



*“Partnering to make recycling strong through economic and environmentally sound solutions”*

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### **Glass Recycling & Processed Glass Aggregate**

*Prepared by the Northeast Resource Recovery Association*

*Remarks by Reagan Bissonnette, Executive Director*

#### **About the Northeast Resource Recovery Association**

The Northeast Resource Recovery Association (“NRRA”) is a nonprofit that enables both small and large communities to manage their own recycling programs. NRRA is one of only a handful of nonprofits in the country that provides cooperative marketing programs for recyclables. This means that we negotiate competitive pricing from companies who purchase recyclables and help our members sell their recyclables to those companies.

In addition, we provide cooperative purchasing programs, educational and networking opportunities, technical assistance, and school programs in the general areas of waste reduction and recycling. The membership of NRRA includes over 400 municipalities, individuals, and businesses in the Northeast, and most of our members are municipalities in New Hampshire.

#### **History of Glass Recycling in the Northeast**

Two key costs for municipalities in the disposal of municipal solid waste are the tipping fee—the cost to dispose of waste at a landfill or incinerator—and the hauling fee—the cost of transportation to get the material to the landfill or incinerator. Both costs are determined by weight. The Northeast has the highest tipping fees in the country for municipal solid waste because we have the least amount of available space for new or expanded landfills. Since glass is heavy, it is expensive to transport—whether for recycling or disposal—and expensive to dispose of with municipal solid waste.

Historically, glass had to be sorted by color in order to recycle it. Over time, markets for glass have diminished, including the closure of the country’s largest recycled glass purchaser, a facility in Massachusetts, in 2018. In addition, keeping glass-like contaminants such as ceramics, window glass and porcelain out of glass has become increasingly cumbersome over time.

#### **Recycling Glass**

Despite the challenges with recycling glass, NRRA has a glass recycling program available to its members. Glass bottles and jars only may be delivered by communities to one of two host site locations in New Hampshire: one in Lebanon, and one in Keene. From those sites, the glass is hauled to 2M Ressources, a Canadian company located south of Montreal. 2M Ressources crushes, cleans and sorts the glass by color, then sends that crushed product to companies in the United States to be made into fiberglass insulation. If participating NRRA members can continue to keep contamination levels in their glass to a minimum, some of the glass will eventually be diverted to be made into new glass bottles and jars, which is the ultimate goal.

2M Ressources has capacity to process even more glass, but a shortage of truck drivers, among other factors, makes transporting the glass to Canada challenging. In addition, many communities find it difficult to meet the high standards of delivering only glass bottles and jars without any contaminants.

### **Processed Glass Aggregate**

The various challenges with recycling glass led NRRA to develop a processed glass aggregate (PGA) program over thirty years ago. NRRA's PGA host sites in New Hampshire include New London, Littleton, and the Waste Management Turnkey facility in Rochester.

#### Process

NRRA members collect and store glass in containers or bunkers at their own transfer station. Members then transport the glass themselves to one of NRRA's PGA host sites, where the glass is weighed before it is dumped in the pile. Members deliver their glass in roll off containers, dump body trailers, or local highway department dump trucks.

Members are charged by the ton for their glass when it is delivered to the host site. Hosts sites get an incentive for hosting, such as a certain amount of free tonnage per crush of their own glass, or a lower price than other members for all tons contributed by the host site.

An ideal host site has a flat, one-acre area with a truck scale and a front-end loader available to load the crusher. Once the host site has roughly 1,000 tons of glass accumulated, NRRA hires a vendor to bring in mobile crusher (a retrofitted rock crusher) to turn the glass into a usable aggregate. Following the crush, NRRA host sites can use the crushed material, sell it, or give it back to the contributing NRRA members.

#### Specifications

NRRA worked with the New Hampshire Department of Environmental Services ("NHDES") to establish specifications for using PGA in road and infrastructure projects. In 1999, NHDES deemed PGA as a Certified Waste Derived Product. This means that glass crushed and used consistent with NHDES PGA specifications is no longer regulated as solid waste.

Acceptable materials for PGA in New Hampshire include any glass beverage or food container, ceramics (i.e., coffee mugs), drinking glass, window panes, Pyrex, mirrors, and at one site, porcelain (i.e., toilets, sinks with all non-porcelain parts removed).

PGA may not contain the following glass-like contaminants: headlights, lightbulbs, thermometers, windshield glass, or plexiglass. In addition, PGA may not contain trash, asphalt, excessive rocks or dirt, wood, plastics or metal. An NRRA member with unacceptable contamination in an incoming load of glass will receive a warning the first time, a fine the second time, and finally be unable to continue using the program after a third offense.

