

**FINAL DRAFT**

Boston University **Zero Waste Plan**

# Reimagining Waste as a Resource

**1.5M HOT-DRINK  
CUPS PER YEAR  
IS JUST THE  
BEGINNING**



Boston University Sustainability

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# Executive Summary

## ZERO WASTE, A PARADIGM SHIFT

For decades, it has been widely demonstrated that the materials we make and use, and how we dispose of them, have significant environmental impacts. These impacts range from growing landfills to air pollution and water pollution, all of which have impacts on human health. In the 1980s, “waste-to-energy” incineration seemed to be the solution, with a 75% reduction of volume to landfill with only the residues from combustion needing to go to landfill. As it turns out, municipal solid waste incineration produces 25% more greenhouse gas emissions than the average coal-fired power plant per unit of energy generated.<sup>1</sup>

Over 90% of what ends up in the trash is potentially reusable, recyclable, or compostable.<sup>2</sup> Knowing this, it is possible to rethink and redesign how our materials flow through society to more efficiently use resources. Using a more holistic systems approach results in:

- **Improved diversion of waste from landfills, incinerators, and the environment**
- **Avoided pollution that threatens public health and ecosystems**
- **Reduced purchasing and disposal costs**
- **Decreased Scope 3 emissions, and**
- **Enhanced community engagement and collaboration**

Zero Waste begins by reimagining the whole notion of “waste.” The focus of Zero Waste is to eliminate wasteful practices throughout the life cycle of materials from the source, to usage and discarding, with a focus on “upstream management” (reducing wasted materials use prior to creation). Focusing on the redesign and implementation of preemptive measures prior to the products or services coming onto our campuses

allows for greater efficiency at the institutional level. Improved diversion rates result from this whole systems approach.

Just like “zero accidents on the job site” and “zero defects in production,” Zero Waste is a goal that is embraced by sustainable communities, businesses, and institutions.

Businesses, including Toyota and Sierra Nevada Brewing, are exemplars of Zero Waste practices. With the international market for recyclables facing upheaval, especially from China’s National Sword ban on contaminated recycling streams, many municipalities are also developing Zero Waste plans, including the City of Boston. The City’s Zero Waste Boston Plan was released in June 2019.

Recognizing these issues, Boston University’s 2017 Climate Action Plan established a Zero Waste Sustainability goal. The plan recommended using the TRUE Zero Waste Certification<sup>3</sup> framework and tools for life-cycle assessment and embodied carbon analyses in the near term. In response, the Zero Waste Implementation Task Force convened in the fall of 2019 to develop a bold and actionable plan. The task force was comprised of key stakeholders, staff, faculty, and students.

## THE ZERO WASTE HIERARCHY OF HIGHEST AND BEST USE

The Zero Waste Implementation Task Force used the Zero Waste Hierarchy of Highest and Best Use<sup>4</sup> in evaluating priorities for investing in new programs and infrastructure. The Zero Waste Hierarchy of Highest and Best Use was curated by the Zero Waste International Alliance in consultation with Zero Waste organizations around the world. The Hierarchy describes a progression of initiatives to support the Zero Waste system. The TRUE Zero Waste Rating System is organized to support the Hierarchy as well, with five of the credit categories and many individual credits mirroring the elements of the Hierarchy. The determination of highest and best use of materials is based primarily on an assessment of the environmental impacts of different policies and programs, as well as consideration of life cycle analyses and natural principles. It recognizes that for every ton of material burned or buried locally, 71 tons of material were disposed upstream through mining, manufacturing, and distribution of products.<sup>5</sup> It also recognizes that “more energy can

<sup>1</sup> Stop Trashing the Climate: [ilsr.org/stop-trashing-the-climate/](https://ilsr.org/stop-trashing-the-climate/)

<sup>2</sup> 2016 Waste Characterization Study in Support of Class II Recycling Program (Saugus, SEMASS, Haverhill)

<sup>3</sup> Boston University Climate Action Plan: [bu.edu/climateactionplan/](https://bu.edu/climateactionplan/)

<sup>4</sup> [zwia.org/zw/h/](https://zwia.org/zw/h/)

<sup>5</sup> Wasting and Recycling in the United States, 2000, Institute for Local Self-Reliance, page 3: [ilsr.org/wasting-and-recycling-in-the-united-states-2000/](https://ilsr.org/wasting-and-recycling-in-the-united-states-2000/)

be saved, and global warming impacts decreased, by reducing waste, reusing products, recycling and composting than can be produced from burning discards or recovering landfill gases.”<sup>6</sup>

## THE ZERO WASTE HIERARCHY INCLUDES:

**Rethink**—Support and expand systems where product manufacturing considers the full life cycle of their product in a way that follows the Zero Waste Hierarchy and moves toward more sustainable products and processes. Producers take back their products and packaging in a system that follows the Zero Waste Hierarchy.

**Redesign**—Design and purchase products from reused, recycled, sustainably harvested renewable, or nontoxic materials to be durable, repairable, reusable, fully recyclable or compostable, and easily disassembled.

**Reduce**—Minimize quantity and toxicity of materials used.

**Reuse**—Maximize reuse of materials and products.

**Recycle/Compost**—Support and expand systems to keep materials in their original product loop and to protect the full usefulness of the materials.

**Material Recovery**—Maximize materials recovery from mixed discards and research purposes after extensive source separation.

**Residuals Management**—Examine materials that remain and use this information to refine the systems to rethink, reduce, reuse, and recycle in order to prevent further discards.

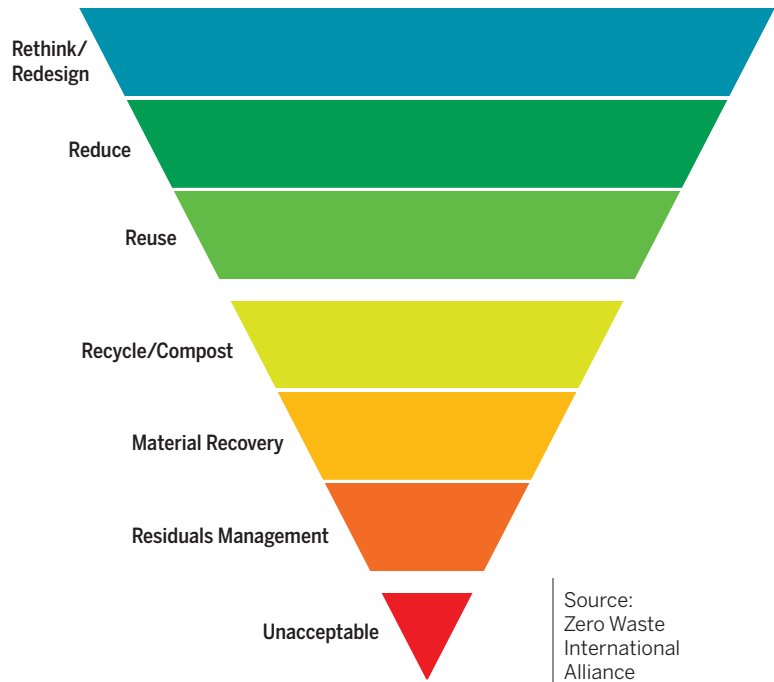
**Unacceptable**—Do not support policies and systems that encourage the destructive disposal of compostable or recyclable materials. Do not support energy recovery and/or destructive disposal systems that are dependent upon the continued production of discards.

## SUMMARY APPROACH

This plan is built on the hard work of Facilities Management & Operations staff, continuous improvements and investments made by the University, and all the engaged students, faculty, and staff who have generated the successes in recycling, composting, reuse, and donation programs over the past decade. The University has increased its diversion rate from 3% in 2006 to 42% in 2019. In that same period, BU also reduced the overall generation of materials by 9%.

While many of the Zero Waste initiatives identified in this plan will come with added costs to the

## The Zero Waste Hierarchy 7.0



University, rethinking and redesigning operations and infrastructure to design waste out of these systems has a positive impact on the triple bottom line of sustainability—economy, environment, and society. This Zero Waste Plan consolidates the 50 initiatives recommended by the five working groups, and prioritizes the initiatives that are expected to have the greatest impact on reducing waste and increasing efficiency.

## RETHINK/REDESIGN

The adage that we can’t manage what we don’t measure is as true for waste as it is for energy, if not more so. To attain the goal of Zero Waste for the University, the plan begins by rethinking and redesigning how we collect data and monitor progress through improved metrics that can then be communicated in an actionable way to change behavior. These recommended initiatives include developing a metrics framework for tracking performance, driving behavioral change, and making operational improvements. With better data, analysis can support engagement and institutional decision making. The plan also includes integrating Zero Waste into the Design & Construction Guidelines and Project Planning & Delivery Process Manual. Building a support network of faculty, staff, and students will be essential to improve the ongoing implementation of the plan.

Source:  
Zero Waste  
International  
Alliance

<sup>6</sup> ZWIA Zero Waste Community Principles: [zwia.org/zero-waste-community-principles/](http://zwia.org/zero-waste-community-principles/)



## REDUCE

Implementing programs that reduce the amount of waste we generate in the first place is a central tenet of the plan. We will do this by reducing consumption on many fronts, including single-use products, printing, food waste, packaging, paper towels, and coffee. By addressing the goods, materials, and their deliveries, we can reduce waste and costs at the same time.

## REUSE

A shift in our perception of discarded materials underlies many of these initiatives. If we think about a department's or individual's "waste" as an asset or resource that can fill someone else's needs, we can extend the life of those resources. Improving existing and providing new systems to exchange resources at the University is essential. The opportunity to do this for chemicals in labs has additional safety, health, and environmental co-benefits.

## RECYCLE/COMPOST

When goods meet the end of their useful life for their intended purpose, they can become a resource and be put to a new use through recycling. To ensure that these resources are diverted from incineration, the University needs to standardize and expand collection processes and infrastructure. To minimize cross-contamination, effective education, signage, and communications will be necessary.

