recommended alternative. This alternative proposes a dual-stream collection system using a Labrie Expert collection truck with two separate compartments on the collection body. The deployment of this type of co-collection program is to capture the two recyclable streams (commingled recyclables and glass) is more cost-effective than deploying two Automated Side Loader vehicles per route, one for commingled and one for glass collecting them separately.

The larger compartment on the truck is for the City's commingled material, and the second is for glass. Glass would be collected at the same frequency as recycling (every other week); therefore, customers would get an 18-gallon bin for glass storage and collection. The use of 18-gallon bins also allows for a visual inspection of the glass before collection and offers the following added value benefits.

- Ensures the highest value when marketing the glass;
- Allows the BDI drivers to visually inspect the glass recycling bins for any contamination efficiently while collecting the glass curbside;
- Allows for a feedback loop to the resident household, should a "Recycling Quality Matters" program be implemented by the City.

This Alternative assumes a seven-year life for the new contract.

### Recommendation Two - Collection Truck Ownership

BDI should own, operate, and maintain the Labrie Expert collection truck as part of the new recycling contract with the City of Walla Walla

### Recommendation Three - Collection Bin Ownership

BDI should procure, own, maintain and supply the 18-gallon glass collection bins to the City residents as part of the contract. This includes bins for new residents, as well as replacement bins for damaged or lost bins. In discussions with BDI management, they stated preferring to own all bins within the City's

glass collection program. The ownership and management of these assets (bins) by BDI make serving the customers much easier and require less involvement by City management and staff.

#### **Recommendation Four – Contracting for Collections**

The City is already in the process of having discussions with BDI for a new recycling collection and processing contract as the current one is set to expire on January 31<sup>st</sup>, 2024. The WRG Project Team proposes that the new recycling agreement be signed to allow for the procurement of new equipment and that the new contract has the correct language for program and price changes. This language allows the City to implement a glass recycling program at any time during the life of the contract with BDI if the city does not elect to implement the glass recycling program at the time of the new contract with BDI. Enter into a seven-year contract with BDI for the new glass recycling and collection program with three – 1-year renewal options.

#### **Recommendation Five – Glass Storage**

WRG recommends utilizing the offer proposed by BDI for storage of the glass at a location owned by BDI. This allows the city to be free of having to incur the costs associated with constructing a storage pad at the landfill and maintaining it. It also frees up staff from having to deal with the loading of the long-haul trucks that would transport the glass to the glass recycling processor in either Seattle or Portland. In discussions with BDI management they offer the following:

- BDI has the desire to build and maintain the glass storage. Some details would need to be discussed, but certainly, there is the desire to perform this feature. If this is deemed beneficial to the City, it is presumed that the performance requirements, and resulting pricing, would be negotiated as part of entering into the new Recycling Collection Contract.
- A key objective for BDI would be to gain increased access to the glass storage, so as not to be subject to the landfill operating hours (if the glass storage were at the landfill). A secondary benefit from that is that increased access would allow more flexibility in transportation timing and the potential for having backhauls, with BDI coordinating the long-haul truck loading and transportation to the processor, the cost savings benefits could be factored into the cost structure of the glass component of the overall Recycling Collections Program.

#### **Recommendation Six – Glass Recycling Processing**

While the WRG Project Team researched and interviewed the two available glass recycling processors in the Northwest, Glass2Glass in Portland, and Strategic Materials (SMI) in Seattle, SMI is offering the City a \$15.00 per ton rebate for each ton of glass. In addition, they offered a 7-year commitment to that offer so it would be aligned with the collection contract with BDI. Aside from this, the long-haul truck backhaul potential exists that could offset the long-haul truck transportation costs and lower the overall cost of the program for the city and its residents.

### **Recommendation Seven – Program Funding Mechanisms**

If the City elects to follow the outlined recommendations in this section by the WRG Project Team, no significant “lump sum” capital program funding costs are required on the part of the city as the glass recycling program cost of service will be covered in the residential recycling rates.

### **Recommendation Eight – Public Education and Outreach**

As stated in Section 9 of this report, the importance of public education and outreach is critical for both the roll-out of a glass recycling program, as well as the long-term success of it. As such, the goal is to educate the residents on the need for proper recycling curbside in order to achieve the highest probability of marketability of the glass in the future, as well as the highest rebate value. The following are the recommendations for public education and outreach:

- Utilize the City’s existing recycling program education and outreach tools to refine and promote the glass recycling program.
- Consider utilizing many of the resources covered in Section 9 of this report for public education and outreach for City residents.
- Utilize the City’s existing Recycle Coach and “Recycling Map” App and update it to include references to the glass recycling program, recycling program requirements, news about promotional events, and other develop a glass recycling curbside education and awareness campaign.
- Utilize BDI’s offer to assist the city in public education and outreach as follows:
  - Basin Disposal is interested in conducting an educational outreach program for either the City of Walla Walla or through the Walla Walla Comprehensive Solid Waste Management Plan, for the entire population of Walla Walla County. It is presumed that this function would be performed outside of the City of Walla Walla Recycling Curbside Collection Contract, as this would span a function currently performed under the Solid Waste Plan, and which receives funding from the Washington State Department of Ecology to the City of Walla Walla.
  - Develop a program in conjunction with Basin Disposal as they are in the best position to assist the city in conducting educational and outreach given their recycling collection experience with the City of Walla Walla.
  - Basin Disposal has direct operational knowledge of the city’s curbside recycling collection program, the scheduling, as well as the quality of the recycling materials being collected. By collaborating with BDI and placing a substantial portion of the responsibility of educational outreach on BDI, they could integrate their customer service communications (whether through the contact center, or direct household visits), and will be able to address service questions, as well as recycling questions better than the city.
  - Work with BDI to determine the key program features and funding of it either as part of the residential collection rates or through a standalone funded program specific for education and outreach by BDI.

- Working with BDI adopt and establish a visual inspection “Quality Matters” type of program as part of the overall Recycling Collection Program with BDI. BDI’s staff and collection drivers would be responsible for performing the visual inspections of the bins to ensure the quality of the glass materials being set out by residents.
- Funding of this program with BDI would become part of the upcoming Recycling Contract negotiations, or at a time in the future when the City elects to implement a glass recycling program.
- Utilize Strategic Materials (SMI) offer to assist the city in public education and outreach. In WRG’s interviews with SMI, they have extensive experience throughout North America in this area and utilizing them as the city’s glass recycling processing teaming partner would prove extremely beneficial to insure a successful glass recycling program for the city and its residents.

### **Recommendation Nine – Program Implementation**

Initial Program Features would include:

- BDI, as the city’s contractor, would utilize their staff that would tag/swap out a percentage of a day’s commingled carts and glass bins. Those carts would be brought to BDI’s location and measured for quality as follows:
  - The information would be aggregated at the community level, with the intent that this information would guide future program features, as well as educational outreach programs.
  - The information would be specific to the household that generated that commingled (non-glass) recycling materials as well as the glass recycled material, with specific comments on how to improve the quality.
  - Quarterly Reporting by BDI would be provided to the city.