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# Case Studies in Success: Recycling Vinyl Building Materials

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May 8, 2024

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## Case Studies in Success: Recycling Vinyl Building Materials

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**Jay Thomas**

Executive Director • Vinyl Sustainability Council

**Matt Dobson**

Vice President • Polymeric Exteriors Products Association

**Richard Krock**

Principal • VyChlor Advisors, LLC





## Vision:

Connecting the vinyl value chain to continuously improve the sustainability of the industry.



### Impact Category Priorities

Resource Efficiency  
Emissions  
People & Community

**Doing The Hard Work**



### +Vantage Vinyl Company Verification Program

Verification of Sustainable Business  
Operations  
5 Priority Areas  
29 Guiding Principles

**Building Credibility**



### Story Telling & Brand Building

Awareness  
Perception  
Preference

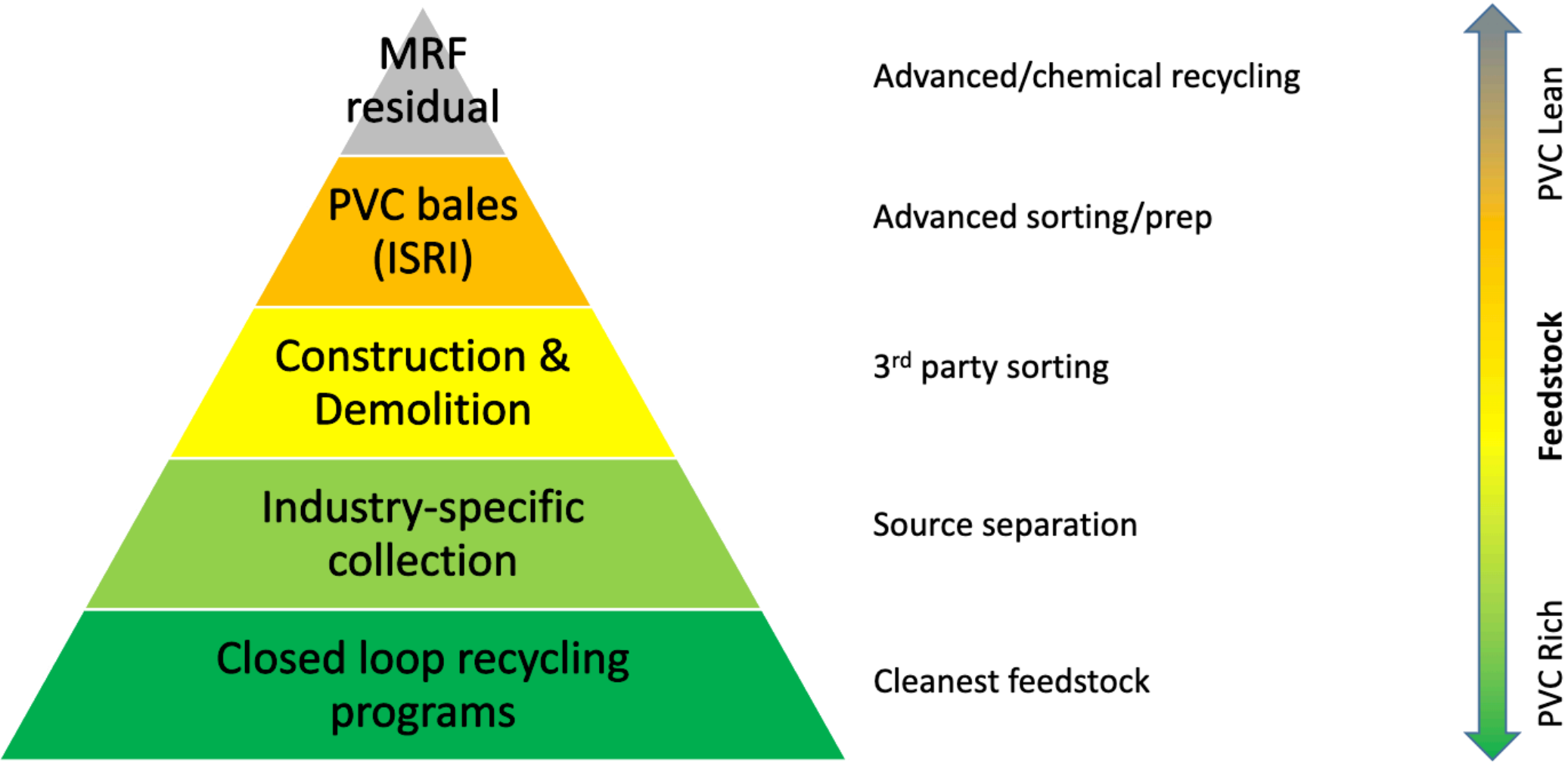
**Getting Credit**

# The Recycling Challenge

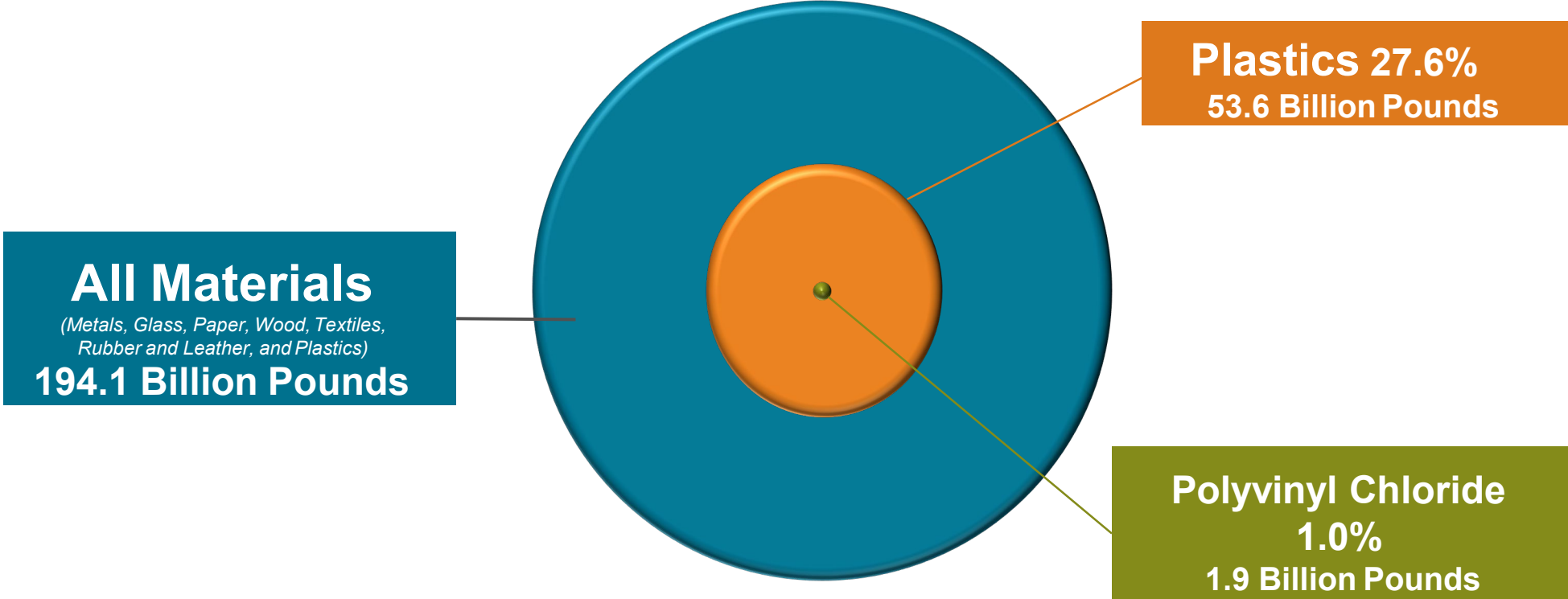




# Collection of Post-Consumer Recycling



# EPA Municipal Solid Waste: Landfilled PVC in Perspective



Source: U.S. EPA Municipal Sustainable Materials Management Report for 2017

# Titus Secondary Recovery Study for VI

- Conducted in May 2020 in Los Angeles, California
- Found less than 0.25% vinyl in secondary MRF feed from curbside recovery
- >15 different products found – pipe, fittings, films, blister packs, clamshells, jars and lids, security packaging, gloves, inflatables, hotel/credit cards, wires, IV bags, etc.





## Industry Recycling Benchmarks

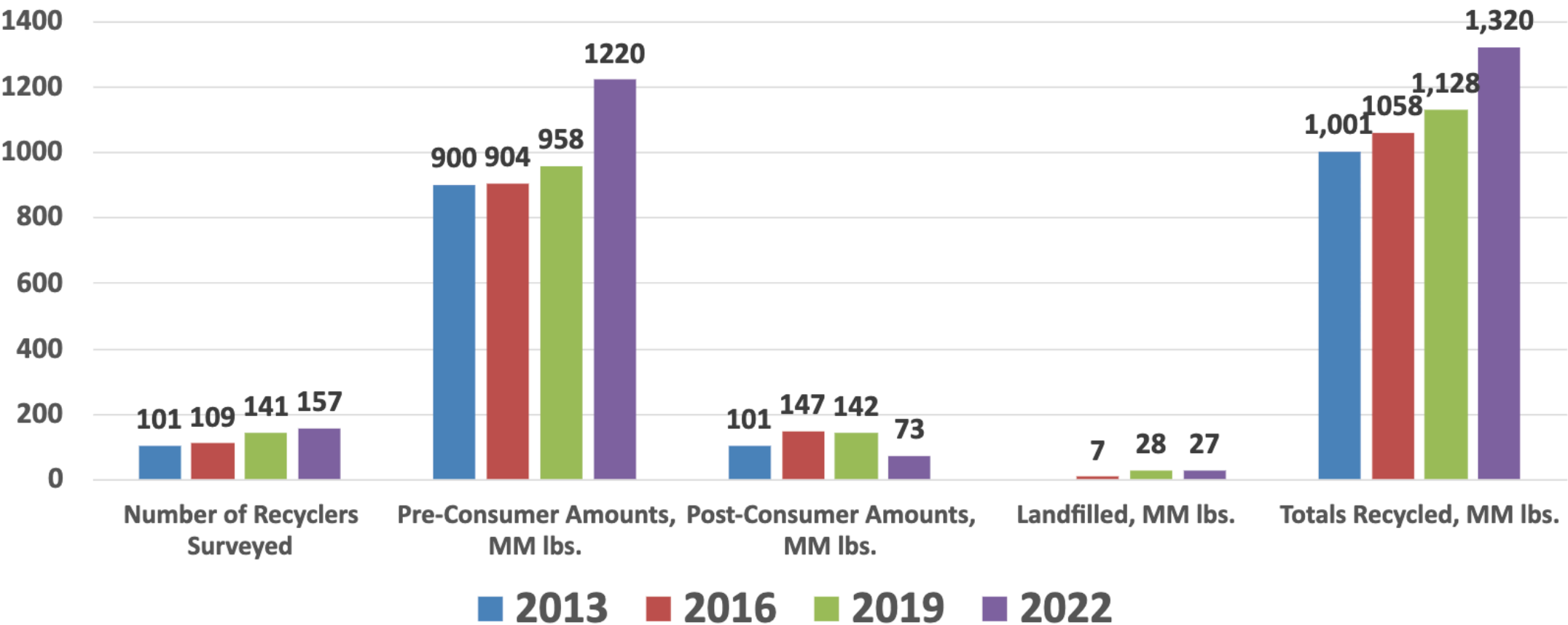
Recycling rates for all PVC materials is comparable to commonly recycled packaging. The Vinyl Institute (VI) assessed the recyclability of all PVC materials at the end-of-life, not just certain components. PVC compares favorably to EPA recycling rates for common post-consumer packaging materials.



