

University of Louisville

**NEW HEALTH SCIENCE, SIMULATION, ACADEMIC,
AND INNOVATION FACILITY**

REBUILD Conference
September 24, 2025



Perkins&Will



Who We Are



Brandy Berry



Tyler Larkin



Paul Graves



Jason East



AGENDA

1

PROJECT OVERVIEW

2

SUSTAINABILITY STRATEGIES

1. Location & Transportation
2. Sustainable Site
3. Water Efficiency
4. Healthy Materials
5. Energy & Atmosphere
6. Indoor Environmental Quality

3

QUESTIONS & DIALOGUE

LEARNING OBJECTIVES

Evaluate how aquifer-based geothermal exchange, heat recovery, and envelope optimization combined to achieve 30% energy savings compared to the LEED 4.1 baseline.

Apply an integrated decision framework that translates institutional sustainability goals into specific, measurable engineering and design choices across multiple building systems.

Analyze the tradeoffs of tighter building envelopes, including how reduced energy demands can offset first costs and support investments in ventilation, filtration, and occupant health.

Identify practical lessons for aligning water conservation, embodied carbon reduction, and material-health targets with real-world budget, modeling, and stakeholder constraints.



A connected ecosystem
for learning, discovery
and care.

Shelby
Campus

Envirome
Institute
HSC Campus

Belknap
Campus

Louisville International
Airport

Newburg

Kentucky

Indiana

Mockingbird Valley

Cherokee Park

Seneca Park

Shawnee Park

64

60

65

71

64

264

7 min

18 min

19 min

264

65

Lynnview

Standiford

Southside

Beechmont

Hazelwood

Cloverleaf

Jacobs

Wyandotte/Oakdale

Taylor Berry

Wilder Park

Fairgrounds

Highland Park

Prestonia

Camp Taylor

Watterson Park

Bashford Manor

Hayfield Dundee

Gardiner Lane

Hawthorne

Bon Air

Avondale Melbourne Heights

Houston Acres

Cambridge

Hikes Point

Meadowview Estates

St. Regis Park

Hurstbourne Acres

Hurstbourne

Jeffersonton

Forest Hills

Hurstbourne

St. Matthews

Louisville

Norwood

Bellemeade

Wildwood

Blue Ridge Ma

Sycam

Wildwood

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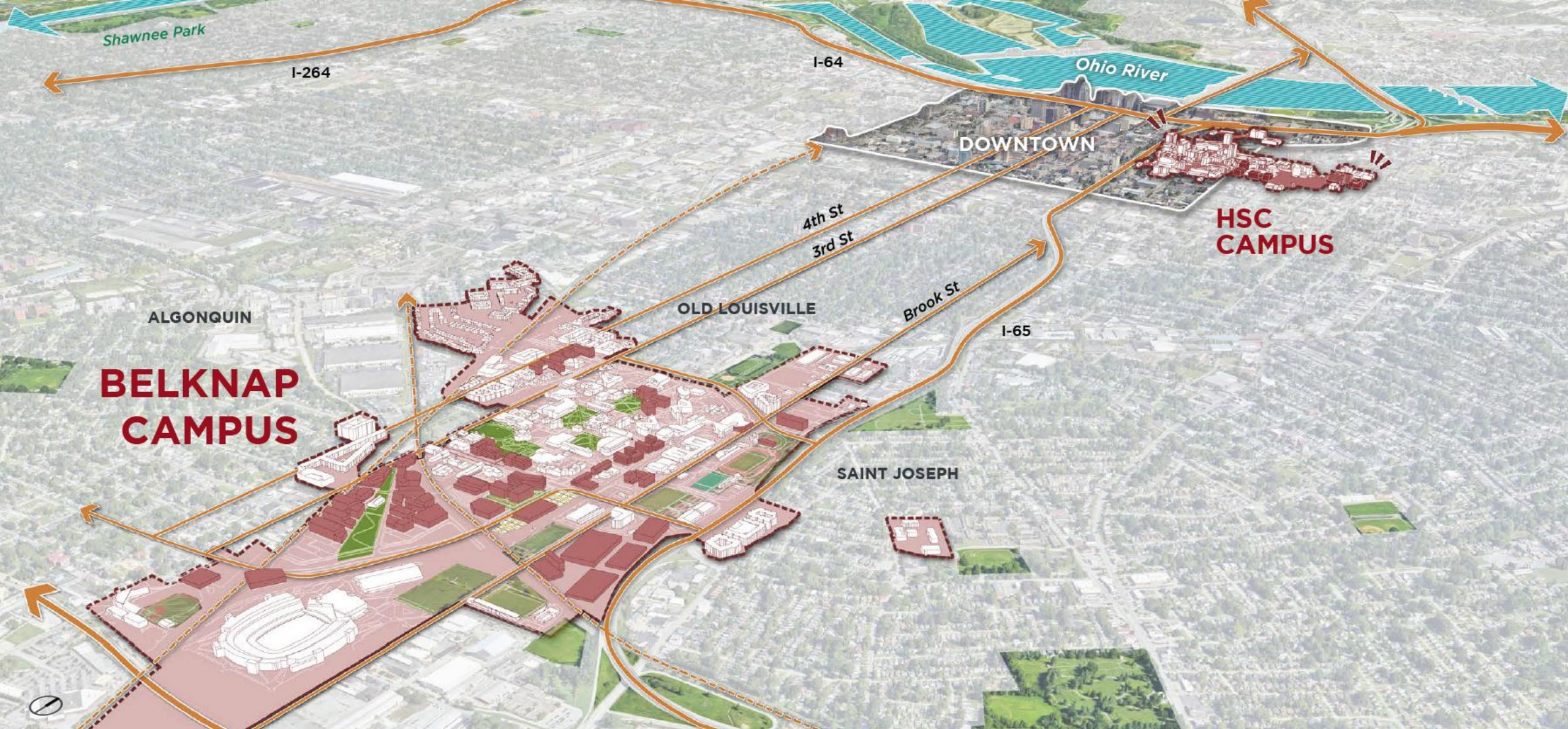
Wildwood