Per NHDES specifications, PGA must be crushed to pieces that are 1" or less in size and be used 100% instead of gravel for municipal end uses described below. Per New Hampshire Department of Transportation ("NHDOT") requirements, PGA must be crushed to pieces that are 3/8" or less in size and be used up to 20% PGA instead of gravel (so up to a 20/80 PGA/gravel mix). NHDOT adopted these restrictions by following the American Association of State Highway and Transportation Officials (AASHTO) specification. One challenge with crushing to the 3/8" requirement is that crushing to a smaller size takes more time and equipment and therefore more money.

### End Uses

In the 1990s, an Army Corps of Engineers study of PGA concluded that PGA is not frost susceptible. Therefore, it may be better than gravel with respect to frost heaves. Frost heaves are created when moisture in the soil under pavement accumulates in a particular area and freezes. Because water expands when it freezes, the pavement above the concentration of frozen soil bulges, pushing the pavement up. New Hampshire is particularly vulnerable to this kind of pavement damage because the silty soil found beneath many streets and roads can hold large amounts of water. Since PGA does not retain water, it can also be stored outside uncovered year-round without freezing, unlike sand.

NHDES has approved PGA “for use in public works construction and other constructed systems including use as subbase material for roads, bedding material for pipes and fill around retaining walls and foundations.” PGA cannot be used uncovered.

In New Hampshire, municipalities can use PGA in place of gravel or sand for these projects if that use meets local municipal rules. However, private use of PGA requires a professional engineer’s approval. NRRA is pursuing a process with NHDES that would remove this added barrier to private PGA use.

Many NRRA members and others have had success with using PGA in their road and infrastructure projects. For example, New London used 100% PGA under a new maintenance building. In Littleton, PGA was used beneath cement pads at the transfer station for bunkers holding shingles and other materials. Soon, a developer in New London will be using PGA as a subbase for a sub-development road. When municipalities have used 100% PGA as a sub-base under road and infrastructure projects, they routinely report that years later, they do not observe cracks typically observed from frost heaves.

### The Numbers

In New Hampshire, NRRA members typically pay NRRA \$35 per ton when they deliver glass to an NRRA PGA host site. Most of that money is used to pay the vendor with the mobile crusher, and the remainder is used to cover NRRA’s time and expense in administering the program.

In 2018, NRRA members in New Hampshire, Vermont and Massachusetts recycled 5,738 tons of glass into PGA. From 2008 through mid-August 2019, NRRA members recycled over 66,000 tons of glass into PGA. Though NRRA’s fee for PGA has changed over time, let’s assume \$35 per ton had been charged for all tonnage through NRRA since 2008. And let’s use \$90 per ton as a reasonable average tipping fee for municipal solid waste in the Northeast for landfilling or incinerating. Therefore:

Total Payment by NRRA Members	\$2.31 million (\$35/ton X 66,000 tons)
Total Cost Avoidance by NRRA Members	\$5.94 million (\$90/ton X 66,000 tons)
<b>Total Savings for NRRA Members</b>	<b>\$3.63 million (\$55 per ton)</b>

By turning glass into PGA instead of landfilling or incinerating it, participating NRRA members save money and reuse a valuable product when recycling it is not a ready option.

### Municipal Crushers

Some municipalities crush their own glass in smaller glass crushers on site that they own. Many of these crushers were purchased in part with grants from New Hampshire the Beautiful, a beverage industry group that supports recycling efforts in New Hampshire. Other municipalities have roughly crushed glass using an excavator. However, municipalities crushing on their own need to ensure they are meeting the NHDES requirement that all pieces of glass be 1” or less, which is not likely to be met by using an excavator.

NRRA's PGA program serves as an option for communities that cannot or do not wish to crush on site, and crushing with NRRA ensures that the glass meets NHDES specifications for municipal or private use.

### **Looking Ahead**

NRRA is partnering with other organizations and agencies, including the Northeast Recycling Council, the Northeast Waste Management Officials Association, NHDES and NHDOT to hold a one-day workshop on April 15, 2020 at NHDES to discuss using recycled content—including PGA—in road and infrastructure projects. We look forward to inviting road agents, public works staff, and engineering and construction companies to attend. NRRA will also hold a webinar in the spring about PGA. In addition, NRRA is looking to develop more host sites so more municipalities have a closer option to cut down on transport costs and the carbon footprint of the program.

These projects will all be supported by a grant from the United States Department of Agriculture, Rural Utilities Service.

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Host Site in Dennis, MA



Mobile crusher in action



Glass before and after crushing into PGA



PGA crushed to 1" or less (NHDES specification)

### **Glass Sites – PGA and Recycling**

(number of communities served by each site in parentheses)

