RECYCLE COLORADO

Innovations in Organics Circularity

Speakers:
Nikki Chernick: Vannguard Renewables
Robbie Tepperberg: Auraria Sustainable Campus Program
Vannevar Fussell: Living Memorial Institute

COMPANY OVERVIEW

2014 Year Founded	200 Employees	29 Facilities Built	40+ Facilities in Development

- More than 1 million tons organic waste recycled for clients across the country since 2014
- 7 currently operating facilities in New England, 3 under construction in Wisconsin & Virginia
- Network of strategic partners spanning 37 states
- Providing zero waste to landfill solutions for food and beverage manufacturers across the country

Backed by

BlackRock

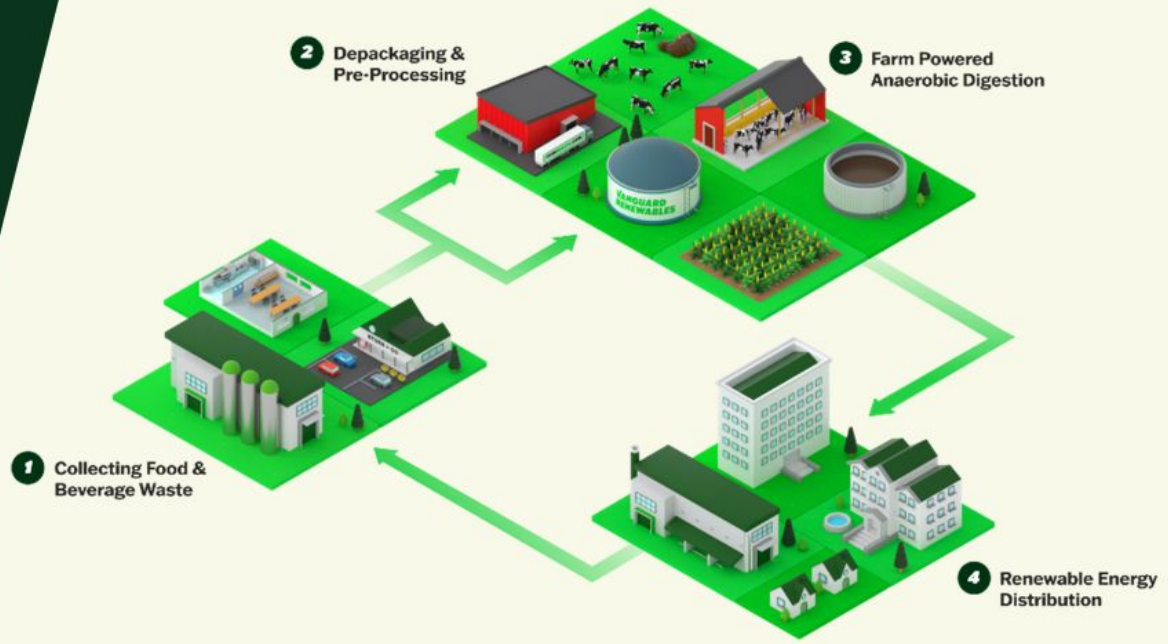
Industry Partners

TotalEnergies

AstraZeneca

VANGUARD RENEWABLES

Vanguard Renewables builds co-located organics recycling facilities and anaerobic digesters on farms near major metros in the U.S. that process organic waste and produce renewable natural gas.



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PROJECT DEVELOPMENT FOOTPRINT

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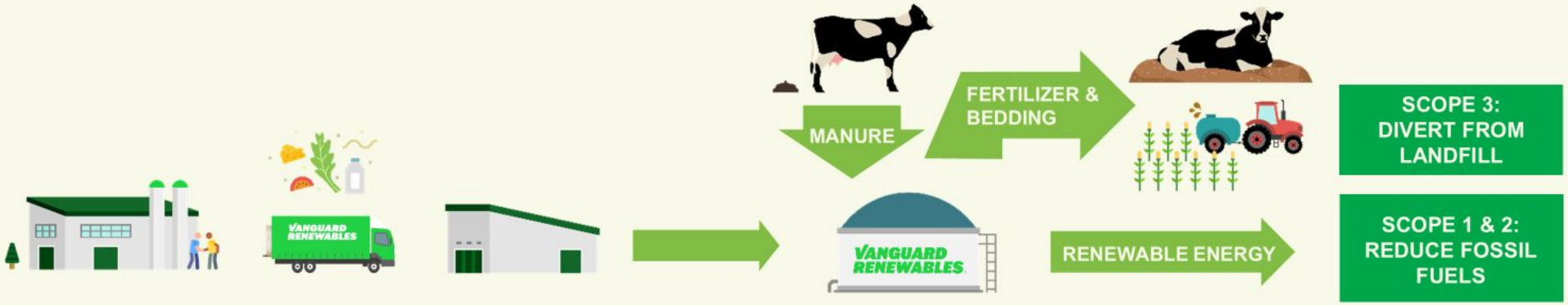
THE FARM POWERED ANAEROBIC DIGESTION PROCESS