**Note:** PVC recycling rate is estimated as Total Recycled Volume / (Total Recycled Volume + EPA Estimate for Municipal Solid Waste + VI Estimate for Construction & Demolition Waste)

# U.S & Canada Vinyl Recycling Summary

## Triannual Survey Results, 2013 – 2022



Source: Vinyl Institute Recycler Surveys

# THE VINYL INDUSTRY RECYCLING ROADMAP

## THE START

## THE JOURNEY

## THE GOAL





# VIABILITY™

VINYL INSTITUTE  
RECYCLING GRANT PROGRAM

VSC



**\$3 Million in Grant Funding for  
PVC Recycling Infrastructure**

**Help Us Meet Our Industry's  
Post-Consumer Recycling Goal  
and**

**We'll Help You with Funding to  
Get It Done.**



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# Revinylize

Recycling Collaborative



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**Matt Dobson**

Vice President • Polymeric Exteriors Products Association



## REVINYLIZE MISSION?

**Our vision:** make it as easy as possible to recycle rigid vinyl material. Together, we can build connections between stakeholders at each step of the waste disposal process, helping to divert and reclaim as much vinyl material as possible away from landfills.





# Government Mandates and Activities on Recycling

## Recent Activity Examples

- **Maine LD 1660**, Passed – Provides that advanced recycling facilities are subject to solid waste regulation; provides that advanced recycling does not constitute recycling.
- **Maryland HB 1241**, Withdrawn - Would prohibit a person from using certain polyvinyl chloride or chlorinated polyvinyl chloride piping in the installation, repair, or replacement of a water pipe or plumbing intended to dispense water for human consumption beginning on specified date; establishes the Water Pipe Safety Workgroup
- **Maryland HB 168**, Pending - Prohibits producers of certain plastic beverage containers and certain rigid plastic containers or other non-durable plastic containers from selling or distributing the products unless they meet minimum postconsumer recycled content percentage requirements in the Postconsumer Recycled Content Program. Also requires producers to register and pay a certain annual registration fee to the Department of the Environment.
- **CA 3rd Party Certification Legislation** – Requiring C&D Facilities to certify recycling rates
- **Hawaii** – Require Recycling C&D and government use of recycling materials to factor into priority offeror selections for competitive procurements-deferred.



# Progress & Availability

## Recycling Stats



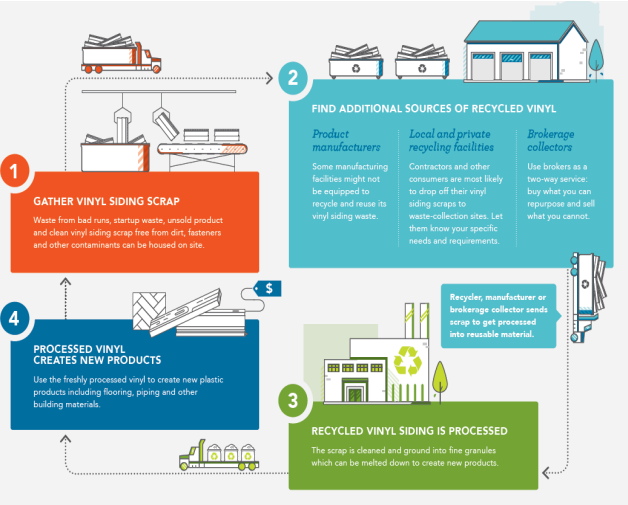
**2021 41,000**  
**2022 84,000**  
**2023 400,000+**

Pounds of rigid vinyl (including vinyl siding getting recycled)



**For every 10% of recycled content used in new product, a 5% reduction in carbon footprint is realized!**

Lower impact of on global warming



- Recycling goals align with Vinyl Institute’s, Vinyl Sustainability Council’s goals, with Revinylize’s goal to divert 5 million lbs. per year beginning in 2025 (year-end).
- How much rigid vinyl siding is available per year for post-consumer recycling? Not fully clear, initial estimates at least 250 million pounds.