Wildwood

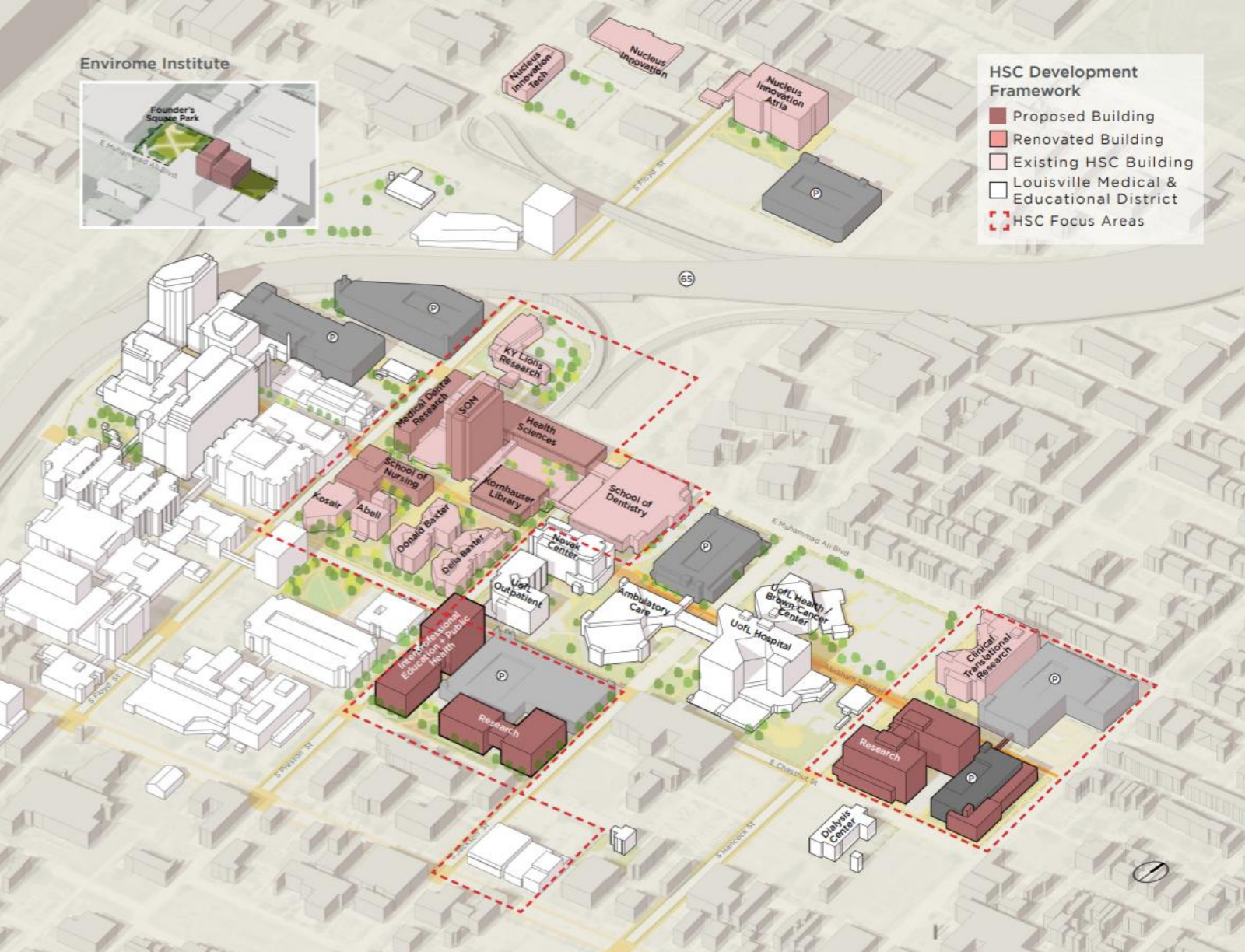
Wildwood

Wildwood

Wildwood



Campus Vision



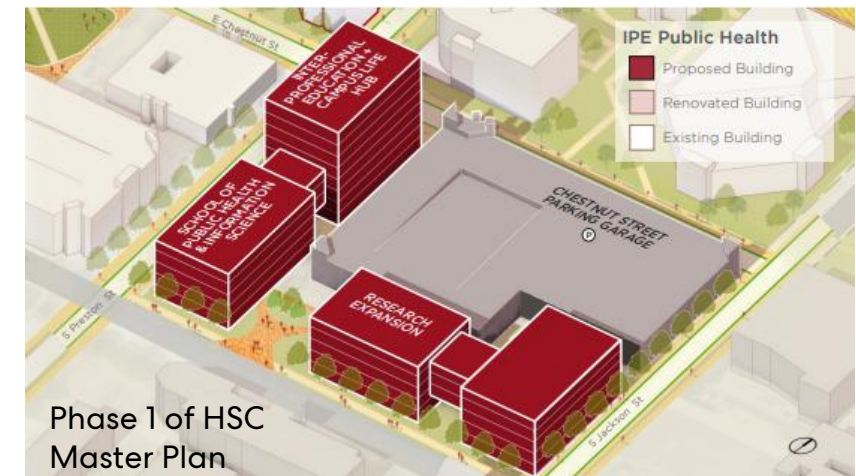
The HSC Campus vision strengthens the academic and research enterprise of the urban medical center by investing in the learning and research environment, improving the campus life experience, and building partnerships. Home to four academic colleges within the LOUMED district, the growth and transformation of HSC will focus on the following:

Expanding and Enhancing Academic and Research Space

Creating a Vibrant Campus Life Experience

Establishing a Distinctive Identity

Strengthening Inter-Campus Connections



Phase 1 of HSC Master Plan

Health Science Campus Vision

FROM LEGACY TO LIVING LAB

A legacy of health. A platform for what comes next.

UofL has repeatedly translated education, research and service into community impact.

9th Oldest

Medical School in the
United States

R1 and OCU

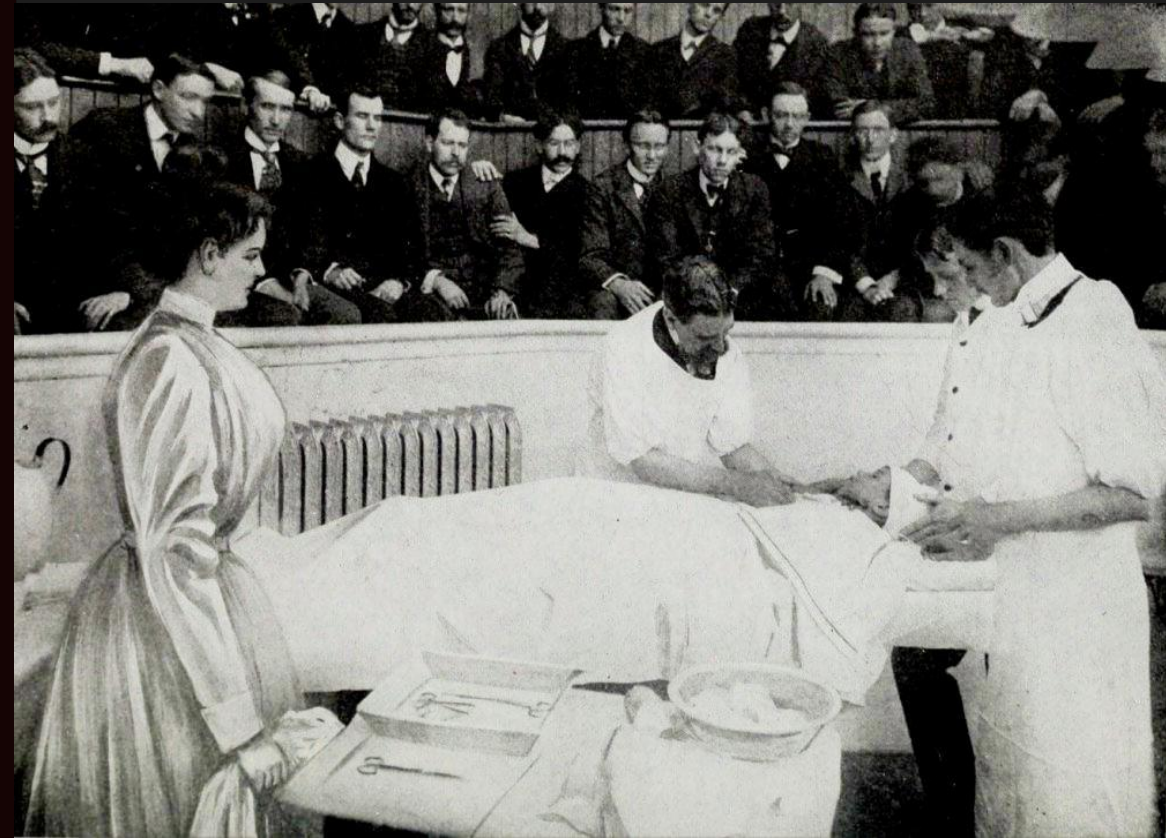
One of only 21 universities to earn both
the Research 1 (R1) and Opportunity
College & University (OCU) Designations

100K+

Annual patient visits through the
School of Dentistry Supporting
Community Care

Top 30%

2026 QS World University
Sustainability Ranking



Project Purpose

The new Health Sciences Building brings four different schools under one roof to create a new cornerstone of academic excellence and research innovation.

The design creates a series of connections and pathways that maximize collaborative learning, social engagement, multi-disciplinary research, and interprofessional practice.

