School of Engineering and Applied Science

SUSTAINABILITY ANNUAL REPORT

2022-2023

Penn Sustainability

CONTENTS

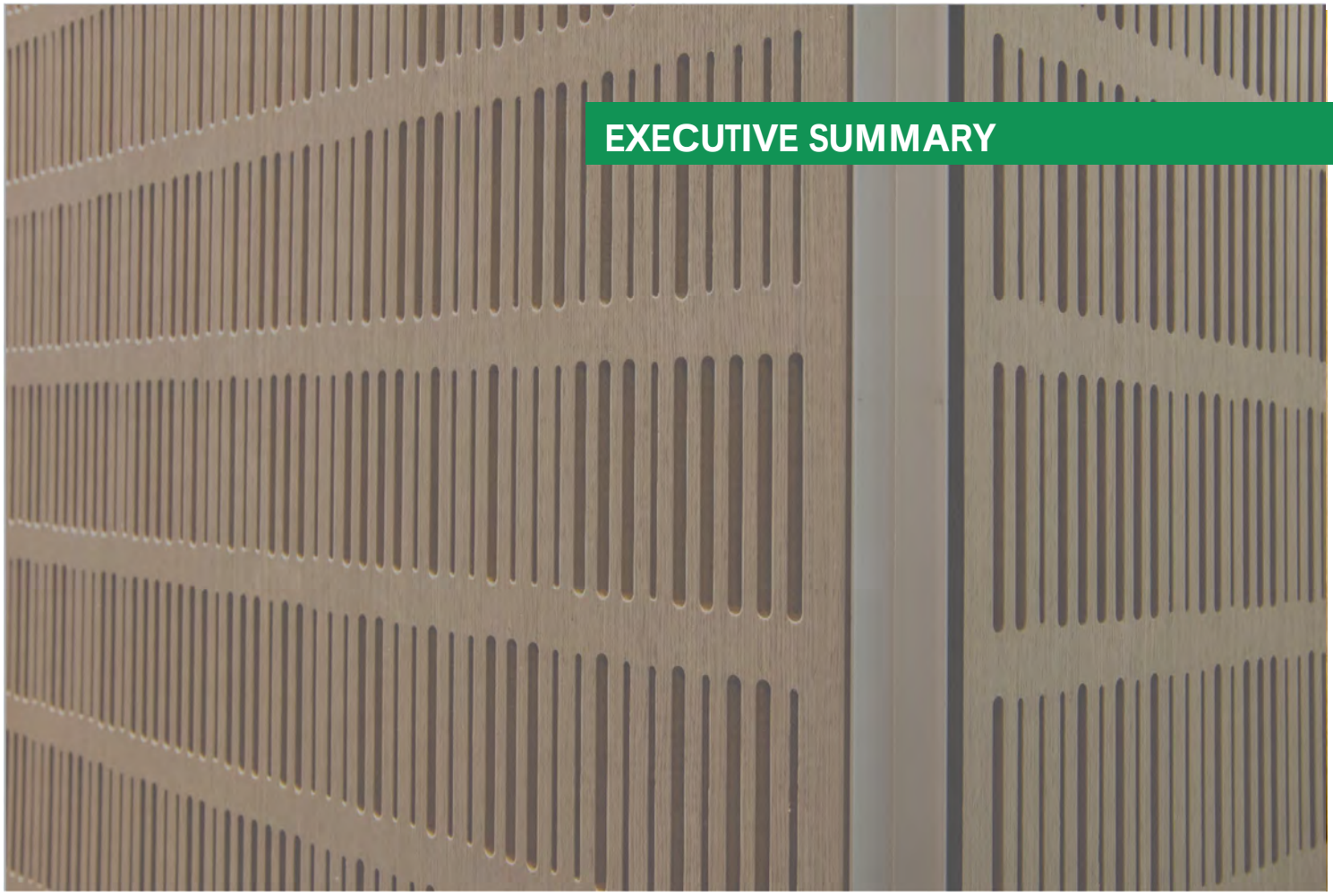
EXECUTIVE SUMMARY

The University of Pennsylvania has committed to the goal of achieving 100% carbon neutrality by 2042, a goal we call 100 x 42. Penn's Climate and Sustainability Action Plan 3.0 represents a vision for our university's environmental future.