# Mission & Vision

Rigid vinyl is designed to be recycled, but only with your help. The Revinylize Recycling Collaborative is a recycling initiative that includes dedicated installers, recyclers, collection sites (i.e. distributors and landfills) and many other advocates, in partnership with the Polymeric Exterior Products Association (PEPA) and verified by GreenCircle Certified.





# Pilot Learning Applied

- Post-consumer infrastructure missing
- Multiple collection site models
- Relationships and networks make success
- Timing good based on 1<sup>st</sup> and 2<sup>nd</sup> generation of vinyl siding near end of life
- Frequency improves efficiency
- Communication helps with mission and perception
- All rigid vinyl materials can apply, which creates a wider net for success











RECYCLING WITH YOUR HELP

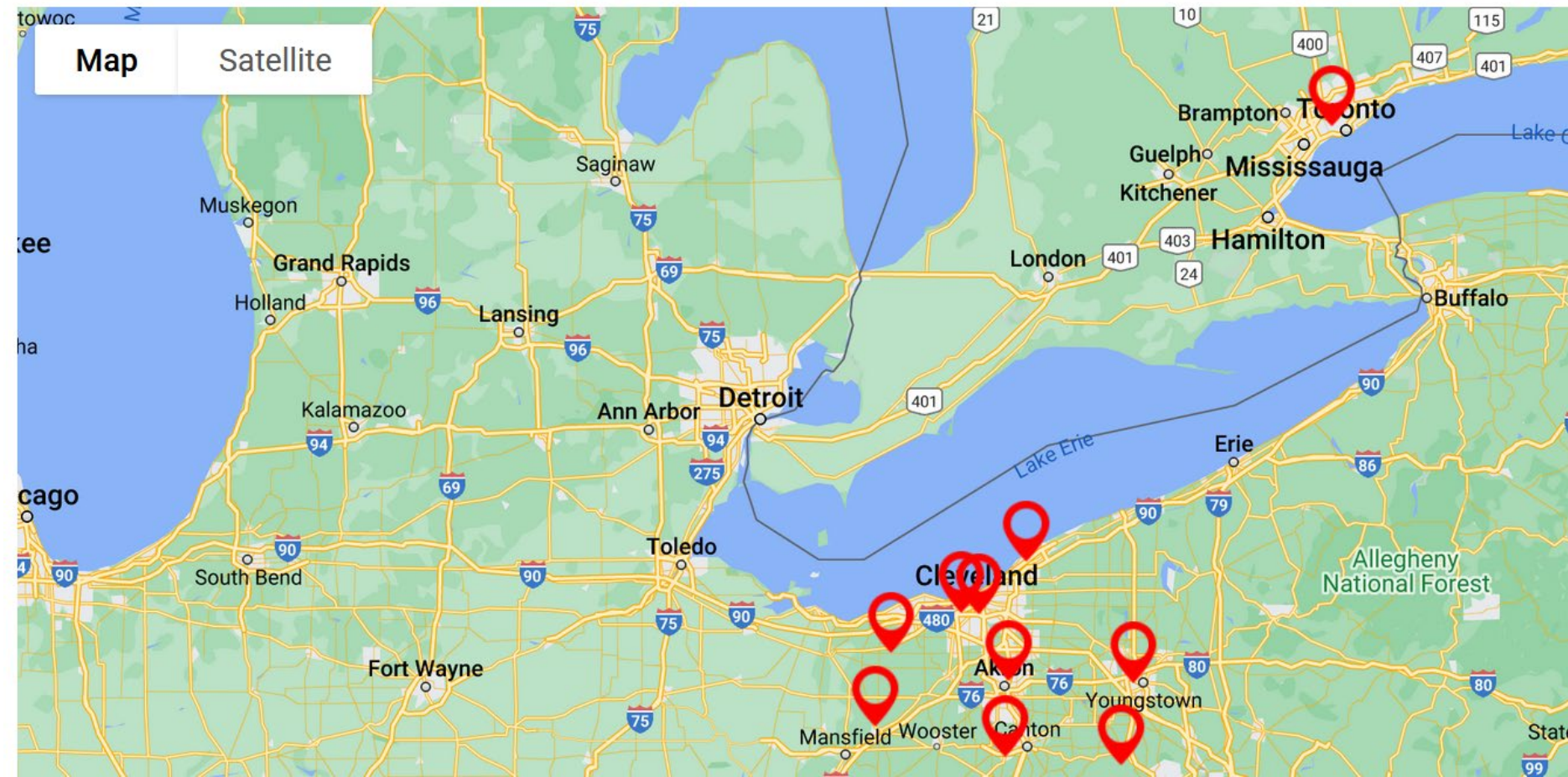
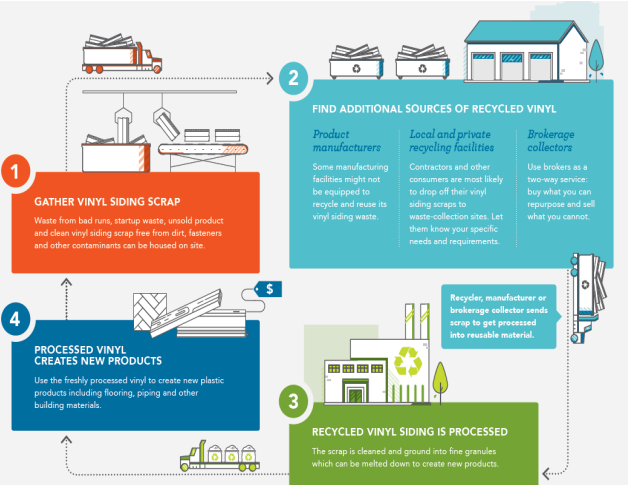
# Join the movement