Project Brief

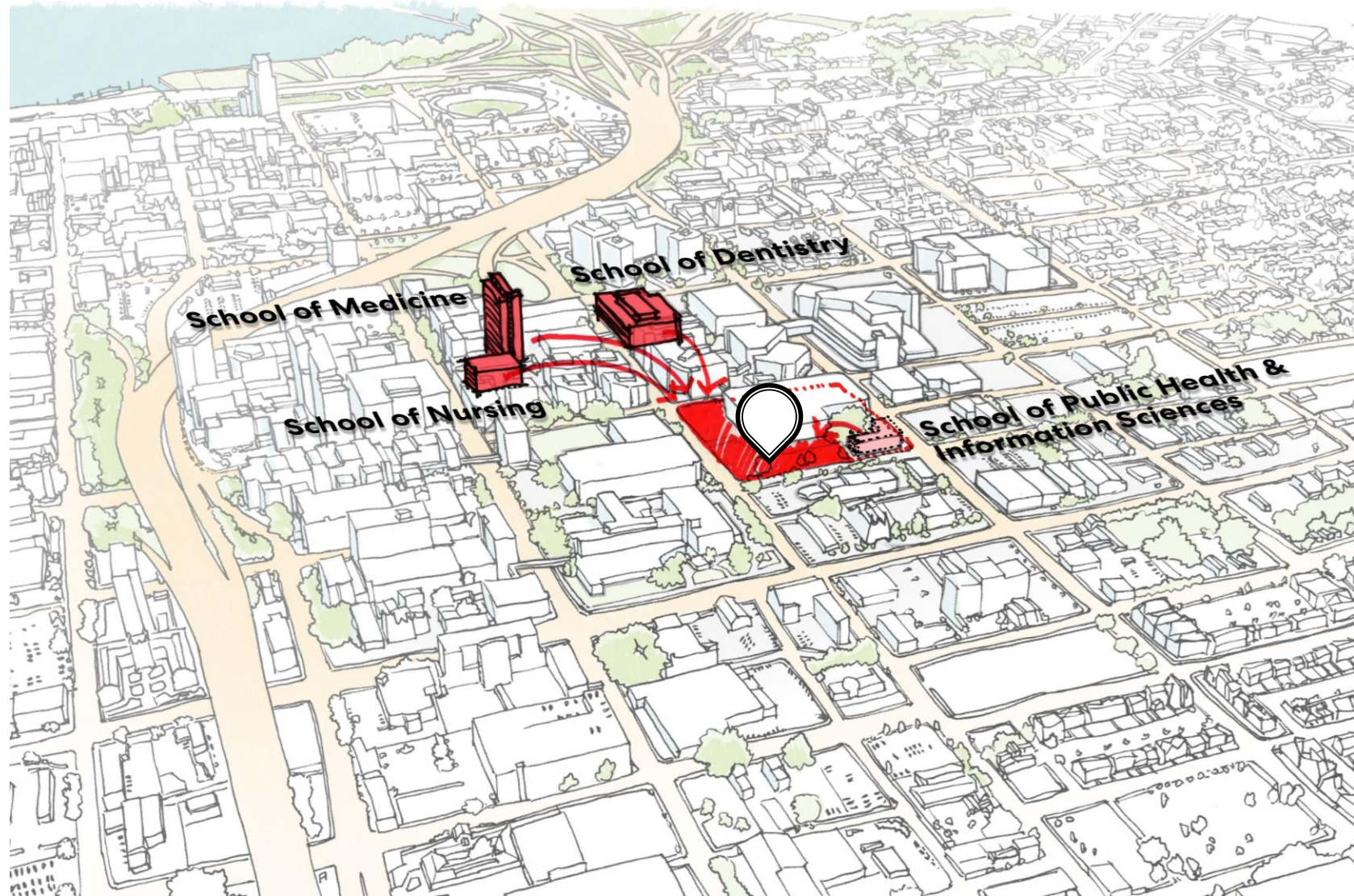
A new 250,000 SF health sciences building with a large simulation center and research lab, as well as providing the campus with much needed food service and indoor/outdoor social spaces with access to nature.

Program to house classrooms, skills training, in-patient/outpatient simulation centers, student social lounges and study spaces, research labs, and academic workplace.

Site located in downtown Louisville within the Louisville Medical & Education District.

Sustainability:

LEED Gold | Net-Zero Ready | Fitwell Principles



A woman with blonde hair in a ponytail is running from left to right. She is wearing a grey long-sleeved shirt, black leggings, and bright pink sneakers. She is running through tall, dry, reddish-brown grass. In the background, there is a grey stone wall and a metal mesh fence above it. The text "Common Mission: HEALTH" is overlaid on the image.

Common Mission: HEALTH

First, do no harm

Project Vision

The new cornerstone for the University of Louisville Health Sciences Center campus will serve as a bridge, creating **pathways for connection**. This shared destination will **blur the lines** between the four existing schools, Belknap campus, and outside partners fostering a collective **sense of belonging and identity rooted in community**.

New opportunities for **collaborative learning, experiential engagement, multi-disciplinary research, and interprofessional practice** will expand the possibilities of the future of health education and research. Cutting-edge spaces will **excite and inspire** dynamic partnerships sparking **innovative research and discovery** to prepare the next generation of care givers to deliver extraordinary care to Kentucky and beyond. **With health as the inspiration, the building and site will serve as a sustainable living laboratory to promote health and wellbeing.**

This building will be a catalyst signaling a new era for HSC – one defined by **unity, diversity, teamwork**, and a passion for educating, driving scientific discovery, and advancing the future of healthcare.

Project Goals

RESILIENT FOUNDATION

Build a strong infrastructure for longevity and future success to support focused energy on education, research, and innovation. Emphasize adaptability and flexibility to easily meet evolving needs.

ICONIC DESTINATION

Create a cornerstone destination for the HSC campus that inspires and energizes all users, instilling pride.

LEADER IN INNOVATION

Position UofL as a leader in innovative, interdisciplinary health education, integrate technology, research, and practical experience to drive change and elevate healthcare's future.

HOLISTIC HEALTH

Create a holistic environment that supports overall well-being, empowering individuals to thrive personally and professionally.