VANGUARD RENEWABLES

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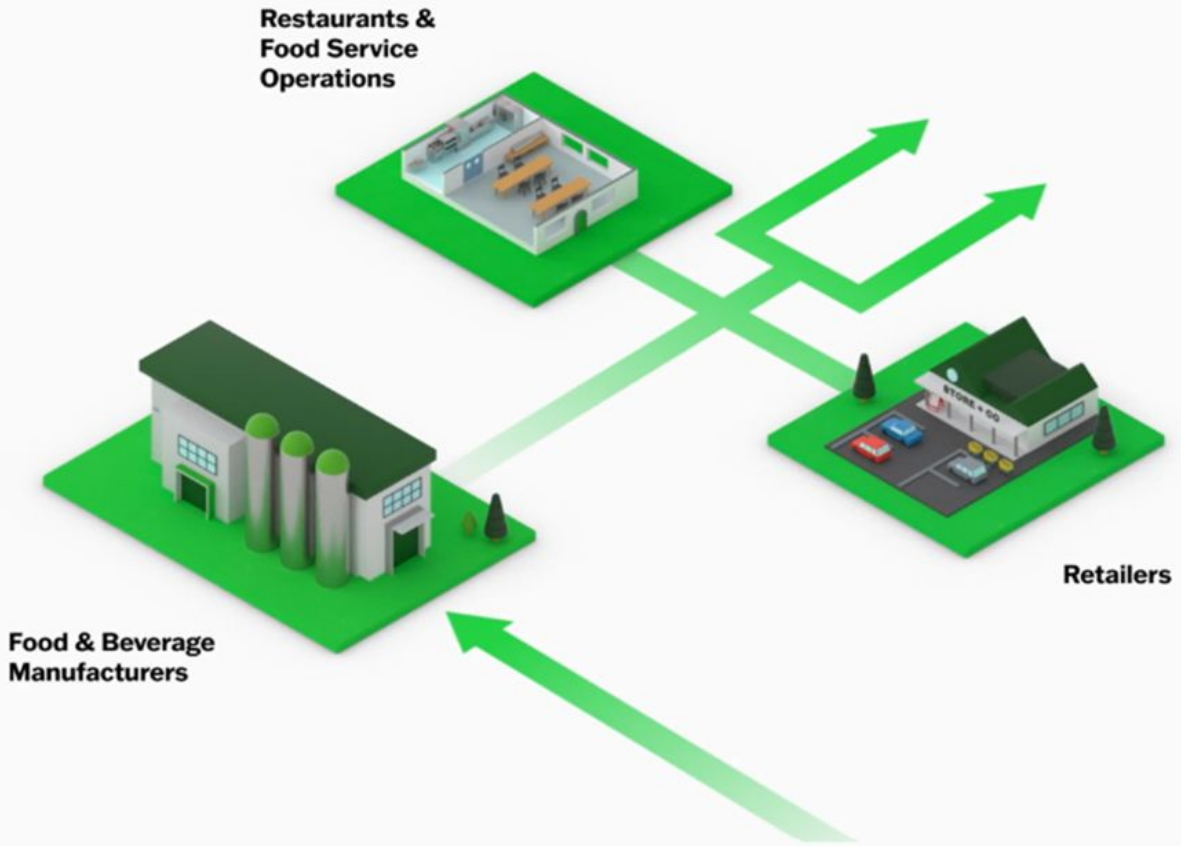
STEP 1

Collecting Food & Beverage Waste

We start by collecting organic waste from food and beverage manufacturers, retailers, restaurants, municipalities, and other waste generators. Our comprehensive solution can handle almost any type of organic waste.