Penn's remarkable transformation into one of the world's premier teaching and research institutions has been fueled by enormous growth in capabilities, means, and influence. The implementation of President Amy Gutmann's Penn Compact puts the University in a strong position to address the environmental challenges ahead. Penn will continue to lead through inclusive climate change scholarship, innovative policy formation, and adoption of best practices to dramatically impact campus efficiency and reduce emissions. Through deliberate assessment, analysis, and planning. Penn is taking action to mitigate climate impacts, adapt to emerging environmental conditions, and prepare our university—and our students—to lead in a rapidly evolving world. The CSAP 3.0 recommends goals to:

- Expand the scope of sustainability research in Penn's academic centers, and connect students to Penn's abundant resources in this field;
- Continue to reduce carbon emissions and explore expanded use of renewable energy to mitigate the impacts of climate change;
- Embrace circular economy principles to reduce waste and single-use products;
- Make sustainable choices in transportation, purchasing, and business operations; and Inform, educate, and empower the Penn community to participate in Penn's climate change and sustainability goals.

Penn's CSAP 3.0 goals will test the ingenuity of the campus community as we continue to reduce our ecological footprint while prioritizing environmental health and resiliency. The focus is on Penn's 100x42 carbon neutrality pledge—an ambition worthy of Penn's commitment, and feasible given the University's resources and expertise. CSAP 3.0 will translate Penn's ambitions into action and our shared values into accomplishments.