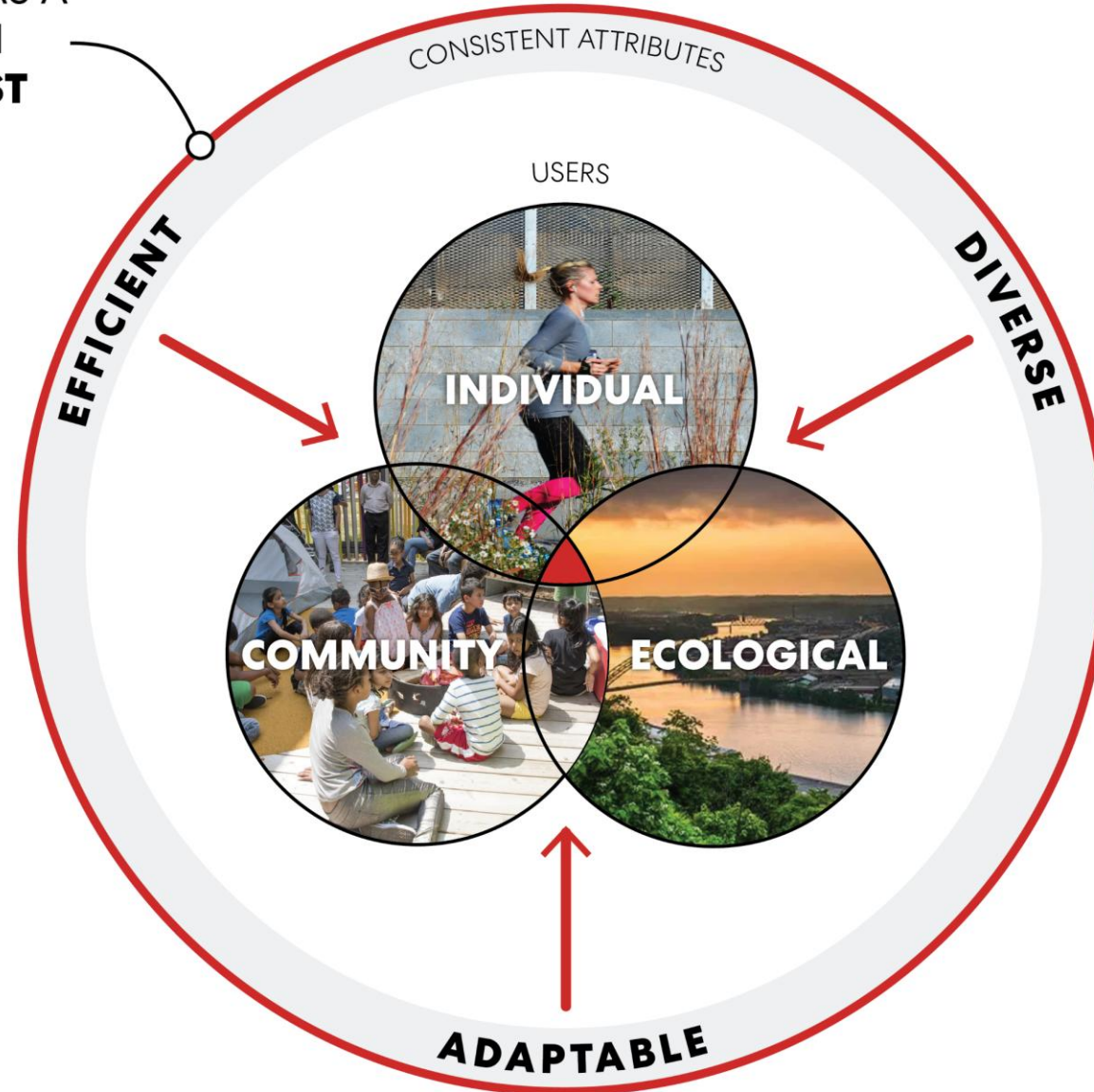
SENSE OF BELONGING

Create an inclusive atmosphere where everyone feels safe, accepted, and empowered. Ensure ease of use and accessibility to support and value all users.

ONE ECOSYSTEM

Empower connections across all four schools and the broader community to elevate interprofessional collaboration and partnership.

BUILDING AS A
**HEALTH
CATALYST**



Building as a Health Catalyst

Individual Health, Community Health, Ecological Health

Design Strategies

Design that encourages movement

Paths that encourage connection to people and nature

Materials that reflect healing

Form that expresses vitality

Spaces that promote learning, reflection, and rest

Architecture

- Open & Visible Stairs
- Strategic program destinations
- Long, open corridors for walking

- Distributed lounges
- Connected outdoor spaces
- Transparency and visual connections through building

- Natural & local materials
- Healthy low VOC materials
- Biophilic design elements

- Dynamic facade
- Vertical emphasis
- Activation of key areas of building and facade

- Acoustic design
- Daylight and circadian rhythms
- Connected classrooms, study, and break spaces

Alignment of UofL's Sustainability Goals



ENERGY & CARBON

Advance the current **AASHE STARS Gold status** toward Platinum. The Campus Plan offers strategies to further this goal.



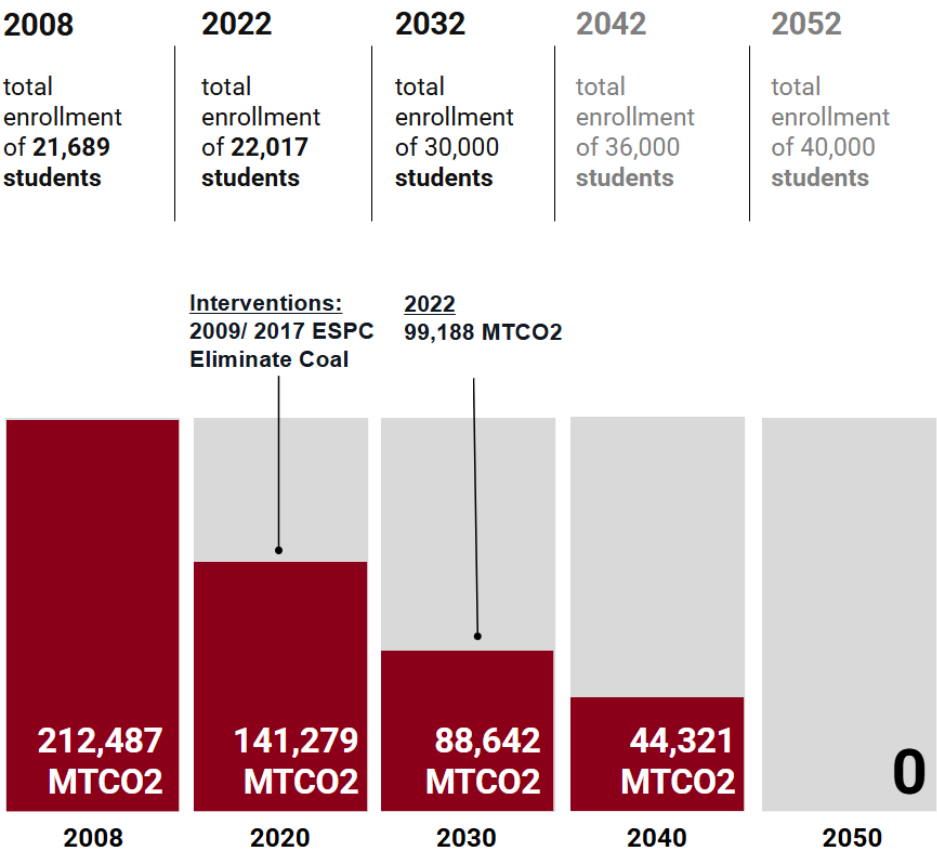
LANDSCAPE & STORMWATER

Provide physical and mental health benefits to the campus community and mitigate environmental impacts such as flooding, urban heat, and air quality.