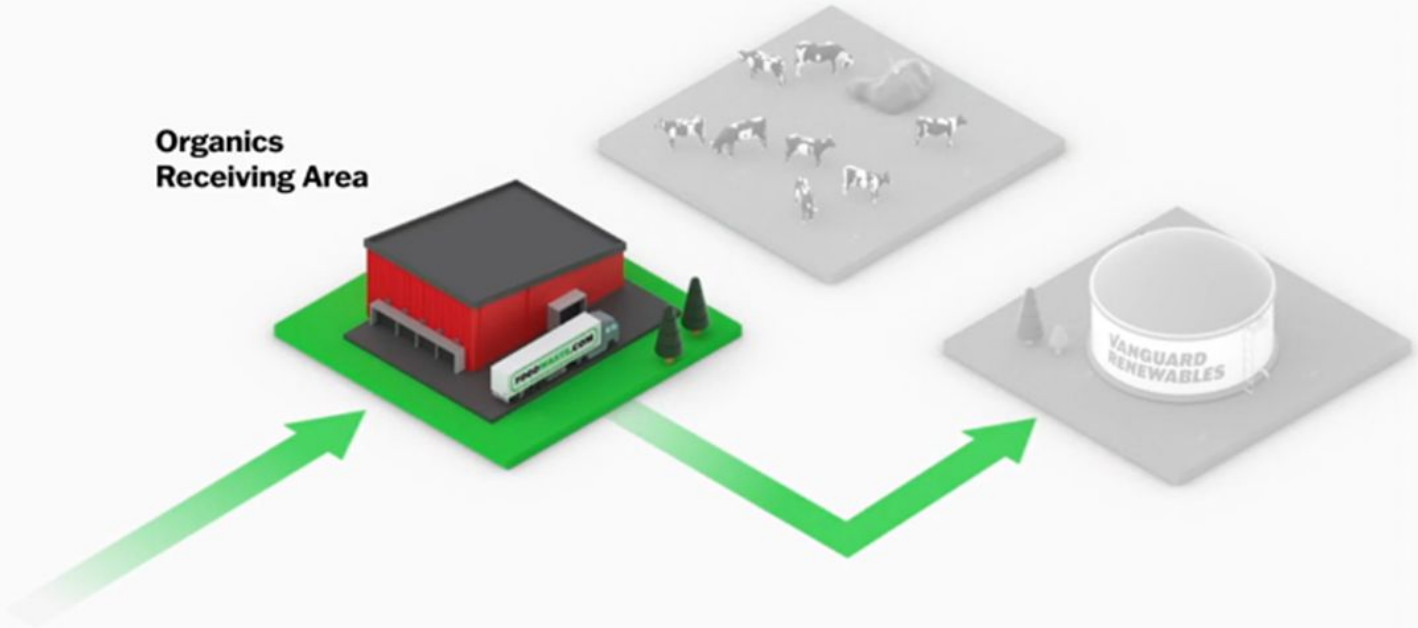
VANGUARD RENEWABLES

RECYCLE COLORADO

STEP 2

Depackaging & Pre-processing

Our advanced Organics Receiving Areas (ORA) depackage and pre-process organic waste, such as expired goods or food and beverage products that are unsafe to eat. This step helps divert more organic waste from landfills.



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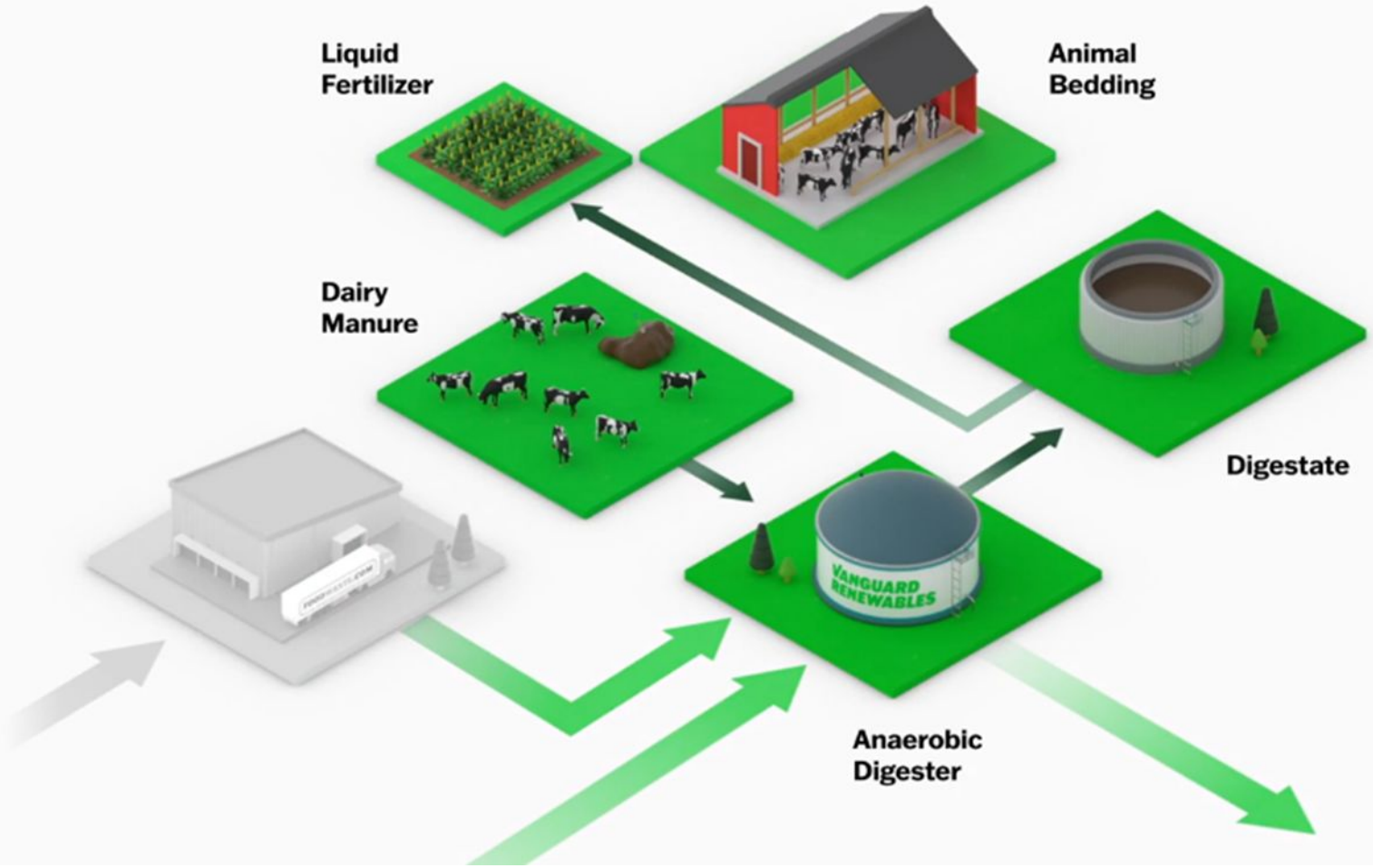
STEP 3