One of the most significant opportunities to reduce the University's climate and landfill impacts is through improved recycling of construction and demolition debris. We recommend piloting requirements for diversion rates for small construction projects commensurate with what is currently achieved on the University's LEED projects to better understand the challenges, opportunities, and costs.

## CULTURE CHANGE

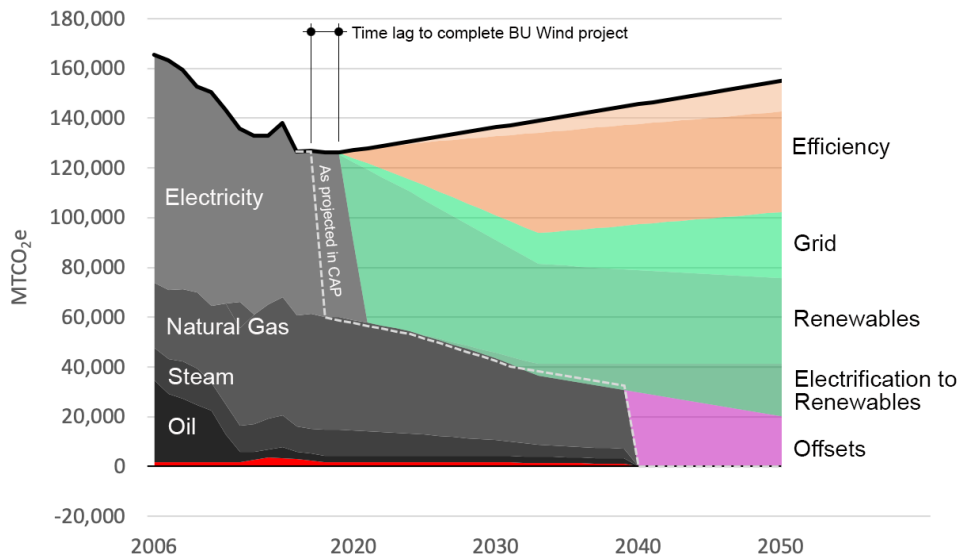
With a population of a small city, all the systems, infrastructure, and programs we envision will not be effective without a community engaged to help implement these solutions. This will be accomplished by educating, engaging, and empowering our students and employees on how to use these systems and support BU's focus on Zero Waste. This will be achieved by including a University-wide sustainability education module, the addition of Zero Waste components in job descriptions and performance reviews, and the development of recognition programs.

## MARKET DEVELOPMENT

Recyclable materials are marketed as international commodities. We cannot accomplish the goals in this plan by ourselves. How the University influences the markets will play a role in the success of this plan. This begins by collaborating with our suppliers, vendors, peers, and the broader community. Our levers include a sustainable purchasing program and policy, nudging the market demand for remanufactured and recycled materials, such as furniture in building renovations or soil amendment for our grounds. We need to engage in a broad conversation around these opportunities while modifying our specifications and requiring accountability of our vendors. The successful implementation of BU's Zero Waste initiatives in concert with similar activities emerging from MIT, Harvard, and other local institutions will set an example for the region and will inspire other institutions and support the City of Boston in its Zero Waste Plan implementation.

# Background

## BU Climate Action Plan Abatement Curve Including Actual Emissions Through 2019



The Abatement Curve shows how BU is addressing direct emissions to reach its goal to be net neutral by 2040.

### CLIMATE ACTION PLAN

Boston University made a commitment to sustainability with the adoption of a Climate Action Plan in 2017. The BU Bold scenario approved by the Board of Trustees will dramatically cut greenhouse gas emissions and achieve carbon neutrality by 2040, a decade ahead of the City of Boston's 2050 carbon-free goal.

#### Zero Waste is:

*"The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health."*<sup>7</sup>

The Climate Action Plan recommended that the University pursue Zero Waste Certification and established a Zero Waste Sustainability goal for its campuses.<sup>8</sup> This goal is based on the certification standards of Green Business Certification, Inc. (GBCI)'s TRUE Zero Waste certification system.<sup>9</sup> This means that 90% of nonhazardous discarded materials would be diverted away from landfills and incinerators, including 90% of construction debris. Closing the gap to achieve a 90% diversion

rate will take additional planning and effort. Many of the Zero Waste initiatives will come at a cost, but will also have significant triple bottom line benefits. Many of the waste reduction initiatives will reduce costs through avoided collection and disposal fees and greater efficiencies (e.g., right-sizing). The cost savings can be used to offset the cost of other measures that may not have a financial payback. Achieving Zero Waste for the University will be possible if built on the success of the initiatives laid out in this plan, coupled with market transformation, advances in technology, and support and engagement.

### THE ZERO WASTE IMPLEMENTATION TASK FORCE

To identify appropriate initiatives for achieving the Zero Waste goal, the University's Senior Vice President for Operations, Gary Nicksa, convened the Zero Waste Implementation Task Force. The task force was composed of over 50 stakeholders, including senior managers from departments throughout the University and all University campuses, including five Associate Vice Presidents, four Assistant Vice Presidents, and staff, faculty, and students. The list of task force members is included in Appendix A. The task force met monthly as a whole group, and was divided into five working groups, which met weekly from September to December 2019. The task force also convened a meeting of Sustainability Liaisons from different University departments and two public

Source: Recommendations of the Climate Action Task Force for Boston University's Climate Action Plan, page 14

<sup>7</sup> Internationally peer-reviewed definition of Zero Waste: [zwia.org/zero-waste-definition/](http://zwia.org/zero-waste-definition/)

<sup>8</sup> BU Climate Action Plan (2017), page 22: [bu.edu/climateactionplan/](http://bu.edu/climateactionplan/)

<sup>9</sup> Green Business Certification, Inc., TRUE Zero Waste certification system: [true.gbci.org/](http://true.gbci.org/)

forums that engaged over 100 students, faculty, and staff on both the Charles River and Medical Campuses. It also conducted an online survey of the BU community with over 400 responses. A summary of the survey is included in Appendix B.

The charge of the Zero Waste Implementation Task Force was to address the recommendations included in the Climate Action Plan's Supply Chain & Waste Stream Working Group Report:

- 1) Develop a Zero Waste Implementation Plan in alignment with GBCI's TRUE Zero Waste Certification framework
- 2) Deliver a plan with clear actions the University can take to meet the goals established in the Supply Chain & Waste Stream Working Group Report
- 3) Collaborate with outside partners, local universities, the City of Boston, and other organizations to establish best practices the University can employ, and market solutions the University and its collaborators can influence
- 4) Use this as an opportunity to rethink and redesign supply chain and waste stream systems to reduce waste, reuse materials, and divert recyclables from incineration/landfill
- 5) In collaboration with vendors, establish accurate data collection and reporting systems and pilot programs where necessary
- 6) Engage the BU community in developing these solutions and their ongoing implementation

This Zero Waste Plan synthesizes the recommendations generated by the Zero Waste Implementation Task Force and the strategic working groups, which addressed five main elements:

- **Supply Chain:** reduce waste in the supply chain
- **Infrastructure & Logistics:** standardize and right-size infrastructures for more effective diversion of discarded materials
- **Engagement & Environmental Stewardship:** engage students, faculty, and staff in changing the culture to support environmental stewardship and Zero Waste
- **Metrics:** develop the systems needed for data accuracy
- **Construction Waste:** divert construction debris from incineration and landfills

The strategic working groups met through the winter of 2019 and identified 50 recommendations which have been consolidated into 21 initiatives outlined in the Zero Waste Initiatives section.

## CAP INDIRECT EMISSIONS



WHAT WE  
**BUY**



WHAT WE  
**TOSS**

### ZERO WASTE BOSTON

Boston University is recognized by the City of Boston as an institution leading on sustainability and climate action. BU's Institute for Sustainable Energy developed Carbon Free Boston, which provided the policies and programs needed to bring the City of Boston's Climate Action Plan 2019 to fruition. The University is also leading by example in building the largest fossil-free and carbon-free building in Boston—the Center for Computing & Data Sciences.<sup>10</sup>

BU is the size of a small city. With over 35,000 students (about a quarter international) and over 10,000 faculty and staff, Boston University occupies over 15 million square feet in 344 buildings in Boston.<sup>11,12</sup>

The University participated in the development of the City of Boston's Zero Waste Plan, which was released in June 2019. Through its participation in the development of Boston's Zero Waste Plan, the University demonstrated its commitment to be a leader in Boston's journey to Zero Waste and through this plan may become a model in Boston on the policies, programs, and practices needed to achieve Zero Waste.

The City of Boston's Zero Waste Plan identified 30 strategies to be implemented in the short-term (through 2024) and the long-term (through 2035). By implementing these strategies, the City can increase its overall recycling rate from 25% to 80% or more by 2035, contributing to the market transformation needed to move the region toward a more sustainable future. Boston University's Zero Waste Plan was developed in the context of the City's plan, especially as we collectively support regional market development strategies.

The Climate Action Plan calls for the University to address its indirect emissions, including addressing the impacts of our supply chain and waste streams.