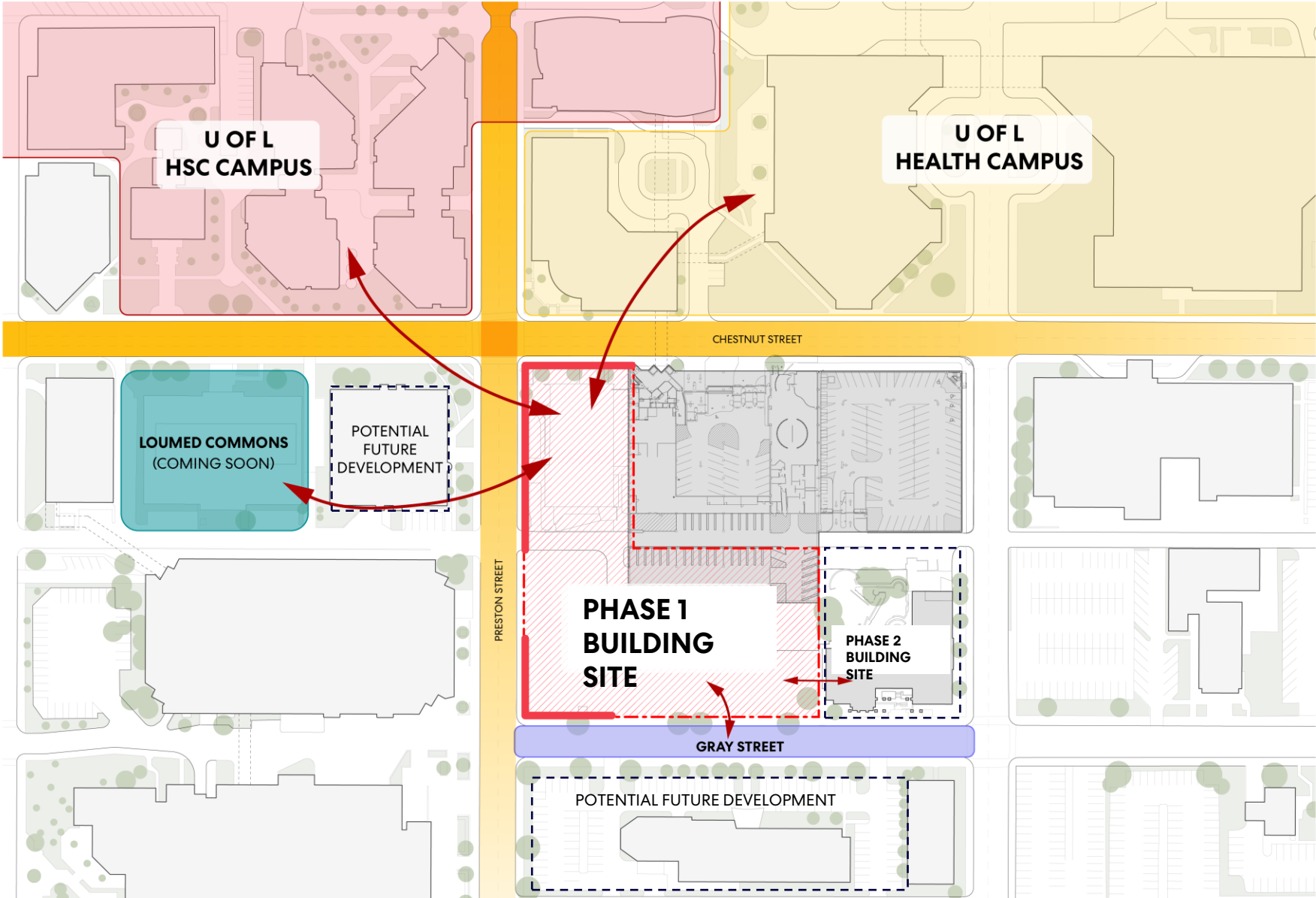


CAMPUS AS A LIVING LAB

Create living laboratories for sustainability across campuses. Making recent sustainability projects visible around campuses will help spread awareness, build support for more sustainability initiatives, and bolster a culture of care for the environment and UofL's impact within in.