Farm Powered Anaerobic Digestion

Farm Powered anaerobic digestion converts dairy manure and organic waste into renewable energy through the use of microorganisms. This process simultaneously produces low-carbon fertilizer and dry animal bedding.



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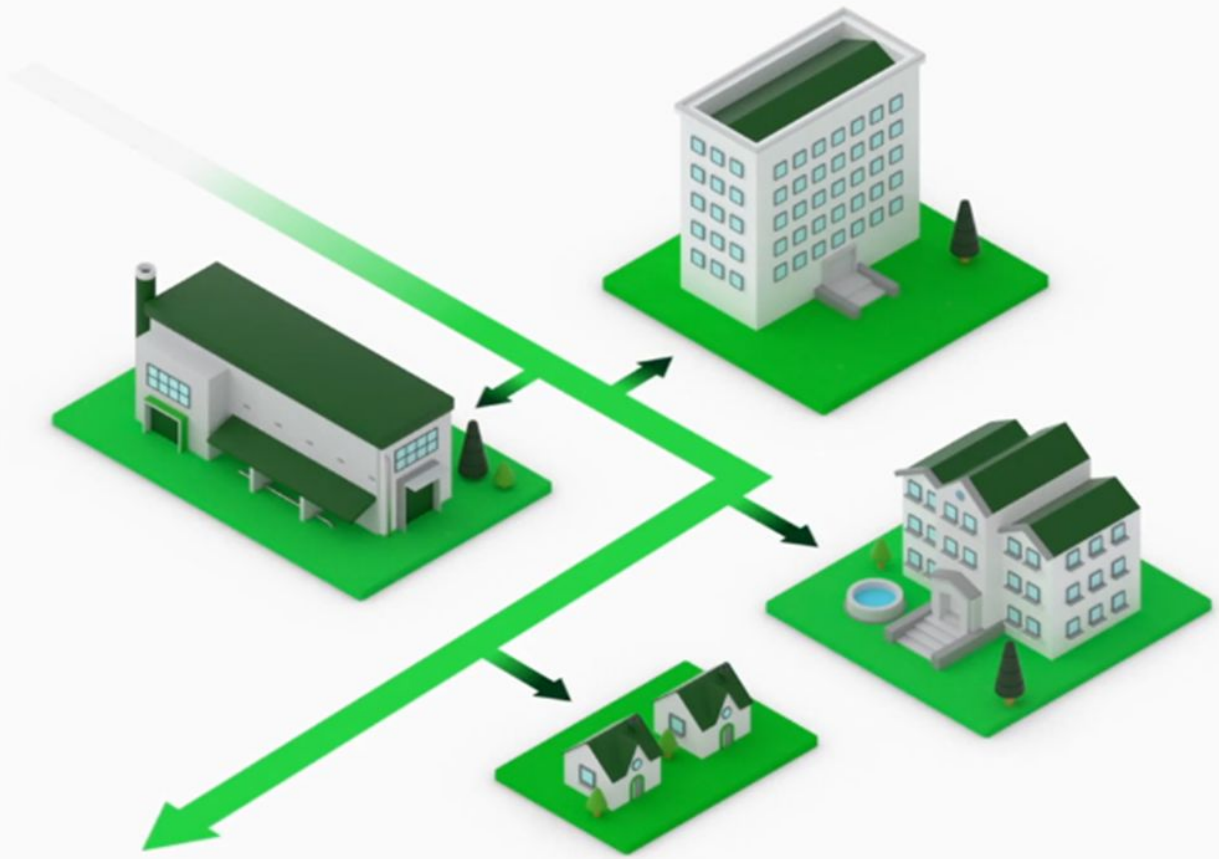
STEP 4

Renewable Energy Distribution

We provide utilities, businesses, and other clean energy buyers with a reliable supply of carbon-negative renewable natural gas. This brings the process full circle, as some of these clean energy buyers are also waste generators.