 <p><b>Collection Site</b></p> <p>Material Distributors, Manufacturers, C&amp;D landfills, Contractors with space to collect material, Municipal Recycling Centers</p>	 <p><b>Recycler</b></p> <p>Have Post-Consumer Collection System, Manufacturers, Recyclers</p>	 <p><b>Interest</b></p> <p>Consumers, Individuals passionate about recycling, Media</p>	 <p><b>Contractor</b></p> <p>VSI Certified Installers, New Home Builders, Remodelers, Carpenters</p>
 <p><b>Municipality</b></p> <p>Local, State and Federal Government Agencies</p>	 <p><b>Partner</b></p> <p>Non-Profit Organizations willing to advocate for the mission</p>	 <p><b>Sponsor</b></p> <p>Trade Associations or businesses willing to advocate for the mission and contribute annually</p>	 <p><b>VSI Member - Participant</b></p> <p>Individuals from VSI Member Companies willing to champion the mission and advocate for Revinylize's goal</p>

# Recyclers and Collection Sites





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**CFFA** CHEMICAL FABRICS & FILM  
ASSOCIATION, INC.  
VINYL ROOFING DIVISION



# **Increasing Sustainability in the Low-Slope Roofing Market through PVC (Vinyl) Membrane Recycling**

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**Richard Krock, VyChlor Advisors LLC**

Consultant to Chemical Fabrics and Film  
Association (CFFA) Vinyl Roofing Division

# Who is the CFFA Vinyl Roofing Division?

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- Represents all the leading manufacturers of thermoplastic PVC roofing systems in North America.
- Purpose: The CFFA Vinyl Roofing Division (VRD) was created to educate architects, specifiers, building owners and roofing contractors on the attributes of PVC as a durable, reflective, heat-weldable and recyclable material for single-ply roofing systems.



# A LONG HISTORY OF PVC ROOF RECYCLING

1999: Post-consumer recycling begins in North America

Through production of highway cold patching material from PVC roofing membranes

One of the first post-consumer recycling projects, in 2005, at the Marriott Long Wharf Hotel in Boston.

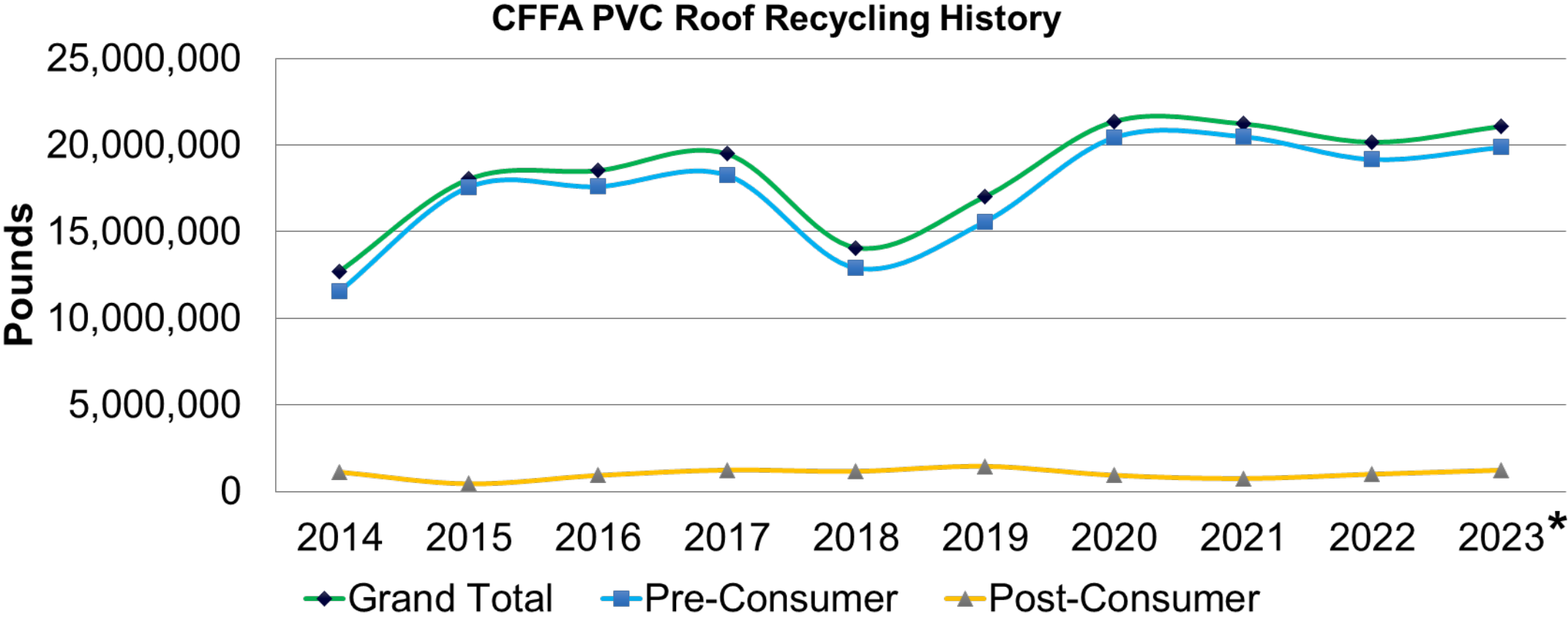


Roof membrane was recycled, and insulation was repurposed.