<sup>10</sup> [bu.edu/data-sciences-center/](https://bu.edu/data-sciences-center/)

<sup>11</sup> [bu.edu/about/dna/](https://bu.edu/about/dna/)

<sup>12</sup> BU Informatics and Strategic Initiatives

**CITY OF BOSTON’S ZERO WASTE TIMELINE**

**Short-Term 2019-2024**

**Long-Term 2025-2035**

<b>Reduce and Reuse</b>	<b>Reduce and Reuse</b>
<ul style="list-style-type: none"> <li>1. Conduct Citywide Public Education Campaigns</li> <li>2. Provide Targeted Waste-Reduction Outreach and Technical Assistance</li> <li>3. Reduce Problem Products &amp; Packaging</li> <li>4. Divert More Reusable Goods</li> </ul>	<ul style="list-style-type: none"> <li>5. Divert Even More Reusable Goods</li> <li>6. Keep Repairable Products from Disposal</li> </ul>
<b>Increase Composting</b>	<b>Increase Composting</b>
<ul style="list-style-type: none"> <li>7. Expand Residential Yard Waste Options</li> <li>8. Pilot Programs to Handle Residential Food Scraps</li> <li>9. Expand Commercial Composting</li> <li>10. Increase Compost Capacity</li> </ul>	<ul style="list-style-type: none"> <li>11. Take Residential Composting Programs to Scale</li> <li>12. Increase Commercial Composting Even More</li> </ul>
<b>Recycle More and Recycle Right</b>	<b>Recycle More and Recycle Right</b>
<ul style="list-style-type: none"> <li>13. Educate Boston Residents, Businesses, and Visitors to Recycle Correctly</li> <li>14. Expand and Enforce State and Local Waste Reduction and Recycling Requirements</li> <li>15. Reinforce Waste-Reduction Goals through the Collection System</li> <li>16. Create New Commercial Hauler and Generator Rules</li> <li>17. Lead by Example at City Facilities</li> <li>18. Expand Recycling During Construction Projects</li> <li>19. Increase Transparency About Costs</li> <li>20. Expand Infrastructure for Recycling “Hard to Recycle” Materials</li> <li>21. Require Zero Waste Strategies for Public Events</li> </ul>	<ul style="list-style-type: none"> <li>22. Create a More Equitable Collection System</li> </ul>
<b>Inspire Innovation</b>	<b>Inspire Innovation</b>
<ul style="list-style-type: none"> <li>23. Expand the City’s Environmentally Preferable Purchasing Practices</li> <li>24. Set Zero Waste Goals and Metrics</li> <li>25. Advocate for Redesign and Take-back of Products</li> <li>26. Support Green Jobs</li> <li>27. Create a Zero Waste Economic Development Strategy</li> </ul>	<ul style="list-style-type: none"> <li>28. Fund New Ideas and Approaches</li> <li>29. Support a Zero Waste Research and Development Network</li> <li>30. Explore the Feasibility of City-Owned Trash and Recycling Infrastructure</li> </ul>



# Existing System

As a leadership institution within Boston, the University has taken waste reduction and recycling seriously by investing in programs throughout the campuses: in administration and academic buildings, residence halls and student centers, on the grounds, and at special events. This effort has resulted in a current 42% recycling rate (meaning that 42% of discarded materials were reduced, reused, recycled, or composted and 58% were disposed of in incinerators).

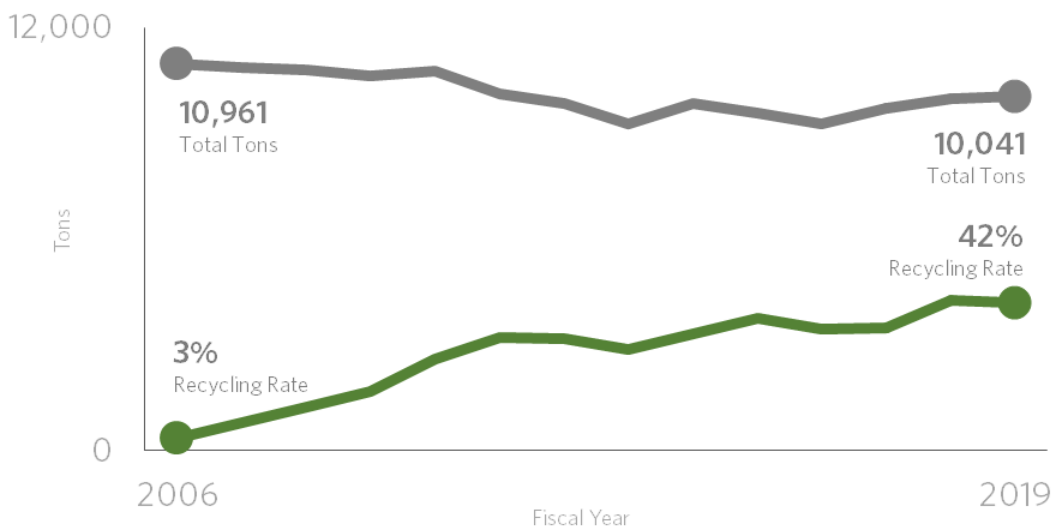
The diversion rate is determined by the following formula:

$$\begin{aligned} \text{Generation} &= \text{Diversion} + \text{Disposal} \\ 10,041 \text{ tons} &= 4,197 \text{ tons} + 5,844 \text{ tons} \\ \text{Diversion Rate} &= \text{Diversion} / \text{Generation} \\ 42\% &= 4,197 \text{ tons} / 10,041 \text{ tons} \end{aligned}$$

The University has increased its diversion rate from 3% in 2006 to 42% in 2019. In that same period, BU also reduced the overall generation of materials by 8% from 10,961 tons to 10,041 tons excluding construction waste.

Construction debris is created when we build new facilities and remodel existing buildings. The University's LEED projects require recycling and reuse of construction debris and have achieved a 93% diversion rate. The statewide average for non-LEED construction debris diversion is 30%. The University's estimated LEED and non-LEED combined construction debris diversion rate is 56%. Since construction projects are episodic, construction debris is not routinely measured as a portion of overall diversion. Adding construction debris (annualized over 10 years) to the University's diversion and disposal estimates, increases the University's overall diversion rate from 42% to 47%.

## Boston University Change in Waste Generation and Recycling



BU 2019 Diversion and Disposal	Tons	BU Construction Debris (annualized)	Total Estimated Diversion and Disposal
Recycled	2,608	3,305	5,913
Composted	1,296		1,296
Reused, donated, or resold	242		242
Disposed in a solid waste landfill or incinerator	5,844	2,583	8,427
Total materials generated	9,991	5,888	15,879
Current recycling rate	42%	56%	47%

Major programs that the University has implemented in waste reduction, recycling, and composting<sup>13</sup> include the following best practices.

<sup>13</sup> The term “composting” in this plan refers to both aerobic and anaerobic processing of discarded organic materials (including food scraps, food-soiled paper, compostable fiber and plastic products, leaves, and landscape prunings).

Area	Reduce and Reuse	Recycling and Composting
<b>Dining</b>	<ul style="list-style-type: none"> <li>Leanpath food waste reduction software and hardware measurement tools in place at all three major dining halls</li> <li>Trayless dining since 2008, reusable plates and flatware in all three dining halls</li> <li>Reducing portion sizes and instead promoting seconds</li> <li>Weekly production meetings to identify opportunities for sustainability, waste reduction</li> <li>Some surplus food donation particularly during end of term and Intersession</li> </ul>	<ul style="list-style-type: none"> <li>Front of the house sorting stations at dining halls and in the Union Court with recycling, composting, and landfill</li> <li>Vegetable oil recycling</li> <li>Most food waste is anaerobically digested offsite</li> </ul>
<b>Events</b>	<ul style="list-style-type: none"> <li>Printing reduction at Commencement (no student names in Commencement Redbook program reduced 120 pages to 24, no printed invitations for on-campus recipients)</li> <li>Dining Services provides for Zero Waste events at an additional cost when requested</li> </ul>	<ul style="list-style-type: none"> <li>Partnership with Dining Services on large-scale Zero Waste events (15 major events per year)</li> <li>No trash cans permitted at Zero Waste events (all materials are sorted by Dining staff)</li> <li>Graduation gowns made of post-consumer plastic bottles</li> <li>Gown recycling bins available throughout Commencement for collection</li> </ul>
<b>Buildings and Grounds</b>	<ul style="list-style-type: none"> <li>Bottle filling stations, reusable cups in some kitchens and common areas</li> <li>Reusable water bottles provided to all first-year students at Orientation</li> <li>Reusable mugs given to BU community members at sustainability festivals</li> <li>Hand dryers replacing paper towels in some locations</li> </ul>	<ul style="list-style-type: none"> <li>Dual stream recycling throughout Charles River Campus</li> <li>“Big Bellies” for trash and recycling deployed across all three campuses</li> <li>Trash buddy (deskside recycling stations) in all offices</li> <li>Cardboard recycling during move-in</li> <li>Cardboard balers installed in many buildings across the campuses</li> <li>E-waste recycling</li> <li>Universal waste collection</li> </ul>
<b>Housing and Residence Life</b>	<ul style="list-style-type: none"> <li>Refurbish, repair, and reupholstery of furniture</li> <li>Durability often a factor in evaluating purchases of furniture</li> <li>Most housing forms are digitized</li> <li>“Goodwill not Landfill” donation program during move-out</li> <li>Donate surplus furniture, fixtures, and electronics</li> </ul>	<ul style="list-style-type: none"> <li>Piloting Resident Sustainability Leaders peer-to-peer engagement program at Warren Towers and expanding to West Campus in 2020/2021</li> </ul>
<b>Procurement</b>	<ul style="list-style-type: none"> <li>Student print reduction program (“MyPrint”) provided to all residence halls: Multifunctional digital printers, copiers, and scanners reduce use and discarding of paper and provide more efficient storage</li> <li>Paperless payroll and DocuSign eliminated paper significantly</li> </ul>	
<b>Custodial</b>	<ul style="list-style-type: none"> <li>Dilution stations (reduced boxes, buckets, etc.), reduced chemicals, reduced deliveries, bulk chemicals, piloted white vinegar—now used for many applications</li> <li>Toilet paper—use coreless and jumbo rolls</li> <li>Paper towels—electronic dispensers are programmed to dispense shorter towels at all locations on campus</li> </ul>	<ul style="list-style-type: none"> <li>Cans and bottles are collected for recycling from dual-stream and single-stream recycling containers.</li> </ul>

<b>Construction</b>	<ul style="list-style-type: none"> <li>• Adaptive reuse—60% of campus buildings have been repurposed from other commercial uses</li> <li>• Just-in-time delivery—big equipment and big deliveries are uncrated prior to being brought on-site</li> <li>• Reuse and deconstruction is increasing, equipment (such as ladders and scaffolding) are reused on-site</li> <li>• Standardizing across campus: bottle filling stations and trash buddies</li> </ul>	<ul style="list-style-type: none"> <li>• LEED Gold Standard and LEED Platinum for new building</li> <li>• PM Web—a new project management system—can provide more efficiency and data, resulting in better oversight</li> </ul>
<b>Medical Campus</b>	<ul style="list-style-type: none"> <li>• Monitors have replaced posters, flyers, and other announcements in many places</li> </ul>	<ul style="list-style-type: none"> <li>• Cardboard is baled on-site and single-stream recycling implemented across the campus</li> <li>• Styrofoam is recycled</li> <li>• Students in campus housing requested compostable material collection; now paid for by Facilities</li> </ul>

A **Zero Waste peer survey** was conducted to understand best practices across the issues addressed by each of the working groups. Data was gathered from web sources and campus visits to UC Berkeley, Stanford University, and the

University of British Columbia. This comparison of peer universities, conducted in 2019, highlights our understanding of their Zero Waste practices. Green is the highest ranking, followed by orange and blue.