RECYCLE COLORADO

Auraria Compost Operations Update

Auraria Compost Outpost

Robbie Tepperberg (he/him)
Compost Operations Manager
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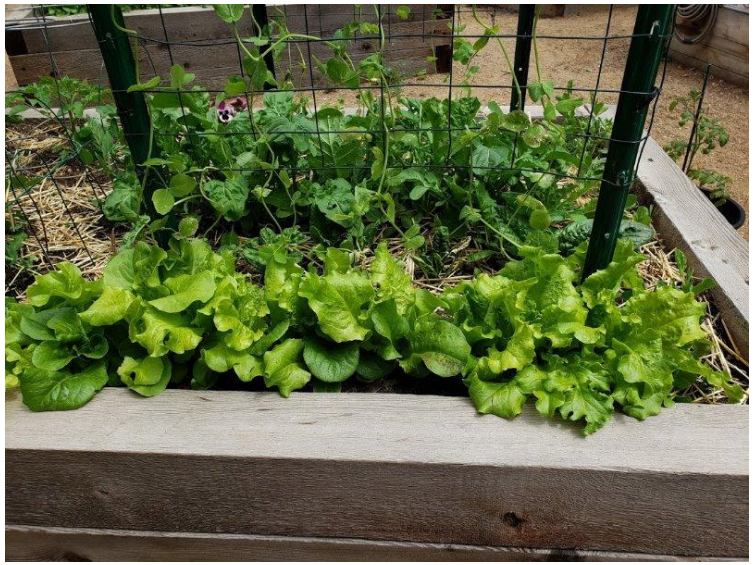
Auraria Sustainable Campus Program

Our Mission

Global impact through local action.

The ASCP is a campus-wide program with the explicit mission of reducing the Auraria Campus' ecological impact and dependence on fossil fuels. We work to accomplish this through projects, events, and programs. We serve all three institutions on campus: MSU Denver, the Community College of Denver, and the University of Colorado Denver.



Auraria Sustainable Campus Program

COMPOST OUTPOST

TIMELINE

1 — Compost Slows across Front Range
New composting guidelines are established across the Front Range.
JULY 2022

2 — Research on In-Vessel Composter Begins
Waste hauler starts enforcing a 0% contamination policy for compost stream.
AUGUST 2022

3 — Thought Partner Engagement
Meet with thought partners for compost operation alternatives and solutions.
NOVEMBER 2022

4 — Data and Research Compilation
Start proposal for CDPHE RREO Grant- compile data, analyze numbers, write proposal.
DECEMBER 2022

5 — Submit Grant Application
Submit CDPHE Grant proposal.
JANUARY 2023

6 — Internal Proposal and Approval Process Begins
SACAB Compost Operations Proposal presented. Prepare compost operations site.
FEBRUARY 2023

7 — Grant Awarded
Grant of $129,000 awarded through CDPHE.
MARCH 2023

8 — All Front-of-house Compost Bins on Campus Shut Down
New compost guidelines go into effect- only food scraps and plant trimmings accepted.
APRIL 2023

9 — Amendments and Hiring
Amend grant terms to change from purchasing the Rocket Composter to Bio Co Tech digester. Hire Compost Operations Manager.
JULY 2023

10 — Expanding Service Area
Hire Compost Operations Student Associates. Deploy 35-gallon carts to the docks across campus. Sorting operations begin.
AUGUST 2023

11 — Site Preparation
Order BioCo Tech-Biospeed M4 in-vessel unit.
SEPTEMBER 2023

12 — E-Trikes!
Acquire two custom-built electric tricycles from local company Main Street Pedicab for hauling.
DECEMBER 2023

13 — Composting Unit Arrives
In-vessel unit arrives on campus and is placed at the Compost Outpost.
JANUARY 2024

14 — In-vessel is Turned On
UL certification acquired. In-vessel operations begin.
JUNE 2024

15 — Compost Distribution
First application of compost is distributed on campus planters.
FEBRUARY 2025

16 — Diverted Materials Milestone
Collected and sorted 100,000 lbs. of organic material on campus since August 2023.
MARCH 2025

CLOSING THE LOOP

Our custodial teams and ASCP staff work collaboratively to collect and transport bagged compost materials to carts waste docks around campus.

ASCP staff haul compost carts via electric tricycles to the Compost Outpost.

Compost materials are generated from vendors, front-of-house tri-streams, events, and offices.

ASCP staff weigh and hand-sort the compost materials to mitigate contamination.

Sorted compost materials are combined with some wood chips and added to the in-vessel digester to be pre-processed, which takes roughly 3 days.