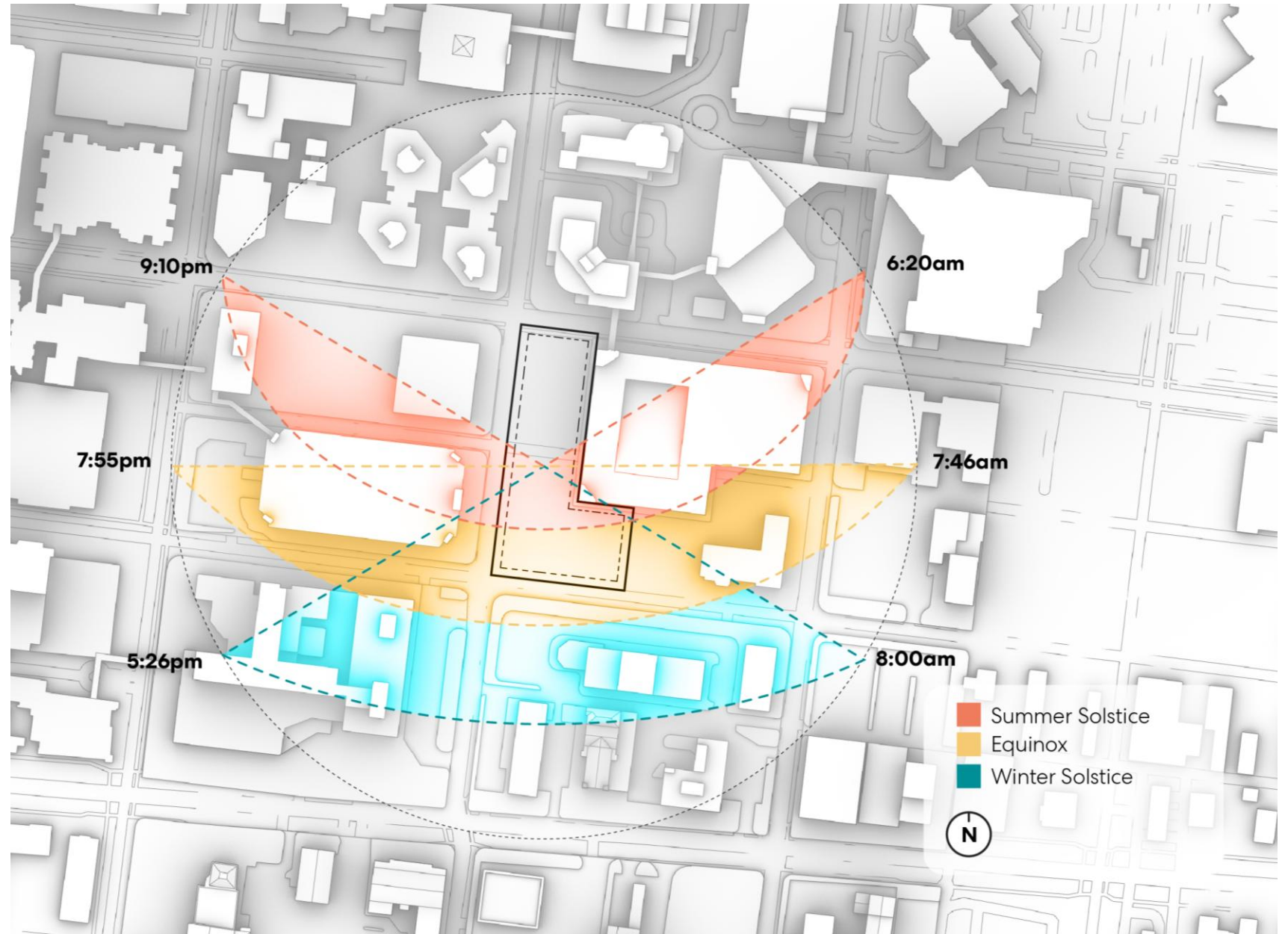


Project Context

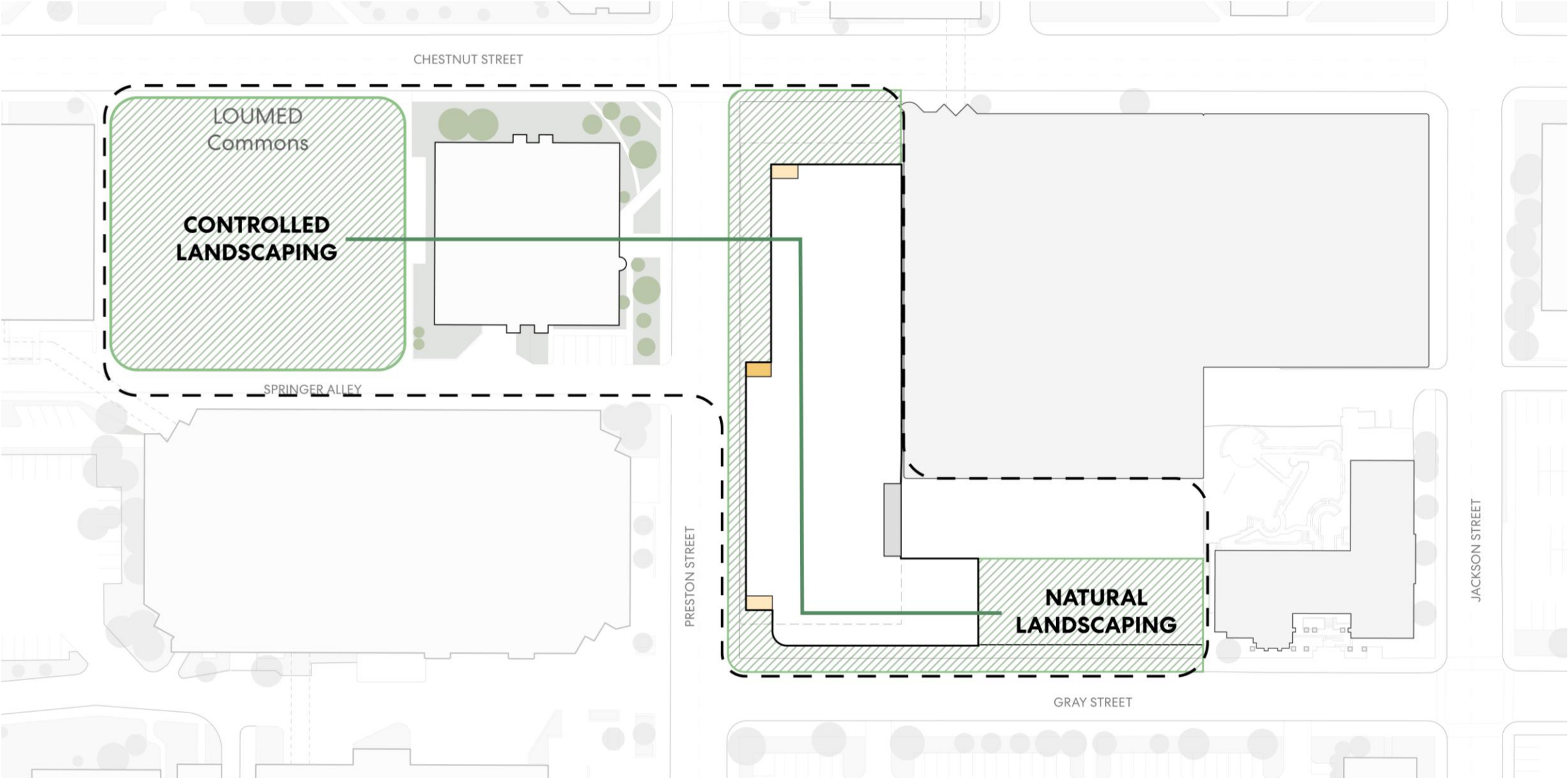


Daylight Analysis

- Orientation
- Solar access & shadows
- Prevailing breeze
- Shade & tree cover
- Views
- Connections to living systems/ water systems
- Changes in climate
- Community
- History
- Culture

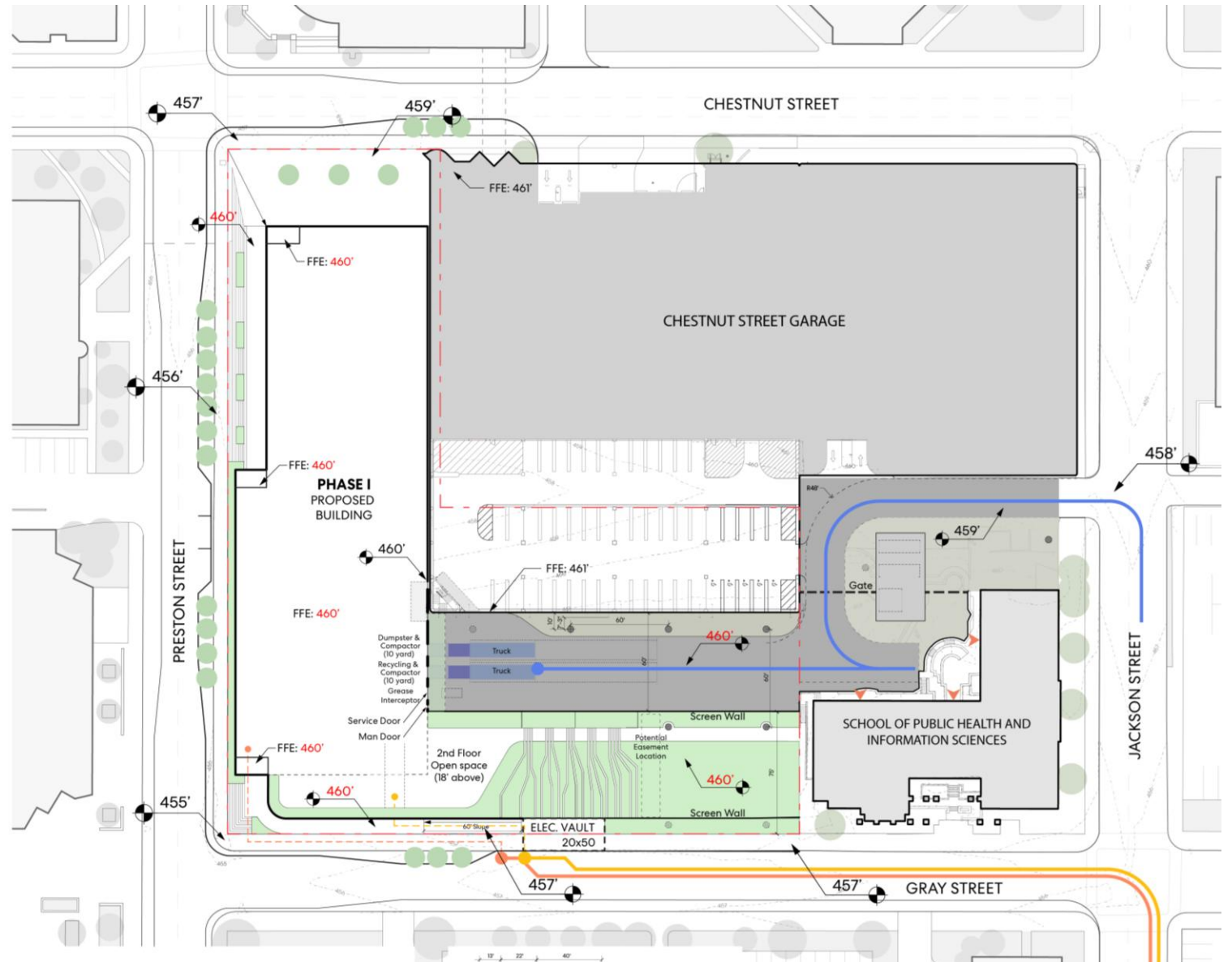


Connection to LOUMED Commons



Site Plan – Phase I

- Campus and Streetscape Connections
- Garage Adjacency
- Site Service and Infrastructure
- Outdoor Spaces
- Public Connections
- Fire Access
- Future Proof Planning