# A Decade of Recycling Performance

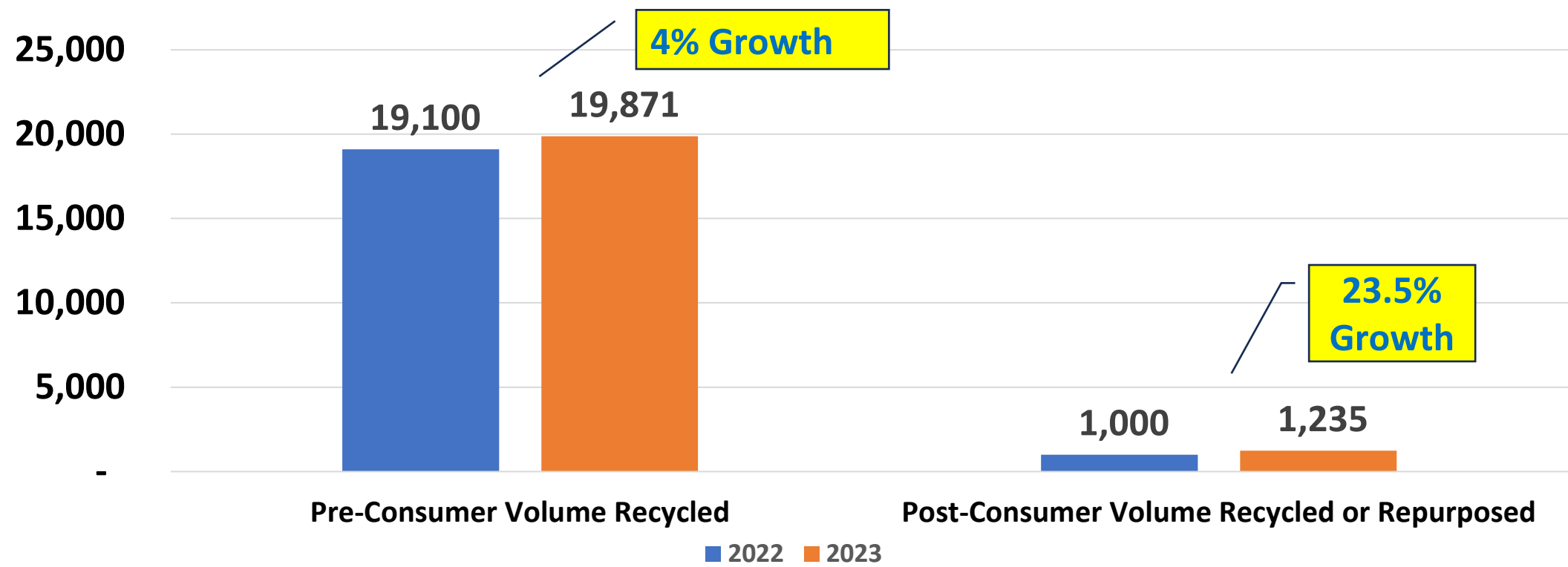


\* 2023 Data includes two non-VRD members results



# Significant Growth in Recycling in a Slow Market

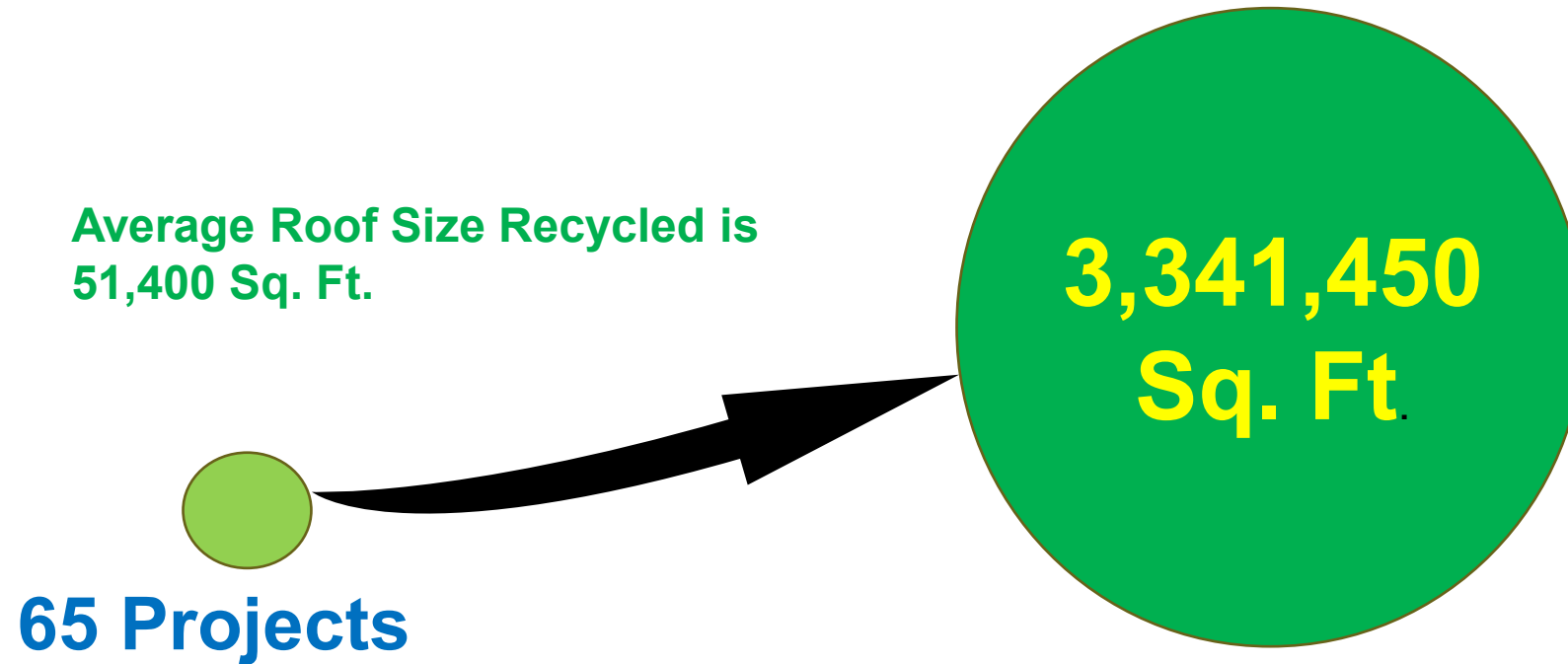
CFFA VRD Recycling Survey, Thousand Pounds  
2022 vs. 2023



2023 Data includes two non-VRD members results

# CFFA PVC Roof Membrane Post-Consumer Recycling

Grew on Project Basis for 2023



*Projects for 2023 Increased 48% Compared To 2022 estimates.*

# Known Recycling Hurdles

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- Demand from Building Owner
- Education of Value Chain
- Unpredictable Cost
- Logistics
- Incompatible Additives
- Recycling Capacity
- Market for Recycled Material



# Create Demand and Educate Value Chain

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- **CFFA Survey shows 83% of roofing contractors and 74% of building owners have a interest in recycling the roof at its end of life**
- **Engage building owner, explain benefits and obtain support of roof membrane recycling**
  - **Benefits include improvement in general sustainability, carbon reduction, and/or meeting ESG goals**
  - **Potential for improved building appraisals with green certifications**
- **Communicate throughout value chain with designers, specifiers, and contractors the features and goals to make it a successful recycling project**