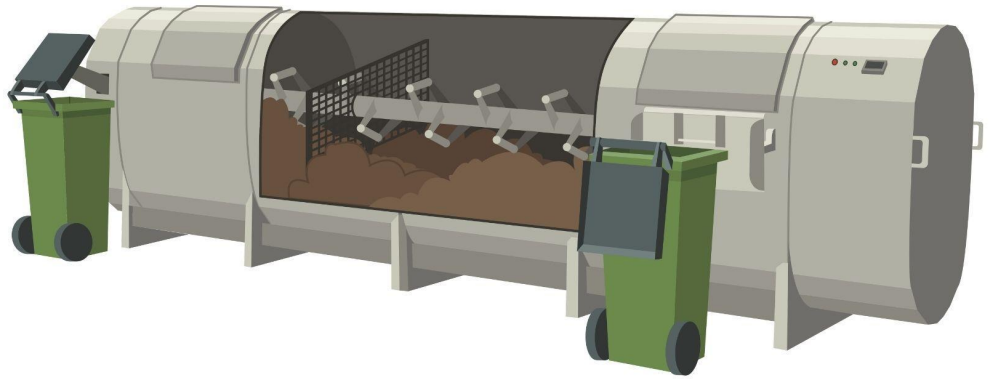
The by-product is then combined with additional wood chips and water to create our compost pile. It is composted for roughly 4-6 months and then cures for another 2 months before it is ready for use.

Our grounds crew utilizes the compost to nurture our campus plants, trees, and grasses.

Auraria Compost Outpost

Aerobic Digesters (dehydrators):

- 24-72 hour processing
- Heating elements to reduce moisture content
- Augers to grind and agitate materials



Pros:

- Does well with fiber and bioplastics
- Removes water weight by 80-90%
- Limited carbon feedstock required
- 72 hours processing time
- Vermicompost worms love it!

Auraria Compost Outpost

Cons:

- Does not create compost
- Removes water weight
- Limited research on unit optimization and utilization of by-product
- Requires further processing
- Hydrophobic by-product

2024 Food Waste Collection Data

Collected ~6000lbs/ month of food scraps

Contamination Rate: 4%

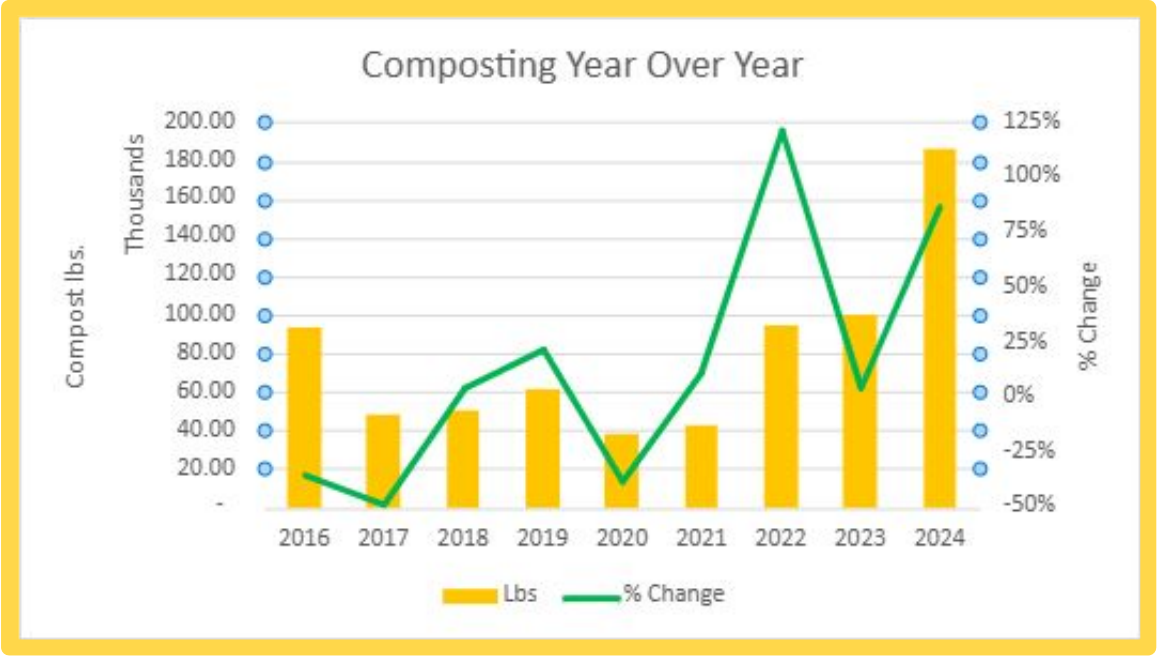
Composting Compostables

Auraria Sustainable Campus Program

Organics Waste Stream:

Organics made up 11.28% of our waste stream

Including yard waste we have diverted 93+ tons of organics from the landfill



Auraria Sustainable Campus Program

Opportunity:

- Unit Optimization
  - Only 55% of materials able to be composted
- Collection expansion
  - Dorm cafeterias
  - Offices
  - Large Events
- Site Improvements & additional equipment