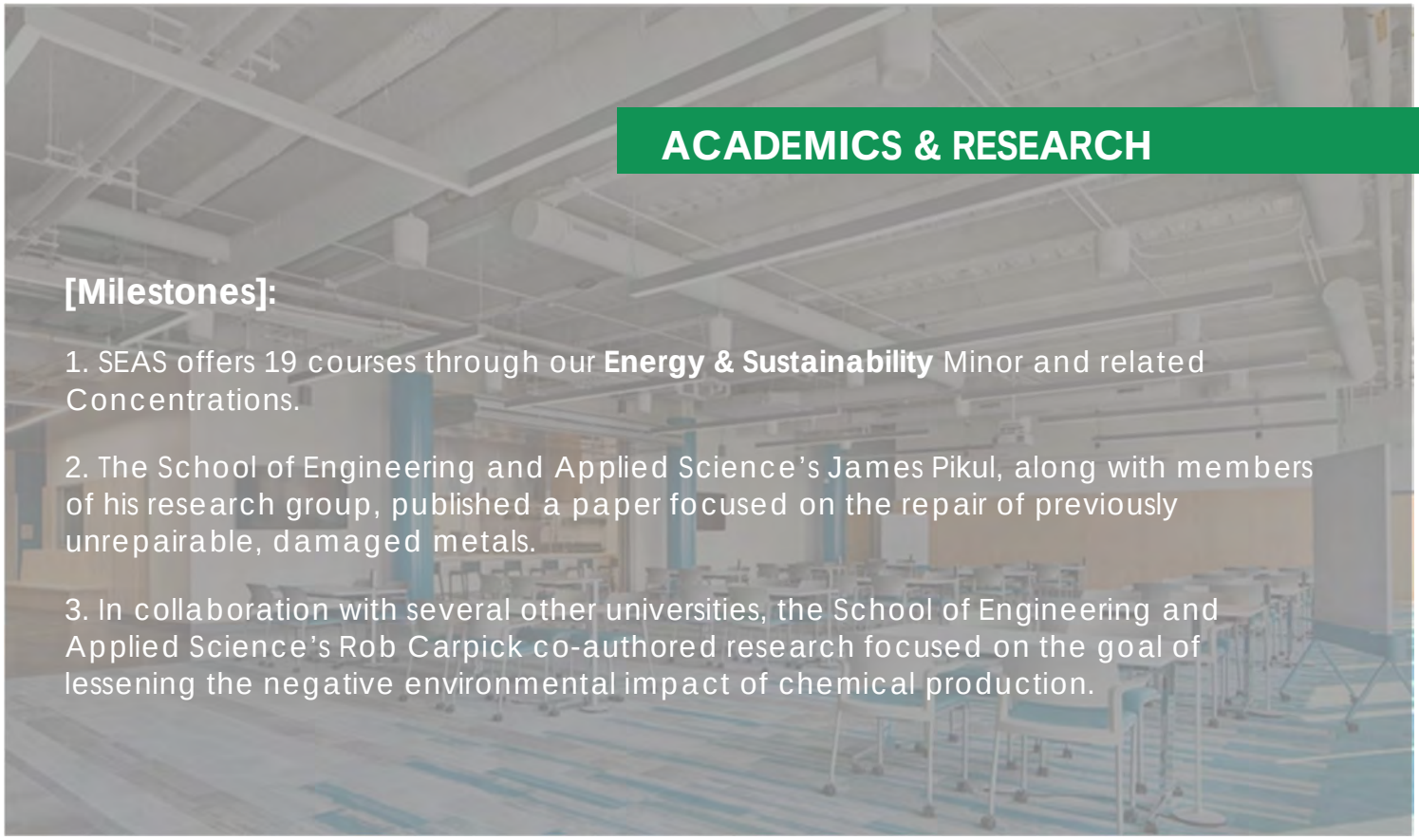


EXECUTIVE SUMMARY

Regarding sustainable practices, the School of Engineering and Applied Sciences is a well-positioned community to innovate and implement positive change.

Our academics and research exemplify the sustainably driven efforts of faculty, students, and alumni. We build and operate with intention, renovating and erecting buildings designed around green guidelines, maintaining them, and replacing inefficient parts and pieces as needed. Recycling is paramount; whenever possible, the products and materials procured by our school require recycled content in manufacturing while any waste removed from our buildings is sent to a recycling facility. For over a decade, the SEAS Green Team has engaged with the Engineering community and others to encourage sustainable initiatives and sponsor events including Climate Week, talks, Earth Week, electronic recycling and more.

SEAS sustainable accomplishments throughout the 2022-2023 year illustrate our unwavering support of the Climate Action Plan 3.0 and our dedication to a greener future.



ACADEMICS & RESEARCH

[Milestones]:

1. SEAS offers 19 courses through our **Energy & Sustainability** Minor and related Concentrations.

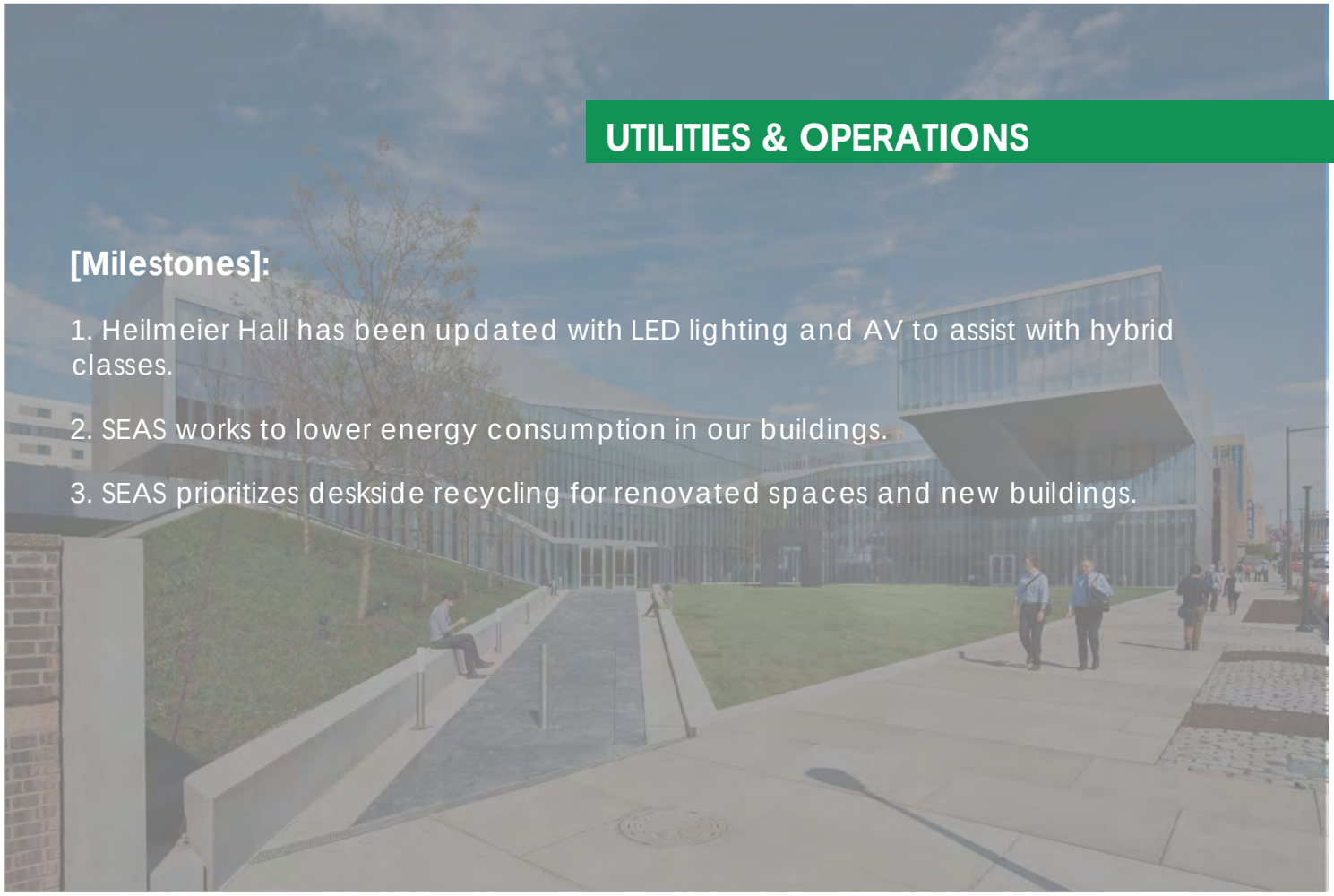
2. The School of Engineering and Applied Science's James Pikul, along with members of his research group, published a paper focused on the repair of previously unrepairable, damaged metals.

3. In collaboration with several other universities, the School of Engineering and Applied Science's Rob Carpick co-authored research focused on the goal of lessening the negative environmental impact of chemical production.

Milestone 1. **SEAS offers an Energy & Sustainability Minor, while the departments of MSE (Material Science and Engineering) and CBE (Chemical and Biomolecular Engineering) offer Concentrations focused on energy and the environment. Combined, they offer a total of 19 courses with an enrollment of 957 students this year.**

Milestone 2. **The collection and preparation of metals used in construction and more account for approximately 3 billion tons of CO2-equivilant emissions. These materials are recyclable but will often experience unrepairable damage that shortens the life of a product. Exploring restoration techniques outside brazing and welding, Pikul presents "electrochemical healing" to repair various fractured metals, including 3D printed structures and subjects of two or more metals.**

Milestone 3. **Currently, 40% of the energy consumed in manufacturing is used to produce chemicals. In addition, this process produces hazardous solvent waste that harms the health and environment of both humans and animals. Carpick, along with a doctoral and former postdoctoral student, coauthored research in collaboration with other universities to develop a technique that uses organic chemistry and nanotechnology to push molecules together, creating chemicals without the use of costly solvents that pollute the environment.**



UTILITIES & OPERATIONS

[Milestones]:

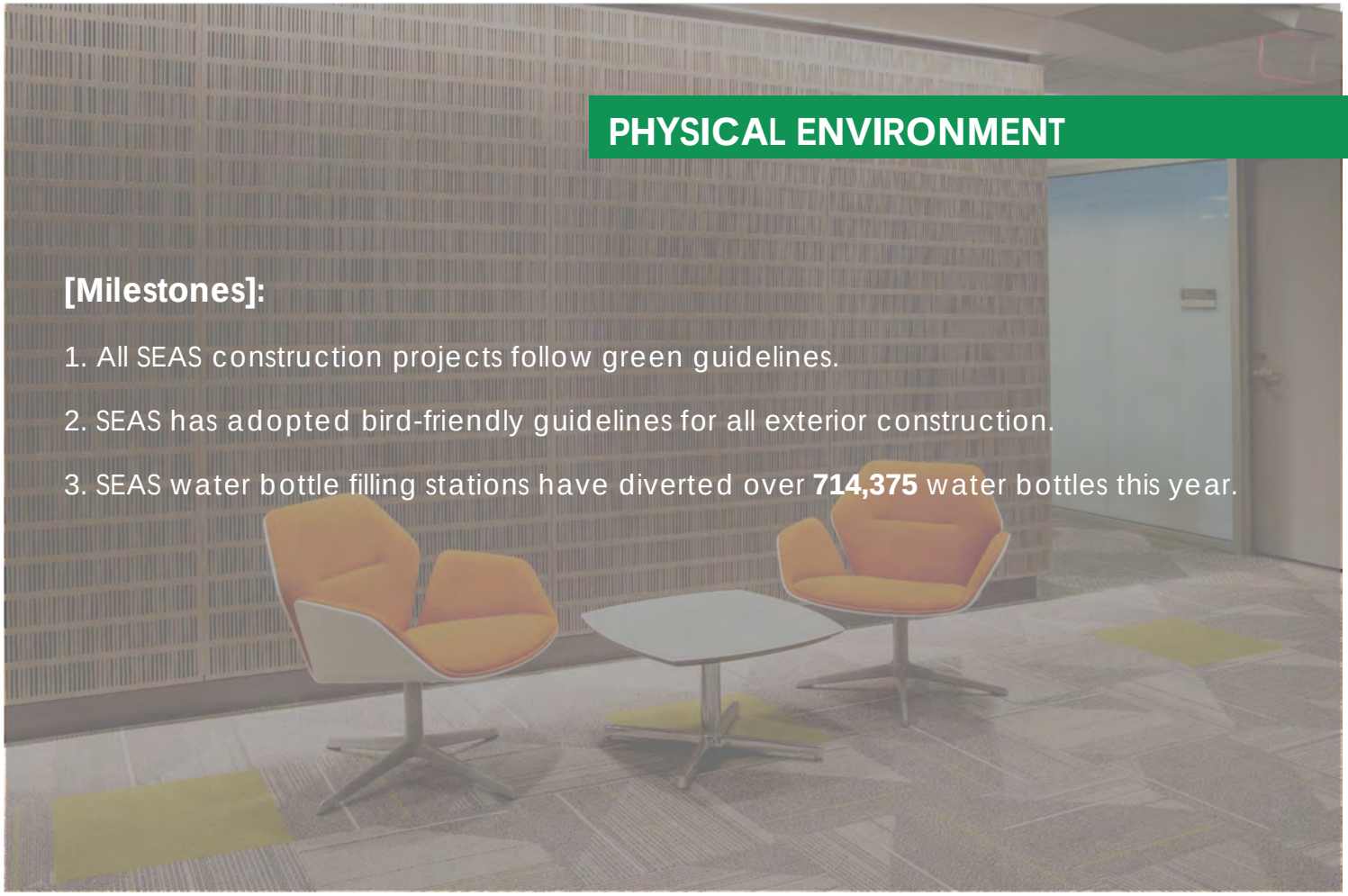
1. Heilmeier Hall has been updated with LED lighting and AV to assist with hybrid classes.

2. SEAS works to lower energy consumption in our buildings.

3. SEAS prioritizes deskside recycling for renovated spaces and new buildings.

The school of Engineering has implemented the following practices in support of the Climate Action Plan 3.0

Milestone 1.	**The renovation of Heilmeier Hall inside the Towne Building has been completed. Outdated light fixtures and AV equipment have been replaced with more sustainable LED fixtures and equipment better suited to facilitate hybrid classes as well as in-person presentations.**
Milestone 2.	**Penn Engineering maximizes opportunities for facilities renewal to reduce our carbon footprint. We continuously prioritize replacing our buildings' HVAC infrastructure with components and processes that achieve higher efficiencies.**
Milestone 3.	**For each new renovation or building, SEAS implements deskside recycling bins and centralized trash bins. Since the majority of waste generated at a desk station is recyclable, this practice increases recycling rates.**



PHYSICAL ENVIRONMENT

[Milestones]:

1. All SEAS construction projects follow green guidelines.
2. SEAS has adopted bird-friendly guidelines for all exterior construction.
3. SEAS water bottle filling stations have diverted over **714,375** water bottles this year.