  - **Emphasize environmental stewardship, and customer satisfaction**



# Recycling credits available from voluntary green building rating systems and sustainability standards

Voluntary Rating System	Credit Language
<u>NSF/ANSI 347</u> , § 5.7	Manufacturer demonstrates program for post-consumer single-ply membrane reclamation and recycling
<u>Green Building Initiative (2021)</u> , §5.1.1.5	Requires waste management policy, procedure, and plan for cycle renovations
<u>U.S. Green Building Council (2021)</u> , <u>LEED v4.1</u> ,	MR Prerequisite - Establishes goals and strategies for renovation waste diversion
<u>BREEAM (2015)</u> , §11.0, Wst 01	Requires reuse or recycling materials, reducing and diverting project waste from landfill
<u>IgCC (2012)</u> , ANSI 189.1 (2011)	Mandatory model code for materials & resources use

# Landfill Avoidance Should be a Key Sustainability Driver

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## **Largest competitor of PVC roof membrane recycling**

- **Convenient**
- **Less costly in some cases**
- **No obstacle to flow**

## **Landfill avoidance benefits**

- **For Building Owner** - Help meet sustainability goals
- **For Roofing Contractor** - Avoid increasing disposal costs
- **For Roofing Consultants** - Position as resource for building owners
- **For Society** - Reduce greenhouse gas and other environmental impacts