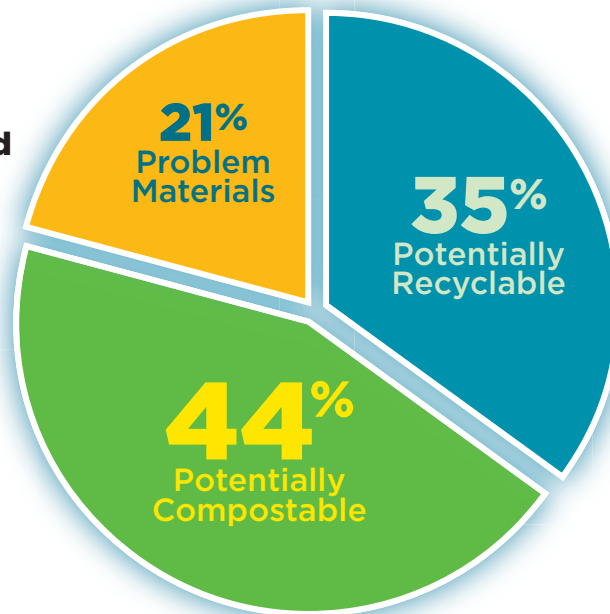
## Comparison of Peer Universities, 2019

Zero Waste Peer Comparisons	Zero Waste Plan	Supply Chain	Infrastructure & Logistics	Engagement & Stewardship	Metrics	Construction Waste
Boston University						
<b>Peer Institutions</b>						
Boston College						
Brown University						
Case Western Reserve University						
Columbia University						
George Washington University						
Johns Hopkins University						
New York University						
Northeastern University						
Northwestern University						
Syracuse University						
Tufts University						
University of Miami						
University of Pennsylvania						
University of Rochester						
University of Southern California						
<b>Institutions of Interest</b>						
Ball State University						
Cornell University						
Dartmouth University						
Duke University						
Emory University						
Harvard University						
Massachusetts Institute of Technology						
Princeton University						
Portland State University						
University of British Columbia						
University of California, Berkeley						
University of Chicago						
University of Colorado, Boulder						
University of Maryland						
Washington University, St. Louis						
Yale University						

	Found plan with strong goals with intent for implementation
	Found mention of a general plan, but lacking in specificity and implementation
	Not found online

# Challenges and Opportunities

## Estimated Composition of Materials Disposed in Landfills and Incinerators



Based on materials composition studies conducted by peer institutions, we know that most of what is thrown in the trash (as much as 75–80%) could be recycled or composted.

Problem materials are those that cannot readily be recycled or composted and are difficult to reduce or reuse. Typically, these materials at college campuses nationwide include contaminated plastic wrap, single-use non-compostable coffee cups, lab gloves, and composite materials.

Potentially recyclable materials at college campuses nationwide typically include readily recyclable materials such as cardboard, white ledger paper, #1–2 plastic containers, aluminum cans, and construction materials (especially wood, concrete, and asphalt). This category can also include materials that are recyclable, but do not have robust markets such as: #3–7 plastic containers, other metal containers, aluminum foil, furniture, and construction materials (especially rigid plastics and sheetrock).

Potentially compostable materials at college campuses nationwide typically include readily compostable materials such as plant debris and food scraps. This category can also include materials that are compostable but do not have robust markets such as food-soiled paper (e.g., paper cups, paper food service containers, and napkins), bio-plastics, and paper towels.

The Boston area has good recycling infrastructure for traditional paper grades, metal cans, plastic containers, and construction materials (including wood scrap, asphalt, and concrete).

The University uses Waste Management's CORE processing facility and Greater Lawrence Sanitary District to process food scraps.

There are currently few local options for processing compostable plastics (e.g., cups and utensils), food-soiled paper (e.g., paper cups, paper food service containers, and napkins), and paper towels. Compostable paper can make up as much as 15–20%<sup>14</sup> of an institution's discarded materials, so waste reduction and composting solutions for these materials is a significant opportunity for the University.

Source: Stanford Waste Characterization Summary Memo, September 2019

<sup>14</sup> Stanford University Waste Characterization Summary Memo, September 2019

# Zero Waste Initiatives

Improving collection and processing systems are essential foundational elements to our Zero Waste Program, but the major focus of our Zero Waste efforts needs to be culture change—changing the behavior of our staff, faculty, and students in their everyday decisions. New programs and guidelines will help the University choose a less wasteful path in its operations and help to achieve Zero Waste. To address waste in our supply chain, the University will need to establish guidelines that both the University community and our suppliers should be encouraged to meet and surpass.

The working groups identified 50 detailed initiatives designed to help the University achieve Zero Waste. The distinct, detailed recommendations can be found on the Zero Waste webpage.<sup>15</sup> For the purposes of this Plan, these recommendations were consolidated into 21 initiatives. These are categorized as follows.

- **Redesign**
- **Reduce**
- **Reuse**
- **Recycle/Compost**
- **Culture Change**
- **Market Development**

## REDESIGN

**1. Metrics framework**—Develop metrics for specific audiences that support the goals of tracking performance, driving behavioral change, and making operational improvements. These metrics should be standardized and collected on a longitudinal basis. Identify any data gaps and develop approaches for measuring and documenting these gaps.

**2. Data analysis**—Provide regular, on-demand, and customized data analysis to support the design of new engagement/implementation programs that are informed by pilots or completed projects. Institutionalize a regular

practice of auditing our waste stream for the purposes of data collection that will inform community engagement efforts and behavioral change initiatives.

**3. Construction design guidelines**—Update the draft Project Planning & Delivery Process Manual to integrate Zero Waste goals. Require contractors to submit a Zero Waste plan for each construction project as part of their logistics plan.

**4. Build a Zero Waste network of support**—A network is needed to support groups around campus who are directly responsible for implementing, monitoring, and maintaining Zero Waste initiatives. Individuals in different buildings and departments should be identified and tasked with being a point of contact on matters related to Zero Waste. The Points of Contact will champion Zero Waste within their departments, engage their co-workers in Zero Waste initiatives, liaise with Facilities and Custodial staff to address recurring issues, help train others in proper Zero Waste sorting, develop targeted engagement activities and departmental Zero Waste plans, and get feedback on Zero Waste initiatives on all campuses.

## REDUCE

**5. Print reduction through on-demand printing**—Building on the success of the student MyPrint program, implement a Managed Print Program in departmental, non-student-facing functions of the University. Contract with a third party to manage and support the printing activity of the University, including supporting the devices and replacing peripherals and paper. Perform an analysis of all existing printers on campus via the IS&T network. Set all printers to print dual-sided. Control printing so print jobs are not released until an individual enters a code at the printer. Provide shared energy-efficient duplexing multifunction devices and encourage the removal and recycling of personal printers.

<sup>15</sup> Boston University Zero Waste: [bu.edu/sustainability/zero-waste-plan](http://bu.edu/sustainability/zero-waste-plan)



## **6. Post-consumer food waste reduction**

All pre-consumer food waste in dining halls is diverted. Institutionalize evaluating Leanpath data. Expand “Weigh the Waste” events at dining halls. Collect weights from different types of post-consumer-waste categories, calculate an average weight based on student count, identify commonly wasted foods and the reasons for the waste, and generate discussion about food waste with students. Modify catering food waste and supply reduction practices and donate surplus edible food to fully align with Zero Waste.

**7. Reduce deliveries**—Reduce the waste associated with hundreds of deliveries made each day on campus. Restrict available delivery days for any noncritical purchases (e.g., Facilities Management & Operations team order custodial supplies only once a month). Start with office supplies, restricting deliveries to twice a week preceded with a robust marketing and communications campaign.

**8. Replace paper towels when possible**—Replace paper towels in administrative, academic, and residential buildings with electric hand dryers. Alternatives may vary depending on individual location needs. In residential areas with common bathrooms, require students to use their own towels. Standardize across campus where different approaches are used. Acknowledge some space types will continue with paper towel use (e.g., wet bench labs and clinical settings).

**9. Eliminate single-use disposables and address coffee service**—Strive for reusables and the reduction of single-use products. Over time, explore ways to phase out single-use disposable foodware on all campuses and with retail vendors. Increase incentives for bringing reusables and increase the number of participating vendors. If users bring a reusable cup or mug, provide a discount for a drink. Dining Services should conduct a behavior change study to identify other ways to increase participation in reusable to-go container programs. Strive to reduce single-use disposables in catering practices and align with Zero Waste goals. Incorporate Zero Waste language into Retail Dining contracts and large-scale event communications. Pursue alternative single-cup brewing

systems with interested departments, such as a bean-to-cup system. Require all K-cup systems still in use to participate in the Grounds to Grow On K-cup recycling program until those programs are phased out.