The New HSC Building



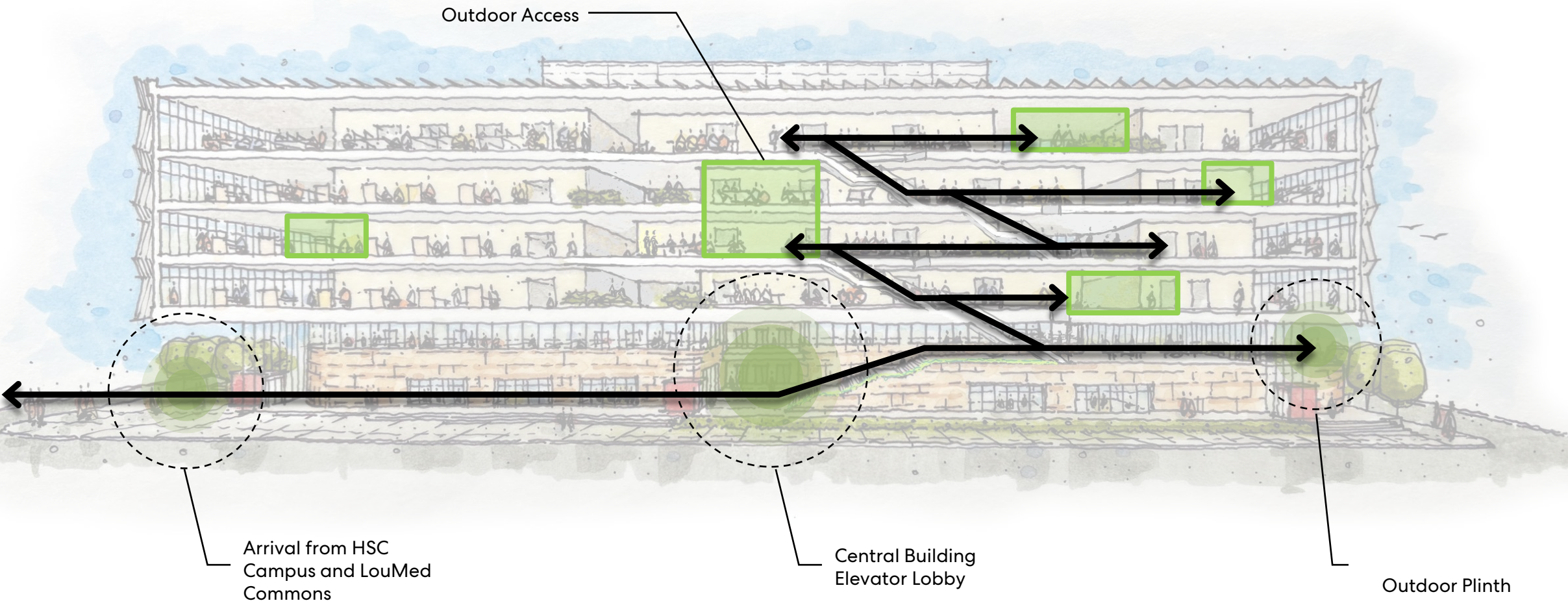
The New HSC Building

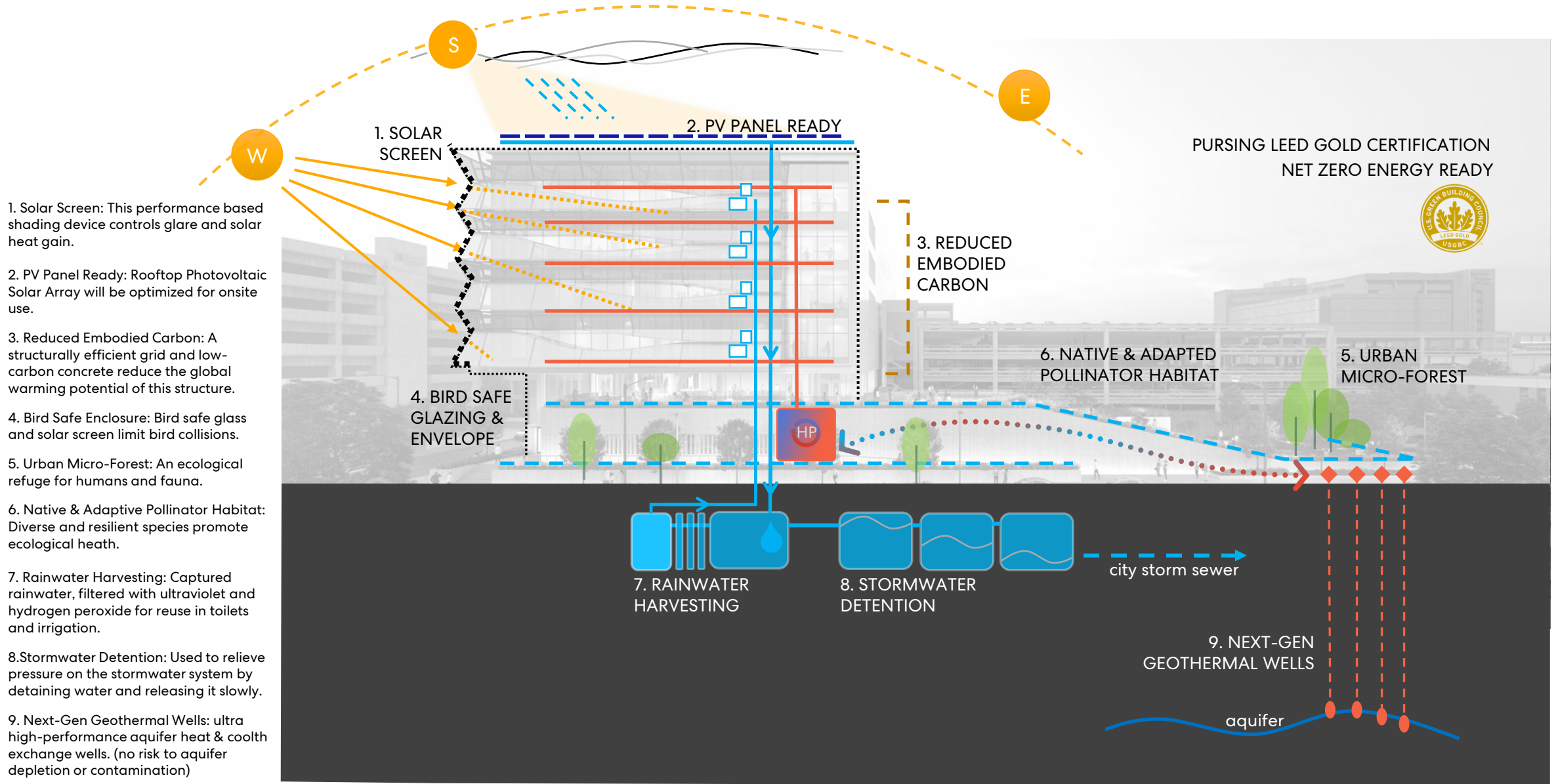


The New HSC Building



The New HSC Building





Preliminary Sustainable Systems



LOCATION & TRANSPORTATION

The Complete Corridor

Placemaking, Ecological Services, Green Infrastructure
Landscape strategies should improve overall ecological functions & connect broader systems



Economic Generators
Set the stage for transit oriented economic development



Pedestrian, Placemaking, Food Security
Public placemaking should be context responsive and encourage vibrant, equitable and accessible public spaces



Technology
Connect to and provide realtime data related to multimodal uses



Cyclists, Food Security
Light vehicle lane supports changing transportation needs & healthy modal choices



Technology
Planned flexibility for current and future utility and infrastructure needs



Technology
V2X that detects and communicates to and from all users to provide safety & efficiency



Technology, Environmental Justice
Technology to measure air quality and related health metrics should be integrated

Transit
Dedicated lanes increase transit reliability and encourage more efficient use of the street



Freight/Service
Service and freight must be addressed in a shifting digital economy



Transit, Technology
V2X technology allows for future bus pre-emption



Transit
Open BRT allows many routes to benefit from dedicated lanes and other improvements



Motorist, Technology
Flexibility to allow future success for autonomous vehicles



Technology, Food Security
Smart transit stops provide real-time information on service and nearby options like scooters and bike share making travel to regional and neighborhood services convenient, accessible and equitable



Ecological Services, Environmental Justice
Identify key opportunities to improve air-quality, urban heat island and other environmental justice issues



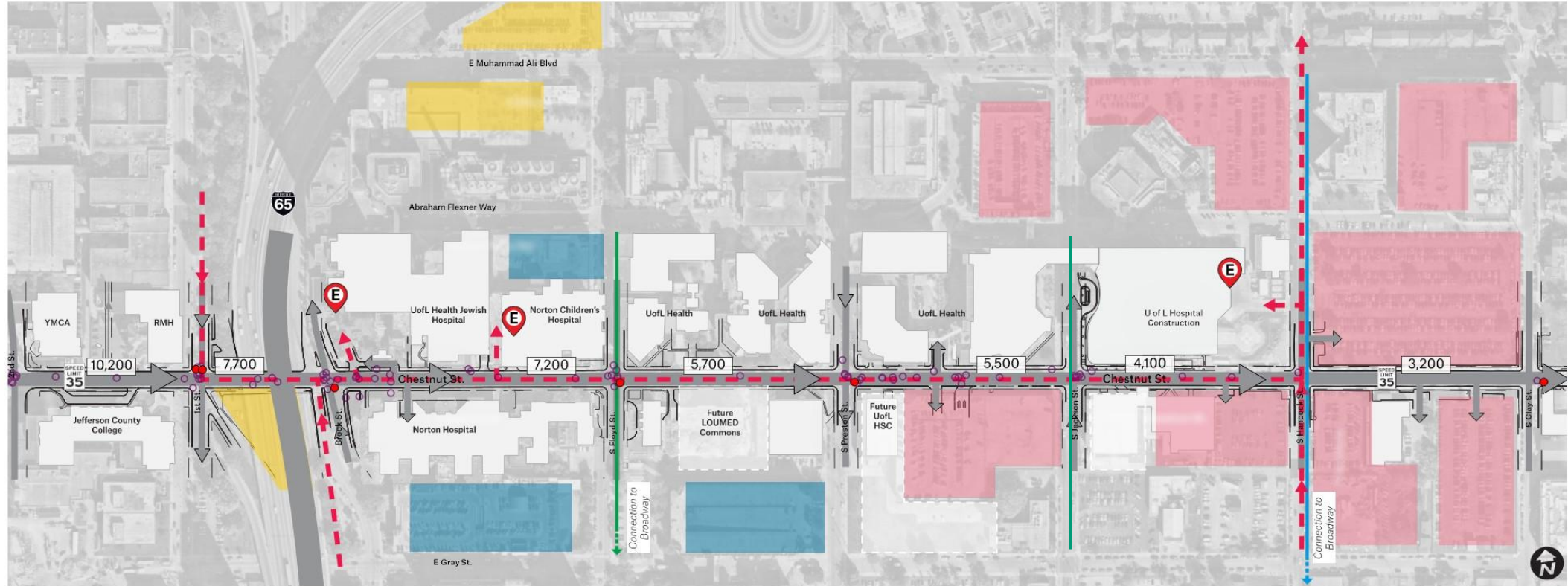
Green Infrastructure, Ecological Services, Environmental Justice
Strategically integrated and meaningful green infrastructure