# Typical Roof Removal Process For Recycling

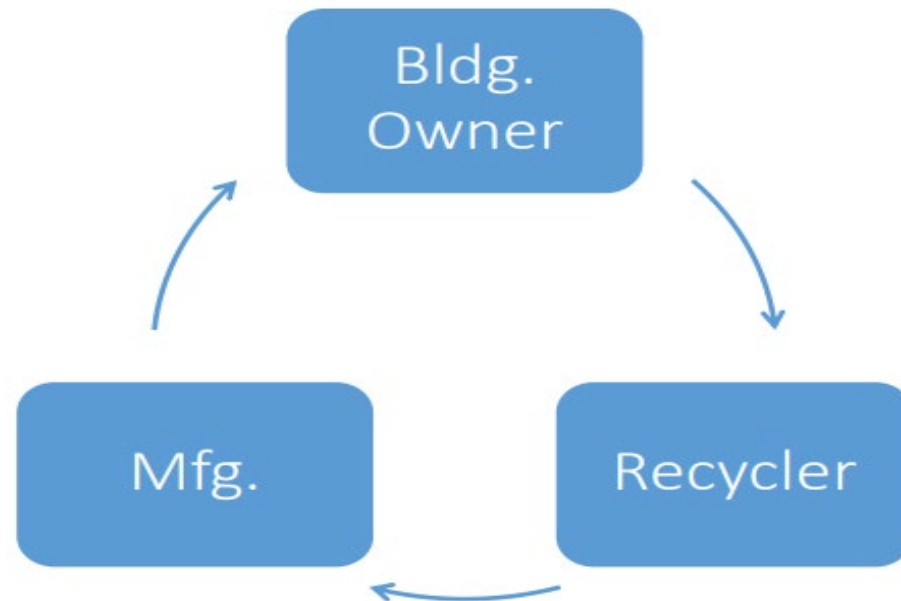




# Closed-loop Recycling Options

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- Material is reprocessed back into PVC roof membrane, roof flashing, roof walkways, and backer board or other products used back on roof
- Polyester scrim reinforcement and any felt backing is separated from the PVC polymer. Fluff can go into backer board.
- Once separated, material becomes feedstock for recompounding with modified virgin blends of compounds



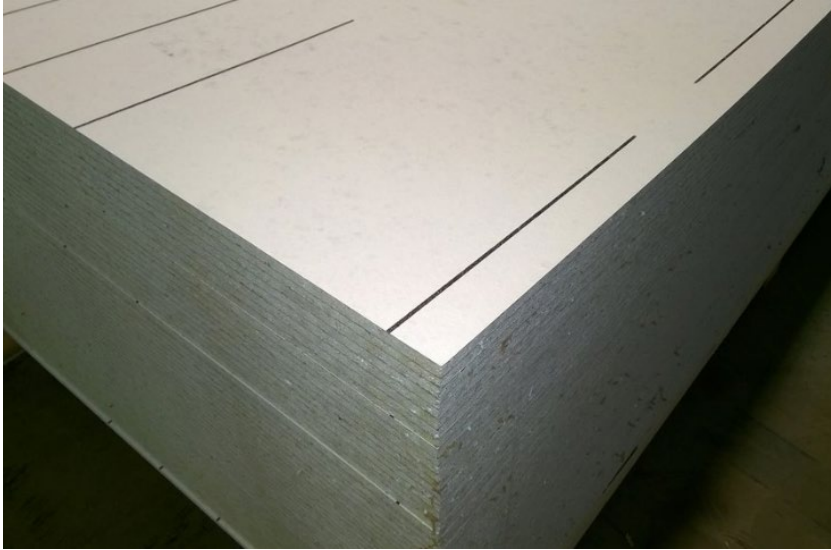
# Closed-loop Recycling Case Study

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## Rogers Centre, Toronto

- 460,000 sq. ft (42,735 sq. m) of PVC roof membrane
- 30-year PVC roof membrane
- Building owner wanted to replace without depositing it in landfill
- Post-consumer recycled content in the backside of new membrane
- Approximately 40 tons (36.4 mt) of material diverted from the landfill





# PVC Roof Closed-loop Recycling

- **Roof cover Board** made from 100% recycled food & beverage cartons and plastic using zero water or chemicals, resulting in a low carbon footprint.
- Working with the CFFA has successfully incorporated fluff generated from PVC roof membrane production trimmings and scrap into the board. Creates a better board; improved dimensional stability, fire resistance, water resistance, and puncture/damage resistance.
- Available today.
- Also have successfully incorporated end of service life PVC roof membrane into the Board mix.
- Achieved Class A unlimited slope for non-combustible decks using PVC membrane!



# Open-loop Recycling Options

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- Material is used in a non-roof-membrane application such as flooring, mats, water stop, and others
- Fiber may not need to be removed depending on the application (i.e., flooring)
- Fiber removal may be required for more cosmetic or smooth surfaces (i.e., automotive floor mats, hoses)



# Open-loop Recycling Case Study

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## Bishop Elementary, Michigan

- 20-year roof stood up to harsh winters
- Building owner requested that contractor needed to recycle the existing roof
- Over 77,000 sq ft (7,154 sq m) of membrane was removed
- More than 8,700 lbs (3,955 kg) of PVC material diverted from landfill
- **Material was recycled into flooring product**



# PVC Roof Open-loop Recycling

- Through CFFA/VSC Recycling Pilot, a vinyl flooring manufacturer was found with capacity for incorporating more PVC roofing into their material.
- Flooring manufacturer accepts both pre-consumer and post-consumer PVC roof membranes.
- Flooring manufacturer organizes freight/logistics to pick up materials from job site on post-consumer tear-offs.



# CFFA Industry Collaboration

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Initiatives of VRD industry program to enhance the PVC roof membrane recycling process and encourage growth

- Create a joint education/promotion plan for value chain
- Participate in voluntary sustainability standards (e.g. NSF 347) and green building rating systems.
- Develop a network of regional material consolidators and logistics providers
- Identify, evaluate, and confirm membrane recycler capabilities
- Expand recycled-PVC material end-use markets
- Explore collaborative opportunities with other stakeholder partners





# Discussion

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