## **10. Convert to electronic documents**

Encourage departments to transition paperwork that is sent to or received by BU departments that are either large in size (e.g., RFPs, bids, contracts) or need to be completed by more than 100 people (e.g., Housing and Residence Life forms) to electronic documents. Include in Zero Waste Challenge that users “Rethink Before They Print” and reference Zero Waste goals. BU Sustainability should work with the largest purchasers of paper and provide support and technical assistance to those departments to determine if there are electronic alternatives or how the task can be done without paper.

## **REUSE**

### **11. Surplus asset reuse and online material exchange**

Invest in an online material sharing platform for use by the entire BU community for material and equipment sharing University-wide. Contract with a third party, such as Rheaply or Warp-It, to manage a broader reuse effort to improve communications, push notifications to end-users when goods are available, and allow end-users to post items themselves. Once implemented, eliminate surplus furniture storage with Olympia or combine the construction waste and Housing surplus asset program and warehouse/storage plan with a larger reuse effort. Sourcing & Procurement and BU Sustainability will work together to implement and promote the program.

### **12. Lab waste and chemicals**

Incorporate a focus on lab waste reduction and diversion, safer chemicals, and chemical reuse in the new Sustainable Labs Manager position. Develop a strategy for limiting the University’s use of hazardous and toxic chemicals in all operations and research. Capture usable chemicals from grant-funded projects when they end to help new projects starting up. Identify centrally located stockrooms or vacant spaces and designate for chemical reuse by labs.

## RECYCLE/COMPOST

### 13. Standardize and expand collection

**(recycling, organics, trash)**—Develop an integrated recycling and waste system for the University to reduce the number of times waste is handled, increase efficiency, and increase the amount of material that is properly recycled. Expand access to composting. Establish consistent collection systems across all campuses: compost, landfill, and recycling. Custodians should be responsible for collecting trash and recycling from inside all buildings and depositing in appropriate centralized collection containers for vendor pickup. Conduct a study to identify and resolve barriers to making this change. Reorganize existing stations and procedures for diversion of various “special” material types including but not limited to universal waste, batteries, ink/toner, mattresses, mattress pads, pallets, white goods, scrap metal, scrap wood, furniture, and cardboard bales. Engage vendors to identify gaps and opportunities. Remove trash containers from as many locations as possible (e.g., buildings seeking TRUE Zero Waste certification and athletic fields) and promote “carry in, carry out” and “leave no trace” programs as was done at UC Berkeley’s Chou Hall. Review research from Leave No Trace<sup>16</sup> and UC Berkeley and solicit their help to promote that message. Explore diversion of new materials types based on volume, diversion impact, and cost feasibility.

### 14. Construction debris diversion

**requirements**—Establish a baseline standard for a minimum 75% diversion rate for typical projects utilizing a comingled waste handling approach where project space and funds are at a minimum. Target a 90%+ diversion rate for projects utilizing a source-separated waste handling approach where project space and funds are more available. Pilot this approach initially to understand challenges, opportunities, and costs. Require University construction contractors to use BU-approved construction debris recyclers for construction waste collection and processing. Require deconstruction, dismantling, and recovery of usable products and materials from renovation, remodeling, or demolition work prior to demolition.

### 15. Designate sites for construction

**debris separation**—Designate a staging area for small amounts of construction debris (e.g., from scope 1 and 2 projects) so that University staff and contractors can recycle readily divertible materials from construction projects, including cardboard, rigid plastics, metal, wood, carpet, wallboard, reusable building materials, and small amounts of concrete, asphalt, and soil.

## CULTURE CHANGE

### 16. Zero Waste engagement pro-

**grams**—Standardize the ways that BU communicates about Zero Waste. Partner with Marketing & Communications to create a series of Zero Waste campaigns nested under the overarching identity highlighting specific issues, programs, and calls to action. Using the successful Statement of Commitment from Environmental Health & Safety as a model, develop a letter to the BU community from President Brown to encourage support and participation in the Zero Waste Initiative. Challenge students, faculty, and staff to help achieve the Zero Waste goal, and have an annual recognition program of outstanding accomplishments.

### 17. Zero Waste training

—Incorporate Zero Waste awareness and training at New Employee and Student Orientations. Create a required University-wide online training module for all students, staff, and faculty.

### 18. Zero Waste job descriptions and

**performance reviews**—Identify existing positions that are related to Zero Waste and add environmental stewardship responsibilities to job descriptions specific to those positions. Incorporate Zero Waste performance factors in the annual review process for all employees.

<sup>16</sup> Int.org



At a fall 2019 Zero Waste Campus Forum, students and employees explore opportunities. Photo credit: Melissa Ostrow.

## MARKET DEVELOPMENT

### 19. Sustainable Purchasing Program—

Implement a Sustainable Purchasing Program that supports social and environmental objectives as well as local markets where possible. Require suppliers to report sustainability data to the University. Empower departments to make more sustainable choices when purchasing goods.

### 20. Specify remanufactured furniture—

Direct architects to standardize the use of remanufactured furniture in BU projects and bring supplier partners who offer such products into design meetings earlier. New furniture should be a last resort option. Work with suppliers and designers to ensure all furniture follows LEED credits for Indoor Environmental Quality and Materials and Resources, reducing human exposure to VOCs and other potentially hazardous materials. Add this language to the Project Planning & Delivery Manual.

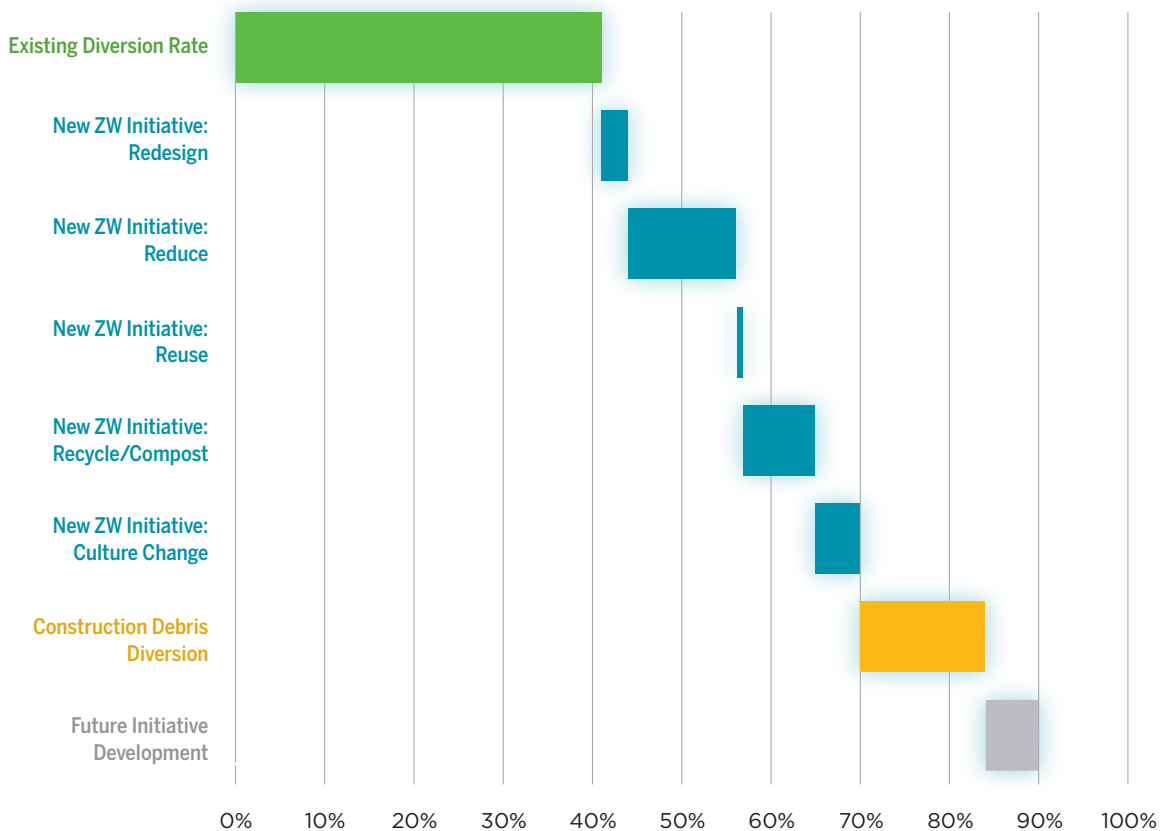
### 21. Implement Zero Waste grounds practices—

Should we need to purchase compost in the future, priority should be placed on purchasing from the BU composting vendor if the quality and prices are reasonable to support a closed-loop system. Evaluate whether compost can be used in lieu of mulch to decrease high emissions from mulch. Work with Trucking and Grounds Services to pilot at various locations and expand if successful. Practice grasscycling for all mowed surfaces and reduce yard trimming waste through native landscaping or xeriscaping.

# Impacts

Implementing the initiatives identified by the strategic working groups will increase the University's diversion rate. Using conservative estimates for capture rates by material type, the Zero Waste initiatives would result in an additional 2,800 tons per year diverted from landfills and incinerators. This would result in our diversion rate increasing from 42% to 70% by 2026. Construction debris is a significant contributor to the University's overall waste generation. Including annualized estimates for construction and projecting the diversion potential from new initiatives, the diversion rate would increase to 84% by 2026. The assumptions and calculations are included in Appendix D.