The school of Engineering has implemented the following practices in support of the Climate Action Plan 3.0

Milestone 1.	**SEAS helped to develop green guidelines for all projects that don't meet LEED requirements. These green guidelines are used for all SEAS renovation and new construction projects.**
Milestone 2.	**SEAS has adopted bird friendly guidelines for all exterior renovations. These guidelines impact the design of both renovations and new construction to minimize the number of window bird strikes and reduce harm to aviary life on campus.**
Milestone 3.	**SEAS requires the installation of water bottle filling stations in the renovation or new construction of buildings when replacing or addressing traditional water fountains. There are now a total of 14 water bottle filling stations installed throughout Engineering buildings.**

WASTE MINIMIZATION & RECYCLING

[Milestones]:

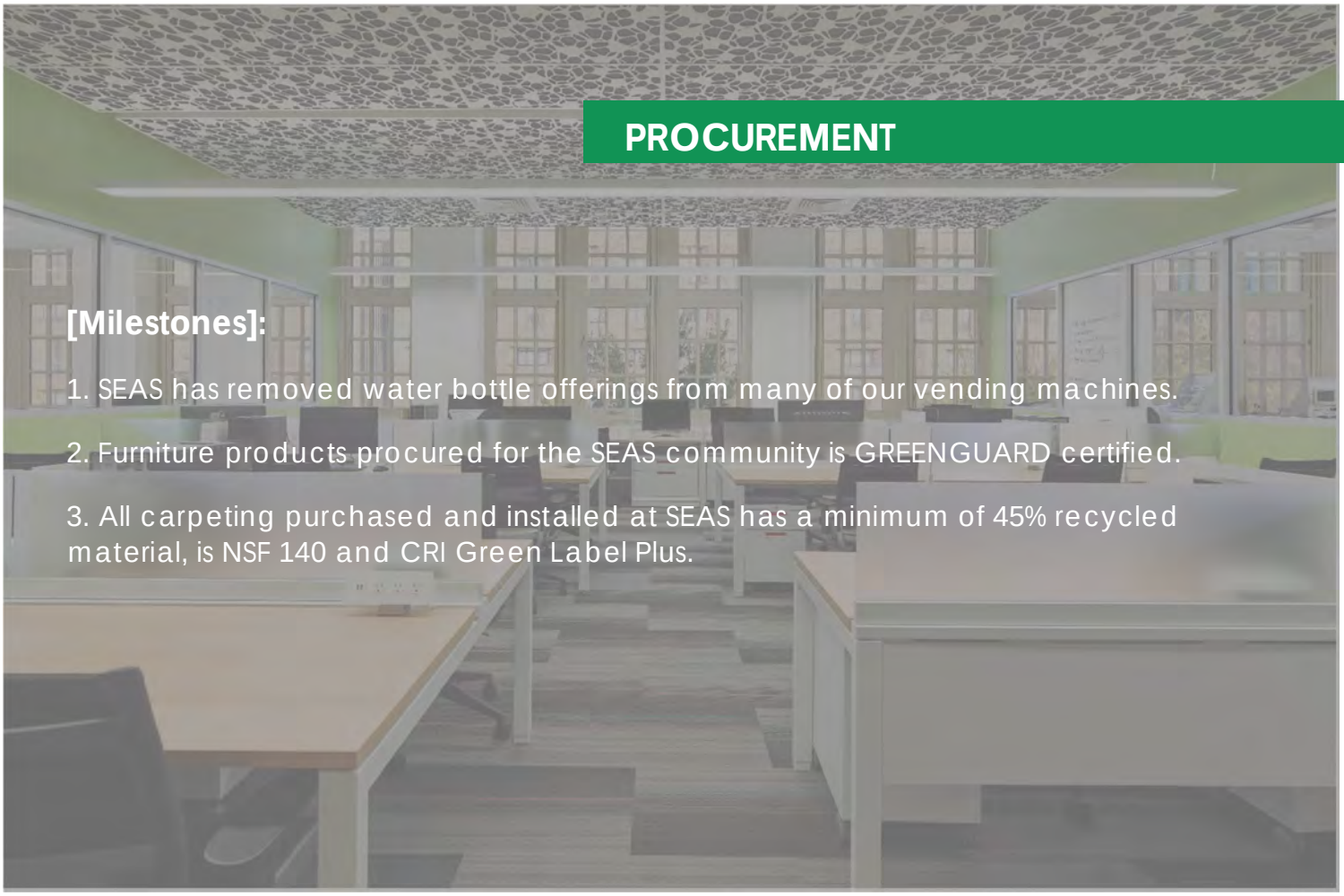
1. The SEAS Recycling Center recycled over **11.6 tons** of electronics, lightbulbs, Styrofoam, cardboard and more.