Expansion:

- Vermicomposting
- ASP system
- Vendor and Events Policy

Education & Outreach:

- Research and classroom engagement
- In-vessel digester awareness for campuses
- Tours of our facility

Auraria Sustainable Campus Program

revive

Living Memorial Institute

Cemetery Reform

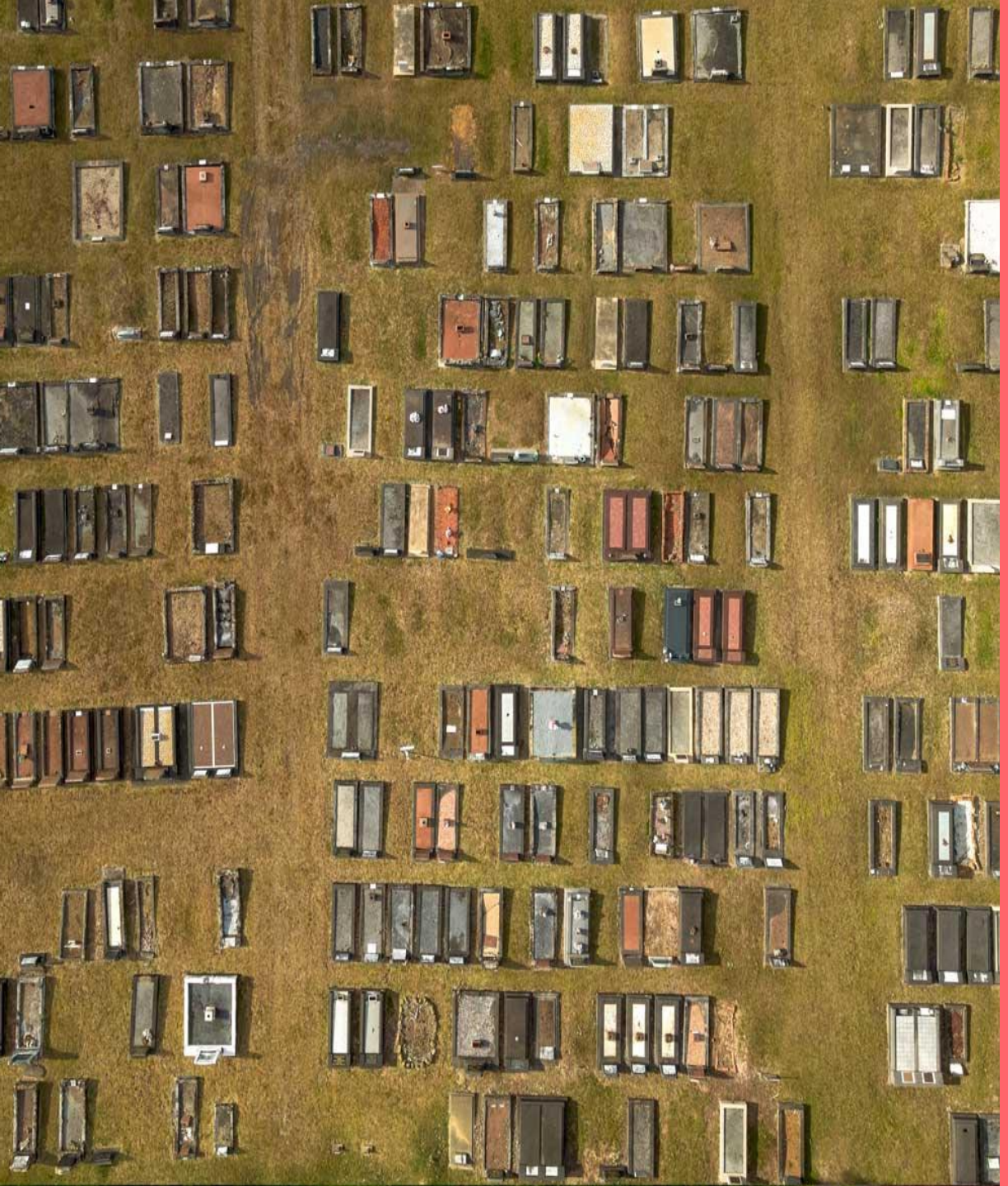
=

Upcycling human landfills

Cemeteries Are Not Working

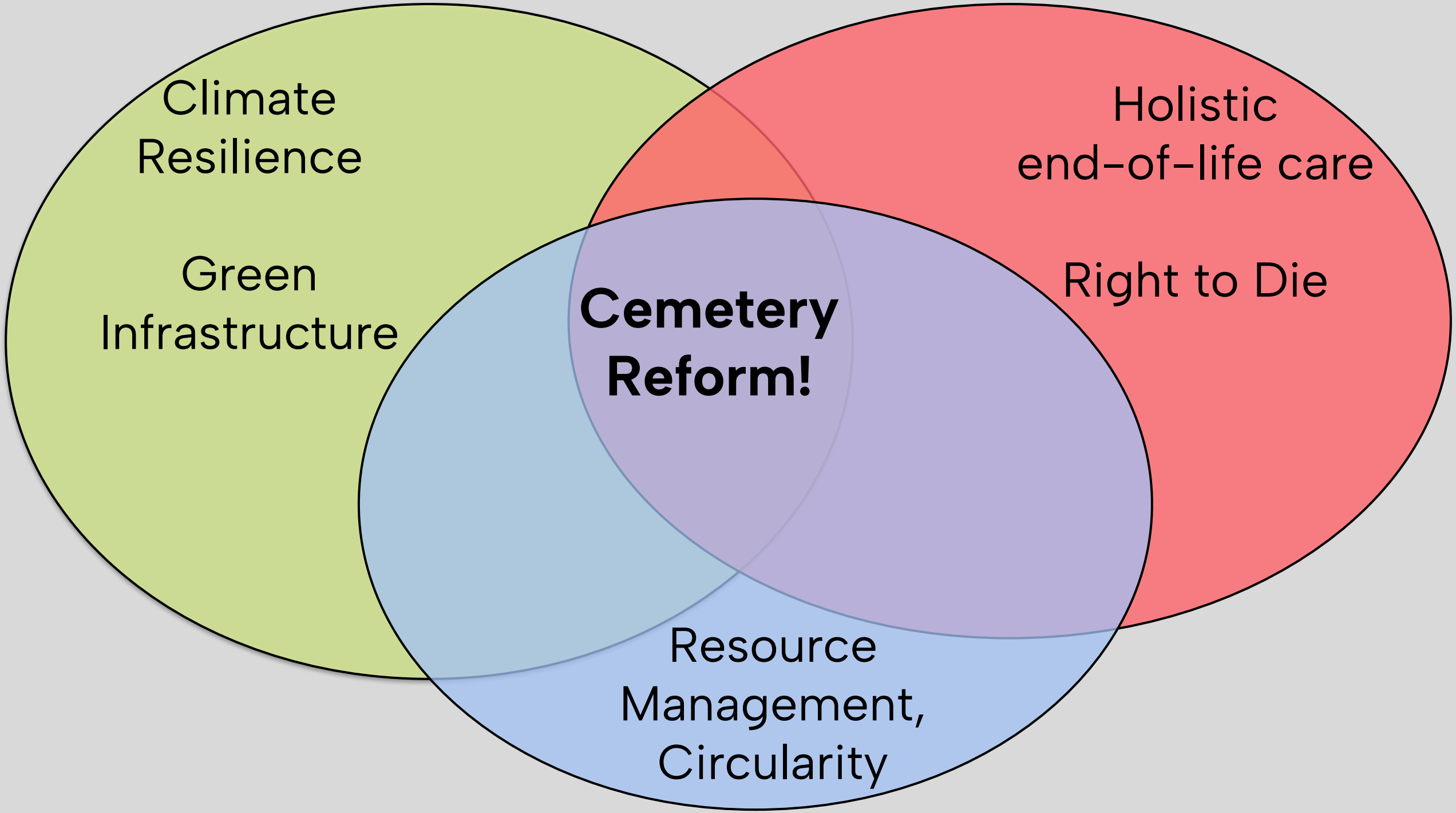
- Disconnected from Memorialization
- Failing as Community Assets
- Environmental Hazards, Climate Vulnerability

Cemetery Management resembles parking lots, storage unit rentals.



Zooming Out

- 44,862 – People who died in CO, 2023
- 124 – People who die in CO every day
- 9 tons – Daily Human biomass
- 63.8% – Cremation Rates
- 34% – Burial Rates
- ~15,000 burials each year in CO
- 1,062,000 gallons of water per acre per year for cemetery irrigation
- 4.3 million gallons of embalming fluid each year in the US. About a fifth of that is made up of chemicals like benzene, methanol, and formaldehyde, which have known health and environmental effects.
- In New York City alone, burial grounds occupy over 4,300 acres – equivalent to 5.2 Central Parks


Climate
Resilience
Green
Infrastructure
Holistic
end-of-life care
Right to Die
Cemetery
Reform!
Resource
Management,
Circularity

What is the solution?

Upcycle these spaces!

- 2021 NOR signed into Law in Colorado
- Updated stormwater infrastructure
- Innovative landscape architecture
- Regulate embalming chemicals
- FEMA
- Green Burial Council

What is the solution?

<u>Adapt</u> these spaces!

- Grave Recycling & Plot Reuse
- Communal Plots
- Open up cemetery to multi-use zoning
    - Hollywood Forever Cemetery


“When mitigating the risk to the built environment, some cemetery land could be used to protect nearby infrastructure.”
FEMA


“Avoid the unmanageable,
manage the unavoidable”

Thank you & your Contact info

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