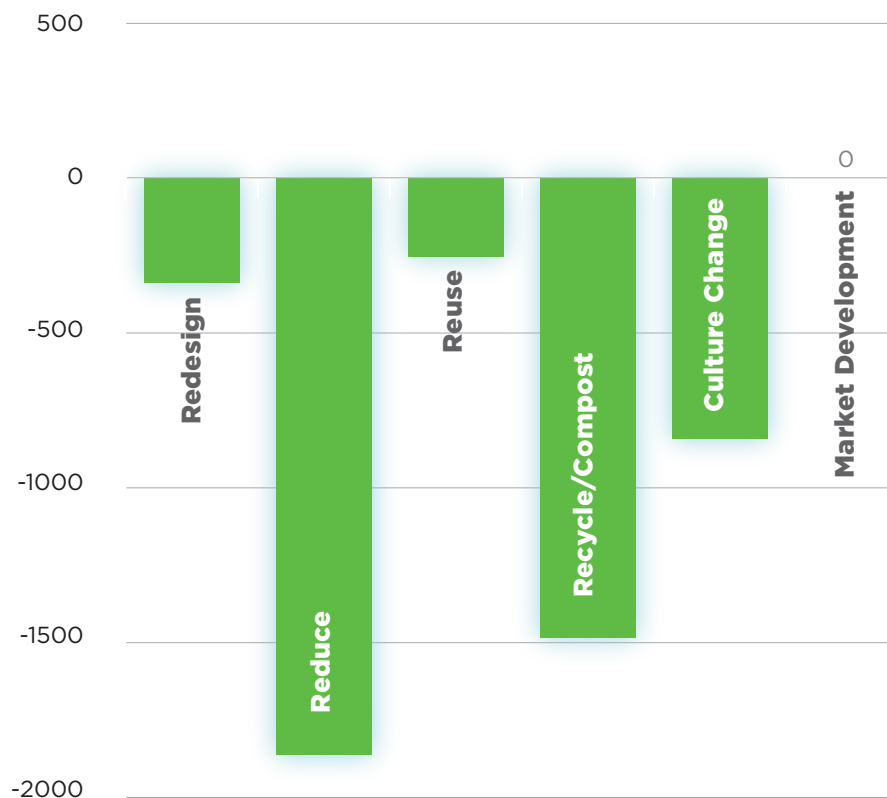
## Diversion Potential of Zero Waste Initiatives



To estimate the diversion potential of the initiatives in the plan, a “capture rate” by material type was determined. For example, reducing deliveries was estimated to eliminate 10% of cardboard from the waste stream. This would result in an additional 28 tons of material diverted from disposal annually. The capture rate estimates were based on results from similar programs or best estimates. It is possible that the implementation of this program will result in much higher capture rates. However, conservative assumptions were used for these calculations. The University will track the real impacts of each implemented program and provide updated progress metrics and impact analysis.

The waste prevention, recycling, and composting initiatives will also reduce greenhouse gas emissions. Using the US EPA Waste Reduction Model (WARM), the Zero Waste initiatives to be undertaken by the University are estimated to reduce emissions by approximately 4,900 metric tons of carbon dioxide equivalent, or about 4% of the emissions currently tracked by the University. This will contribute to the University’s greenhouse gas emissions reduction goal of carbon neutrality by 2040.

### Potential Greenhouse Gas Emissions Reductions (MTCO<sub>2</sub>e)





# Costs and Staffing

**Waste is an indicator of inefficiency. Boston University spends over \$1.5 million<sup>17</sup> on waste disposal each year, and pursuing a Zero Waste future provides opportunities to control costs. Boston University prides itself on being an institution that figures out how to get things done in a cost-effective manner, and also an institution that addresses climate change head-on.**

Many of our Zero Waste initiatives will come at a cost, but also have significant triple bottom line benefits. Waste reduction initiatives will reduce costs through avoided collection and disposal fees and greater efficiencies (e.g., right-sizing). Realized savings can be used to offset the cost of other measures that may not have a financial payback. Institutions and businesses nationwide are seeing long-term cost savings from many Zero Waste Initiatives, and we have taken into consideration prioritizing those at Boston University. Implementing a logistically and financially sound Zero Waste program will allow us to once again lead by example on solving difficult challenges.

Fully implementing the Zero Waste initiatives will require increased staff support, collection of many more recyclable and compostable materials, and deployment of new infrastructure. The following are the most significant staffing/consulting support and infrastructure changes needed, based on our analysis to date of the recommended initiatives.

## **Staffing or consulting support needed:**

- School, college, and departmental efforts to **identify and name a point of contact** and develop new department-level Zero Waste Plans
- Procurement effort to implement **Sustainable Purchasing Program and Managed Print Program**
- Sustainability effort to implement **Zero Waste training** and Zero Waste engagement initiatives

- Planning, Design & Construction effort to **develop guidelines** and enforce construction debris diversion requirements
- **Consulting support** for a waste characterization study
- Data analytics FTE to provide **ongoing reporting support** to Zero Waste Manager

## **Infrastructure needed:**

- Construction to **modify space in existing facilities** to provide convenient collection areas on floors and staging areas accessible to generators and collection staff
- Purchase of **standard internal bins** and bin enclosures—costs dependent on standardization study
- **Updated signage** to enhance source-separation—estimated design and labor costs
- Conversion from paper towel dispensers to **hand dryers**—removal of paper towel dispensers, purchase of dryers; installation of dryers if implemented in all residential buildings could be offset through savings of paper towel purchase and labor
- Processing of **construction debris**

<sup>17</sup> Estimated from FY 2019 Waste Fund Center Budget

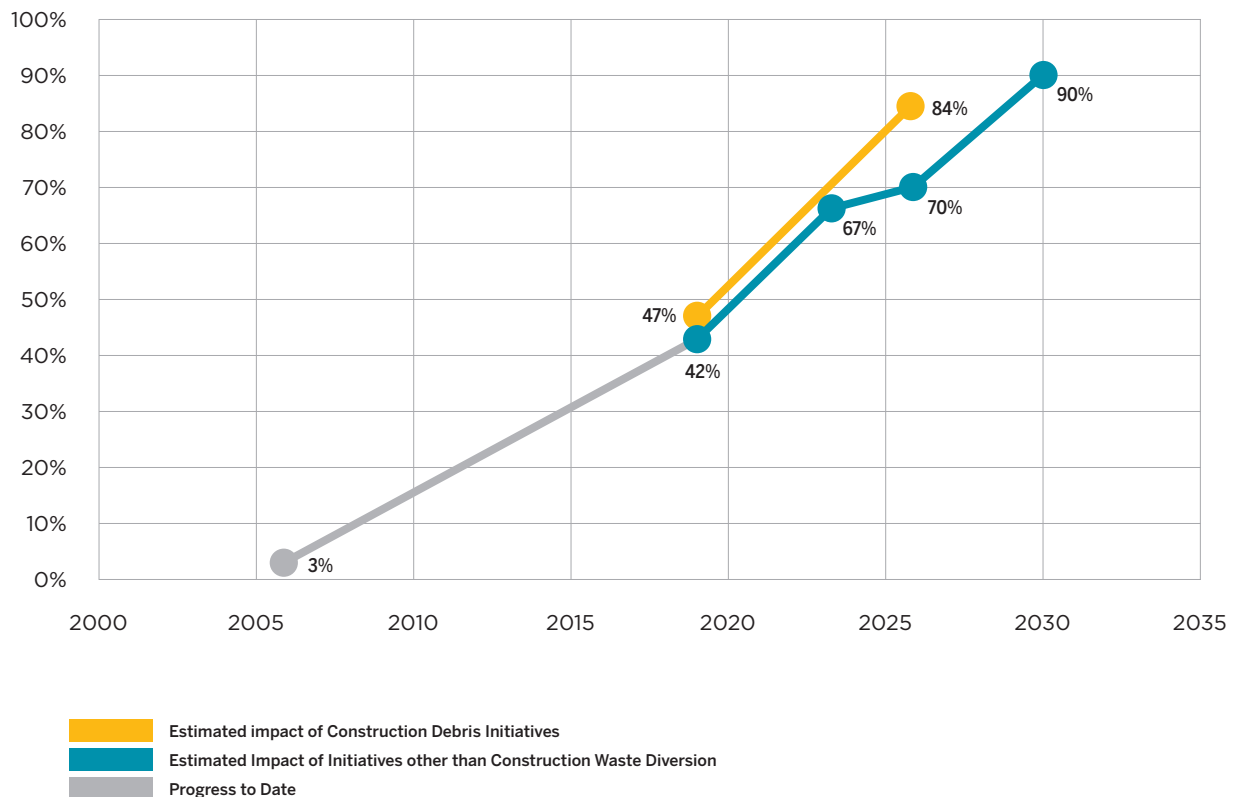
# Timeline

Full implementation of the Zero Waste initiatives identified in this plan is expected to increase the University's recycling rate from 42% to 70% by 2026. This mid-term goal is achievable based on the implementation of the Zero Waste initiatives and the experience of other leadership institutions. Construction debris initiatives will also contribute to the University's overall diversion rate, elevating it to an estimated 84%.

Closing the gap to achieve a 90% diversion rate will take additional planning and effort. Achieving Zero Waste for the University will be possible if built on the success of the initiatives laid out in this plan, coupled with market transformation and advances in technology.

The University will continue to pursue the long-term goal of 90% diversion of discarded materials from landfills and incinerators. This goal is consistent with the University's goal of carbon neutrality by 2040. The University will measure and monitor its waste reduction and diversion, identify new or expanded Zero Waste initiatives, and update and revise the Zero Waste Plan. The University will need to undertake a Zero Waste Plan updating effort in 2025–2026 to identify the University's progress toward its milestones and to identify future initiatives for implementation.