2. Approximately **18.75 tons of furniture was reused** within the SEAS community instead of being trashed or sent to a recycling facility **saving nearly $248,000** in new furniture costs.

3. SEAS has recycled over **8.3 tons** of small renovation trash and furniture.

The school of Engineering has implemented the following practices in support of the Climate Action Plan 3.0

Milestone 1.	**Each year the SEAS Recycling Center diverts several tons of electronics, lightbulbs, Styrofoam, cardboard and more from landfills by recycling them through EForce.**
Milestone 2.	**SEAS prioritizes furniture reuse programs. Prior to furniture being recycled, we check to see if a use can be found between current furniture projects and/or existing spaces where end users may have a need.**
Milestone 3.	**Whether SEAS is completing a larger construction renovation or a small furniture update, whatever can't be salvaged is sent to Revolution Recovery to be recycled. This diverts several tons of waste from landfills each year.**



PROCUREMENT

[Milestones]:

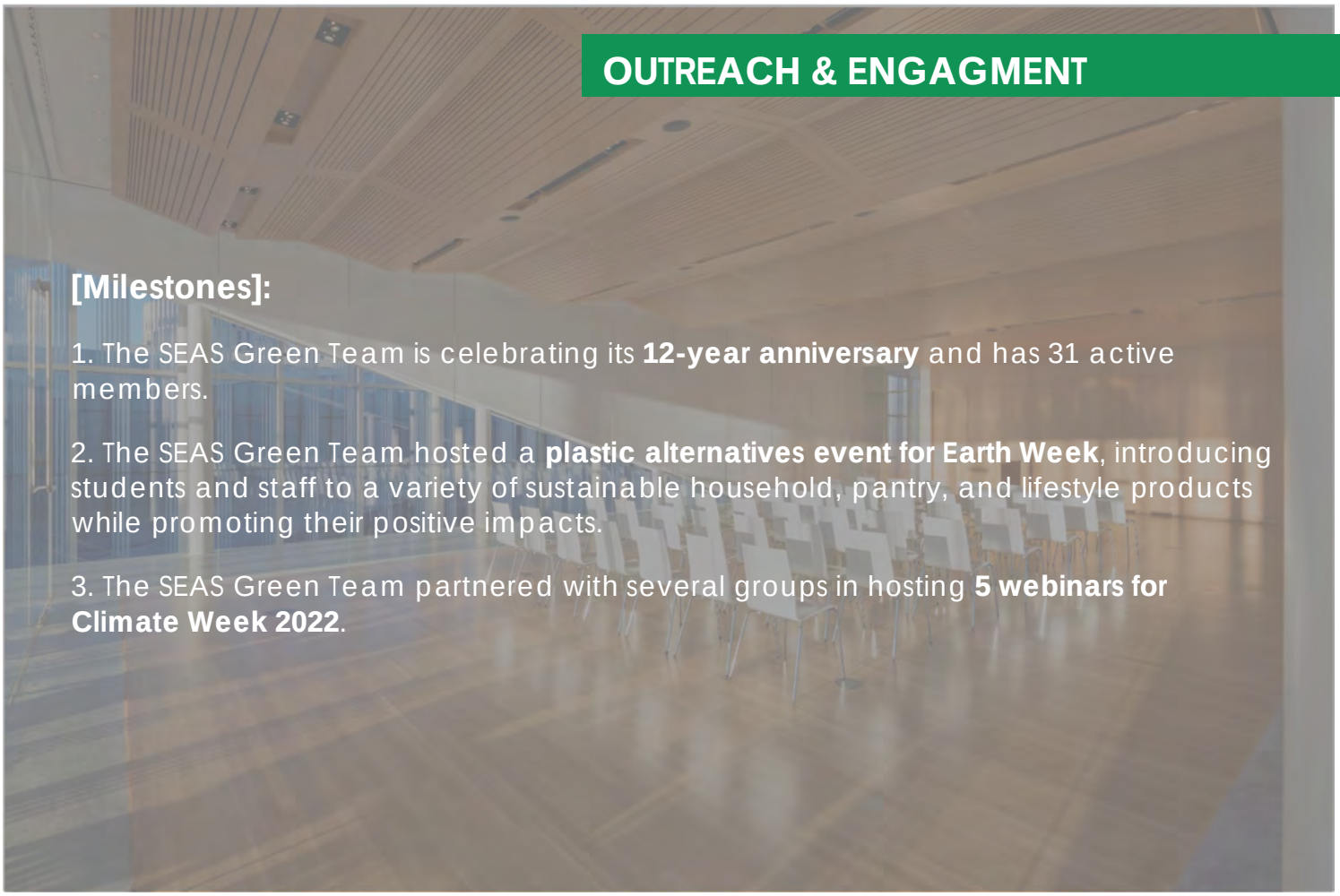
1. SEAS has removed water bottle offerings from many of our vending machines.

2. Furniture products procured for the SEAS community is GREENGUARD certified.

3. All carpeting purchased and installed at SEAS has a minimum of 45% recycled material, is NSF 140 and CRI Green Label Plus.

The school of Engineering has implemented the following practices in support of the Climate Action Plan 3.0

Milestone 1.	**SEAS works to become a plastic bottle free community. Water bottles have been removed from many of our vending machines and the Towne building café. Most SEAS offices also have water filtration systems in place of water delivery services.**