## Timeline to Zero Waste



# Appendix A — Zero Waste Implementation Task Force

## Overarching Task Force

### Co-chairs

Dennis Carlberg	Associate VP, University Sustainability
Paul Riel	Associate VP, Auxiliary Services

### Members

Bill Walter	Assistant VP, Campus Planning & Operations
Bob Whitfield	Executive Director, Environmental Health & Safety
Colleen McGinty	Assistant VP for Annual Capital Projects, Planning, Design & Construction
David Flynn	Assistant VP, Major Projects, Planning, Design & Construction
Ed Jacques	Facilities Director, Fenway Campus
Greg King	Associate Category Manager, Site Services, Sourcing & Procurement
Jeff Roy	Executive Director, Sourcing Strategy & Analytics, Sourcing & Procurement
Joseph LaChance	Resident District Manager, Dining Services
Kaity Robbins	Zero Waste Manager, University Sustainability
Lisa Tornatore	Director, University Sustainability
Randall Moore	Associate VP, Chief Procurement Officer, Sourcing & Procurement
Shane Cutler	General Manager, Events & Conferences
Stephen Ellis	Data Manager, University Sustainability
Ziba Cranmer	Director, BU Spark!

## Supply Chain Working Group

### Co-chairs

Greg King	Associate Category Manager, Site Services, Sourcing & Procurement
Lisa Tornatore	Director, University Sustainability

### Members

Bob Simboli	Category Manager, Research, Sourcing & Procurement
Carlos Vazquez	Director, Custodial Services
Jill Brown	Senior Designer, Campus Planning & Operations
Jeff Roy	Executive Director, Sourcing Strategy & Analytics, Sourcing & Procurement
Karen Murphy	Director, Center for Professional Education, Metropolitan College
Keith Haran	Category Manager, Technology, Sourcing & Procurement
Kaity Robbins	Zero Waste Manager, University Sustainability
Melinda Wheeler	Associate Category Manager, Business Services, Sourcing & Procurement
Mike Lyons	Category Manager, Facilities, Sourcing & Procurement
Ronald Corley	Director, National Emerging Infectious Diseases Laboratories
Stacy Gianoulis	Assistant VP, Client Services & Support, Information Services & Technology

### Infrastructure & Logistics Working Group

#### Co-chairs

Ed Jacques	Facilities Director, Fenway Campus
Kaity Robbins	Zero Waste Manager, University Sustainability

#### Members

Bob O'Toole	Trucking & Grounds Manager, Trades, Facilities Management & Operations
Colleen McGinty	Assistant VP for Annual Capital Projects, Planning, Design & Construction
Jason Grochowalski	Associate Director of Residence Life for Administration
John Barton	Executive Director, Medical Campus, Facilities Management & Operations
Joseph LaChance	Resident District Manager, Dining Services
Leigh Thumith	Director of Residence Dining Operations, Dining Services
Lisa Tornatore	Director, University Sustainability
Michael Ciarlante	Director, Events & Conferences
Michael DiFabio	Associate VP for Real Estate, Campus Planning & Operations
Michael Puim	Associate Director of Environmental Management, Environmental Health & Safety
Nishmin Kashyap	Director of Housing, Auxiliary Services
Shari Tumandao	Assistant Director, Howard Thurman Center, Dean of Students
Will Matos	Assistant Director, Facilities Management & Operations

### Engagement & Environmental Stewardship Working Group

#### Co-chairs

Bob Whitfield	Executive Director, Environmental Health & Safety
Kaity Robbins	Zero Waste Manager, University Sustainability

#### Members

Bill Walter	Assistant VP, Campus Planning & Operations
Denise Hagen	Student Government
Fernando Sousa	Assistant Director, Facilities Management & Operations
Gabriela Boscio Santos	Engagement Manager, University Sustainability
John Freeley	Director of Retail Operations, Dining Services
Kaity Robbins	Zero Waste Manager, University Sustainability
Lexie Raczka	Sustainability Director, Dining Services
Lisa Tornatore	Director, University Sustainability
Rick Reibstein	Lecturer, Department of Earth & Environment
Thom Gorham	Associate Director of Occupational Health & Safety, Environmental Health & Safety

### Metrics Working Group

#### Co-chairs

Stephen Ellis	Data Manager, University Sustainability
Ziba Cranmer	Director, BU Spark!

## Members

Dennis Carlberg	Associate VP, University Sustainability
Erik Levy	Founder & President, Save That Stuff
Jason Pina	Director, Analysis & Data Management, Informatics & Strategic Initiatives
Kaity Robbins	Zero Waste Manager, University Sustainability
Lexie Raczka	Sustainability Director, Dining Services
Michael Walsh	Research Assistant Professor, Department of Earth & Environment
Paul Riel	Associate VP, Auxiliary Services

## Construction Waste Working Group

### Co-chairs

Colleen McGinty	Assistant VP for Annual Capital Projects, Planning, Design & Construction
Jeff Hoseth	Senior Project Manager for Major Projects, Planning, Design & Construction

### Members

David Flynn	Assistant VP for Major Capital Projects, Campus Planning & Operations
Dennis Carlberg	Associate VP, University Sustainability
Ed Jacques	Facilities Director, Fenway Campus
Kaity Robbins	Zero Waste Manager, University Sustainability
Kyle Woolley	Student Intern with Planning, Design & Construction
Max Noe	Assistant Project Manager, Major Projects, Planning, Design & Construction
Mike Lyons	Category Manager, Facilities, Sourcing & Procurement
Rhoda Bianchi	Program Manager, Occupational Health & Safety
Tom Chance	AIA Contract Specialist, Sourcing & Procurement



Kickoff meeting for Zero Waste Implementation Task Force.  
Photo credit: Dave Green Photography.



# Appendix B – Stakeholder and Community Engagement

There are three different types of engagement summarized in this appendix:

- **Stakeholder interviews**
- **Campus forums**
- **Online feedback form**

Prior to the formal Zero Waste Implementation Task Force kickoff, 28 key internal BU stakeholders were interviewed by Zero Waste Associates. The goal was to understand how waste at the University is currently perceived and what a reimagined Zero Waste future would look like from the perspective of our own.

We also wanted to provide these individuals with a foundational understanding of Zero Waste to prepare them for the task force process. Working groups used the information gathering during these interviews to guide the development of their recommendations. Some of the questions asked were:

1. What **waste minimization and reduction initiatives** do you perceive the University has been most successful in so far?
2. How would you **reimagine our use of all the resources** we buy and how resources are discarded at BU?
3. What do you **hope will come out** of this process?
4. What are you **most excited about collaborating** with your peers and/or other departments on Zero Waste?

To solicit community feedback on preliminary working group recommendations, two campus forums were held on October 16 and 17, 2019. More than 100 students, staff, and faculty attended these sessions. Co-chairs led discussion groups in their respective group topics, and used this feedback to adjust their recommendations.

Additionally, an online feedback form was made available on the BU Sustainability website from October 23 through December 6, 2019. We received feedback from over 400 BU community members through this survey. Responses were considered for incorporation into the working group recommendations. Below is a breakdown of the demographics of respondents.

Any ideas collected from the community during these outreach efforts that were not included in this iteration of the Zero Waste Plan will be saved for future consideration in our journey towards a Zero Waste BU.

## Online Feedback Form Response Demographic

Identification	# of Respondents	Percentage of Total Respondents
Student	219	54%
Staff	103	26%
Faculty	47	12%
Combo of Student/Staff/Faculty	30	7%
Other	4	1%

# Appendix C — Diversion Analysis

To estimate the diversion potential of each strategy in the plan, a “capture rate” by material type was determined. For example, reducing deliveries was estimated to eliminate 10% of cardboard from the trash. This would result in an additional 28 tons of material diverted from disposal annually. The capture rate estimates were based on results from similar programs or best estimates. It is possible that the implementation of this program will result in much higher capture rates. However, conservative assumptions were used for these calculations. The University will be able to refine this analysis once it has fully implemented each program.

These waste prevention, recycling, and composting activities will also reduce greenhouse gas emissions. Using the US EPA Waste Reduction Model (WARM), the Zero Waste initiatives to be undertaken by the University are estimated to reduce greenhouse gas emissions by approximately 4,500 metric tons of carbon dioxide equivalent, or about 4% of the emissions currently tracked by the University. This will contribute to the University’s greenhouse gas emissions reduction goal of carbon neutrality by 2040.

A sample calculation is included in this appendix.

Material	Percentage	Tons	Reduce Deliveries		
			Capture Rate	Tons	MTC2e Reduced
Cardboard	4.86%	284	10%	28	97.98
White Ledger Paper	3.96%	231		-	-
Mixed Paper	7.43%	434		-	-
Food-soiled paper - containers	2.08%	122		-	-
Food-soiled paper - other	3.74%	219		-	-
Single-use coffee cups (non-compostable)	1.42%	83		-	-
Non-recoverable/Composite paper	2.05%	120		-	-
#1 and #2 - single use food service items	1.57%	92		-	-
#1 and #2 - other bottles & containers	1.01%	59		-	-
#3-7 - foodservice containers	1.53%	89		-	-
#3-7 - other containers	1.28%	75		-	-
Compostable Plastics	0.71%	41		-	-
Pipette tip trays	0.13%	8		-	-
Recoverable plastic film	0.97%	57	10%	6	8.95
Expanded Polystyrene (e.g. styrofoam)	0.84%	49	10%	5	7.75
Non-recoverable plastic film	7.09%	414		-	-
Bulky plastic items	0.47%	27		-	-
Other non-recoverable/composite plastics	1.79%	105		-	-
Recyclable metal containers	1.16%	68		-	-
Aluminum foil	0.43%	25		-	-
Other Recyclable Metals	1.67%	98		-	-
Non-recoverable/Composite Metals	0.44%	26		-	-
Recyclable Glass containers	2.73%	160		-	-
Lab glass	0.11%	6		-	-
Non-recoverable/composite glass	0.25%	15		-	-
Recoverable food	12.50%	730		-	-
Non-recoverable food waste	11.11%	649		-	-
Liquid Waste	3.09%	181		-	-
Yard Waste	1.24%	72		-	-
Other Organics	1.09%	64		-	-
CFLs	0.01%	1		-	-
Pharmaceuticals	0.02%	1		-	-
Other Hazardous	0.03%	2		-	-
Chemical cleaners	0.06%	4		-	-
Batteries	0.05%	3		-	-
Ceramics	0.19%	11		-	-
Rubber	0.07%	4		-	-
Clothing/Textiles	1.28%	75		-	-
E-waste	0.54%	32		-	-
C&D	1.02%	60		-	-
Furniture	1.91%	112		-	-
Appliances	0.09%	5		-	-
Other Bulky Items	0.05%	3		-	-
Lab gloves	0.51%	30		-	-
Carpet	0.03%	2		-	-
Bathroom Waste (primarily paper towels)	11.14%	651		-	-
Diapers	0.82%	48		-	-
Other Residuals	3.43%	200		-	-
<b>Total</b>	<b>100%</b>	<b>5844</b>		<b>39</b>	<b>115</b>
<b>Total Generation</b>		<b>10041</b>		<b>0.4%</b>	<b>115</b>

Source for composition: Stanford University September 2019

# Appendix D — TRUE Zero Waste Analysis

The Total Resource Use and Efficiency (TRUE) Zero Waste certification system helps facilities quantify their performance and find additional ways to improve their progress toward Zero Waste. Certification is available for any physical facility and its operations, including buildings owned by: businesses, property managers, schools, government agencies, and nonprofits. Facilities achieve certification by meeting seven minimum program requirements and attaining at least 31 points. In tandem with implementing the recommended initiatives that improve the University's overall resource management system and drive a paradigm shift within the community, the University should identify and certify pilot buildings for TRUE Certification.

## TRUE CREDITS IN THE BU ZERO WASTE PLAN

The TRUE Zero Waste Rating System is detailed on the Green Business Certification Inc. website.<sup>18</sup> In this report, potential TRUE credits refer to credits that could be achieved once specific actions in the initiatives are completed that count toward the TRUE Zero Waste Rating System. Individual initiatives have the potential of achieving more than one TRUE credit, as the initiatives include multiple actions. An individual TRUE credit may be justified by multiple initiatives; however TRUE credits will not be awarded multiple times. Where multiple credits are noted, this does not mean that those credits would be awarded multiple times for different initiatives. Instead, multiple initiatives would be used to justify being approved for a particular TRUE credit.

To get a particular building certified, the building must achieve 90% diversion and at least 31 of 81 credits. Only 5 of the 81 TRUE credits are for diversion of 90% or more. The rest of the TRUE credits are designed to help develop a Zero Waste, Closed Circle Economy.

## ADMINISTERING AT BU

Assign BU Sustainability the responsibility for getting University-wide policies and programs developed to meet TRUE credits other than diversion. Prioritize by building types. Through performance evaluations, require building managers to meet targets for diversion incrementally higher every year until 90% is achieved. Incentives will need to be provided to drive action and accountability, such as providing a bonus when they achieve 90%. Start with getting TRUE certification for building types that are most under University control (e.g., classrooms and offices). Get two to three buildings actually certified by TRUE to objectively ensure that BU is meeting the GBCI standards.

## POTENTIAL TRUE ZERO WASTE CREDITS IDENTIFIED IN PLAN

This is a summary of the 63 TRUE Zero Waste credits mentioned as possible to achieve for each of the Zero Waste Initiatives detailed in the Zero Waste Plan.

- 1. Closed Loop Credit 1:** Require a minimum of 30% post-consumer recycled content for office paper
- 2. Closed Loop Credit 2:** Require a minimum of 20% post-consumer recycled content for janitorial paper products
- 3. Closed Loop Credit 3:** Purchase compost from a local source
- 4. Compost Credit 1:** Collect compostables separately from other materials
- 5. Compost Credit 2:** Compost, digest, or reuse yard trimmings
- 6. Compost Credit 3:** Compost food scraps and/or soiled paper on-site
- 7. Compost Credit 4:** Compost food scraps and/or soiled paper off-site
- 8. Compost Credit 5:** Utilize/reuse compost or mulch on-site
- 9. Compost Credit 7:** Use compost from site for on-site food production

<sup>18</sup> [true.gbci.org/resources](https://true.gbci.org/resources)

- 10. Diversion from landfill, incineration (WTE), and environment Credit 1.1:**  
Diversion is 90.1–94.9%
- 11. Hazardous Waste Prevention Credit 3:**  
Reuse or recycle universal waste
- 12. Hazardous Waste Prevention Credit 4:**  
Reduce the use of hazardous chemicals/ materials
- 13. Hazardous Waste Prevention Credit 5:**  
Collect universal wastes from employees and/or customers
- 14. Leadership Credit 1:** Adopt Zero Waste goal at upper management level
- 15. Leadership Credit 2:** Review monthly diversion activities with upper management
- 16. Leadership Credit 3:** Encourage and incentivize employee participation
- 17. Leadership Credit 4:** Take responsibility for BU products and packaging
- 18. Leadership Credit 5:** Require vendors to take responsibility for products and packaging
- 19. Leadership Credit 6:** Promote Zero Waste in the community utilizing upper management personnel
- 20. Recycle Credit 1:** Meet highest and best use for 80% of materials by weight
- 21. Recycle Credit 1.2:** Meet highest and best use for 100% of materials by weight
- 22. Recycle Credit 2:** Determine end markets for recycled commodities
- 23. Redesign Credit 1:** Right size collection containers and service levels
- 24. Redesign Credit 2:** Restructure solid waste collection agreements for Zero Waste
- 25. Redesign Credit 3:** Review all 9 points of generation
- 26. Redesign Credit 4:** Complete review of supply chain
- 27. Reduce Credit 1:** Document materials reduced by commodity
- 28. Reduce Credit 2:** Implement tracking programs to eliminate waste before it occurs
- 29. Reduce Credit 3:** Adopt a goal to reduce the overall size/amount of product packaging
- 30. Reduce Credit 4:** Go paperless for at least one major office function
- 31. Reduce Credit 5:** Duplex printing default setting
- 32. Reduce Credit 6:** Grasscycling standard practice
- 33. Reduce Credit 7:** Native landscaping, xeriscaping
- 34. Reuse Credit 1:** Develop systems that emphasize reuse
- 35. Reuse Credit 3:** Implement reusable transport containers
- 36. Reuse Credit 4:** Establish program to reuse office supplies and materials
- 37. Reuse Credit 5:** Use reusable/durable food serviceware
- 38. Reuse Credit 6:** Donate all food safe for human consumption
- 39. Training Credit 1:** Provide Zero Waste goal/policy to all employees
- 40. Training Credit 2:** Incorporate Zero Waste into employee orientation
- 41. Training Credit 3:** Communicate with employees about Zero Waste activities quarterly
- 42. Training Credit 4:** Clearly label all collection receptacles
- 43. Training Credit 5:** Train purchasing agents
- 44. Training Credit 6:** Include Zero Waste in evaluation process and/or bonus structure
- 45. Training Credit 7:** Dedicate at least one person for Zero Waste leadership role
- 46. Training Credit 8:** Provide all employees access to Zero Waste training
- 47. Upstream Management Credit 1:** Work with vendors to eliminate non-recyclable packaging
- 48. Upstream Management Credit 2:** Give preference to vendors who embrace Zero Waste goals
- 49. Upstream Management Credit 3:**  
Request vendors to use 100% recyclable packaging
- 50. Zero Waste Analysis Credit 1:** Conduct annual physical waste audit
- 51. Zero Waste Analysis Credit 2:** Analyze results of annual waste audit and implement recommendations
- 52. Zero Waste Analysis Credit 3:** Complete annual physical audit of recyclables
- 53. Zero Waste Analysis Credit 5:** Engage employees in waste audit and/or analysis

- 54. Zero Waste Purchasing Credit 1:** Adopt an Environmentally Preferred Purchasing (EPP) guideline or policy
- 55. Zero Waste Purchasing Credit 2:** Include preference for durable goods in EPP policy or guideline
- 56. Zero Waste Purchasing Credit 3:** Give preference to sustainably produced paper and wood products
- 57. Zero Waste Purchasing Credit 4:** Identify EPP items in purchasing catalogs
- 58. Zero Waste Purchasing Credit 6:** Give preference to used, refurbished, and/or remanufactured goods
- 59. Zero Waste Purchasing Credit 2:** Include preference for durable goods in EPP policy or guideline
- 60. Zero Waste Purchasing Credit 4:** Identify EPP items in purchasing catalogs
- 61. Zero Waste Purchasing Credit 6:** Give preference to used, refurbished, and/or remanufactured goods
- 62. Zero Waste Reporting Credit 1:** Document diversion by commodity or waste
- 63. Zero Waste Reporting Credit 2:** Track financial data for diversion and waste disposal

## ADDITIONAL TRUE CREDITS that could be added to Plan and Working Group Recommendations

The following eight TRUE Zero Waste credits were NOT identified by working groups and could be included in a future iteration of the Zero Waste Plan. They are categorized by “easier” or “harder” to achieve based on an understanding of what is required to achieve those credits, and where BU policies, programs, and infrastructure stand today.

### Easier to achieve

- 1. Innovation Credit 2:** Commit to reduce total discards annually
- 2. Innovation Credit 3:** Implement innovative waste reduction activity
- 3. Innovation Credit 1:** Participate in upcycling programs

### Harder to achieve

- 1. Closed Loop Credit 4:** Ensure material remains in local markets and comes back on site
- 2. Zero Waste Purchasing Credit 5:** Track purchase of environmentally preferred products
- 3. Zero Waste Analysis Credit 4:** Add rejected recyclables back into waste stream documentation
- 4. Upstream Management Credit 4:** Request vendors to redesign products for reuse and recycling
- 5. Reuse Credit 7:** Participate in an animal feed program for inedible food