Milestone 2.	**SEAS has standardized on GREENGUARD certified furniture, ensuring a sustainability story behind all furniture purchases.**
Milestone 3.	**All carpeting purchased for new buildings or the renovations of existing buildings at SEAS has a minimum of 45% recycled material, is NSF 140 and CRI Green Label Plus.**



OUTREACH & ENGAGMENT

[Milestones]:

1. The SEAS Green Team is celebrating its **12-year anniversary** and has 31 active members.

2. The SEAS Green Team hosted a **plastic alternatives event for Earth Week**, introducing students and staff to a variety of sustainable household, pantry, and lifestyle products while promoting their positive impacts.

3. The SEAS Green Team partnered with several groups in hosting **5 webinars for Climate Week 2022**.

The school of Engineering has implemented the following practices in support of the Climate Action Plan 3.0

Milestone 1.	**The SEAS Green Team has been active for 10 years! Once a month, the team meets in person and online to discuss sustainable topics and school initiatives. The Green Team hosts and supports sustainably driven events and initiatives throughout the year.**
Milestone 2.	**The SEAS Green Team participates in Earth Week every year. The university-wide initiative presents opportunities for students, faculty, and staff to participate in cross-disciplinary events that educate and inspire action around environmental justice, climate, and nature-based solutions. This year, the Green Team hosted an educational plastic alternatives event that provided students, staff, and faculty with over 15 different plastic alternative products to replace their unsustainable everyday counterparts.**
Milestone 3.	**SEAS is a leading participant in Climate Week, hosting several talks/events each year focused on energy, climate, and sustainability/environmental research conducted at SEAS.**

INDEX