Pedestrian, Food Security
Equitable and accessible



Traffic Study



The heart of this corridor is a one-way street that utilizes two vehicular lanes with parking on either side.

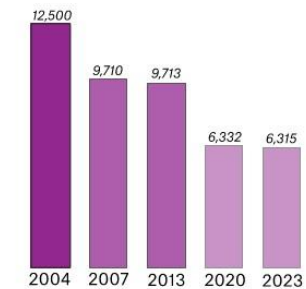
It is expected that the corridor east of Jackson Street will be converted to a two-way street in future roadway improvements.

The remainder of the corridor is currently being studied for the same reconfiguration and could likely see a two-way conversion at some point in the future.

Key take-aways from traffic data:

- Volumes are the greatest near the I-65 interchange and taper off towards the east end of the corridor.
- The lowest speeds were identified in the middle of the corridor and up-tick towards the east and western ends of the project extents.
- Despite the lower speeds, a number of mid-block incidents occurred between Preston and Jackson Street.
- The majority of recorded collisions occurred at intersections.

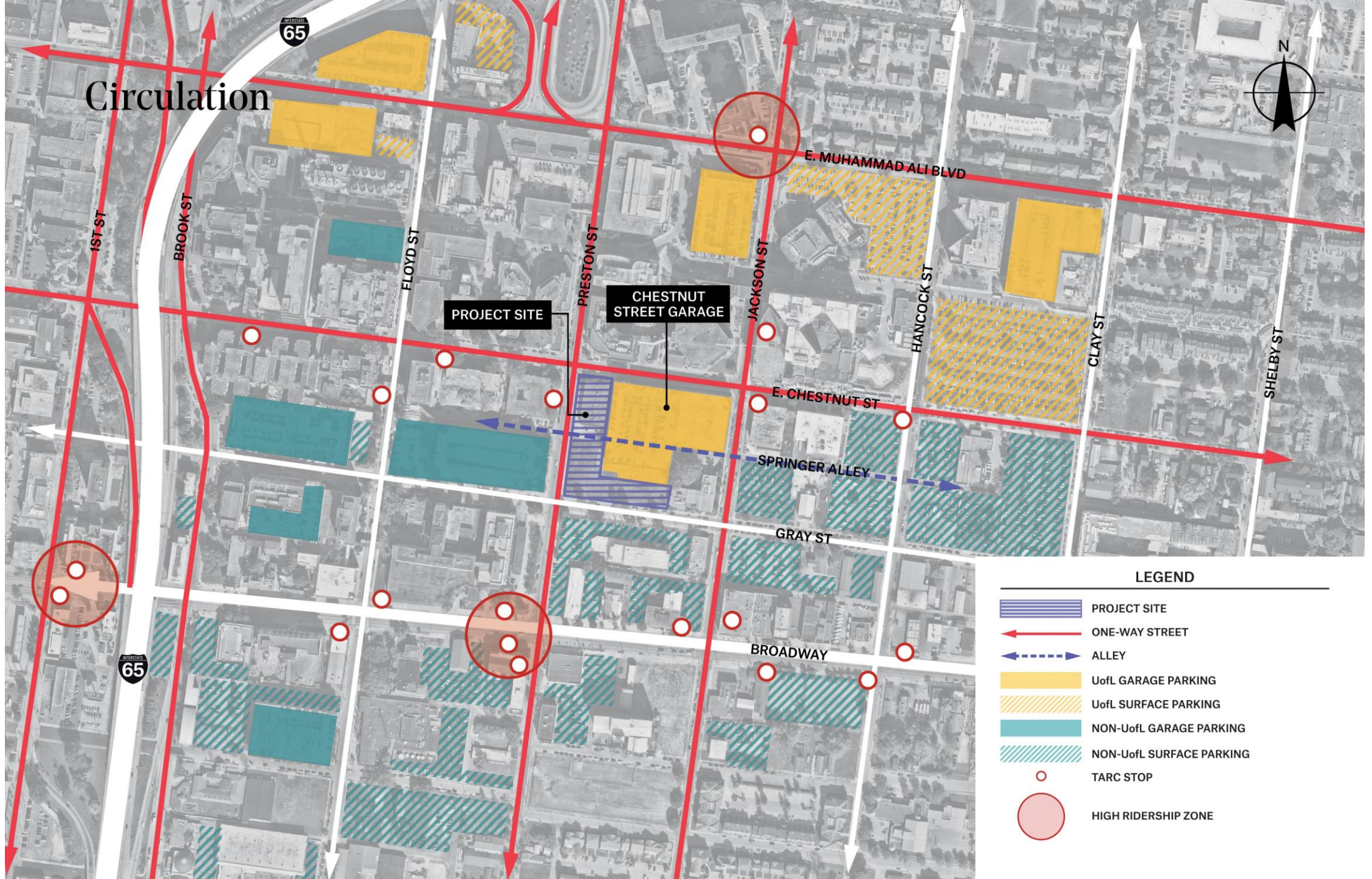
KYTC Average Annual Daily Traffic



The trend of daily traffic counts over the past 20 years has shown a steady decline. This indicates there won't be a need to design for an increase in capacity.

Legend

- Major Road
- Minor Road
- Traffic Flow
- Ambulance Flow
- Bike Lane
- Neighborhood
- UofL Employee & Visitor Parking
- JH-Employee & Visitor Parking
- Norton-Employee & Visitor Parking
- Emergency Room
- Average Daily Traffic
- Car Crash / Incident
- Crash with Pedestrian and Injury





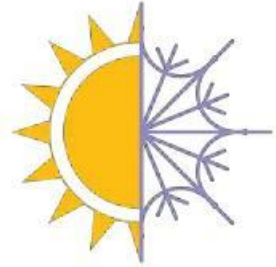
SUSTAINABLE SITES

Ecological Study



Air Quality

Air quality is a measure of the pollutants in the atmosphere and how these pollutants affect human health and the environment.



Climate

Climate is a long-term statistical overview of weather in a specific area, typically averaged over a span of 30 years.



Soils

Soil health relates to the soil's ability to function as a vital living ecosystem that sustains plants, animals, and humans.



Biodiversity

Biodiversity encompasses the multitude of life at all levels (plants, insects, animals) and the interactions between them. It is vital for a healthy and stable ecosystem to support life on Earth.



Water Quality

Water quality refers to the chemical, physical, and biological attributes of water and how effectively it can be used for certain purposes such as drinking, agriculture, or sustaining aquatic life.



Water Quantity

Water quantity refers to the levels of water needed to support a healthy ecosystem.

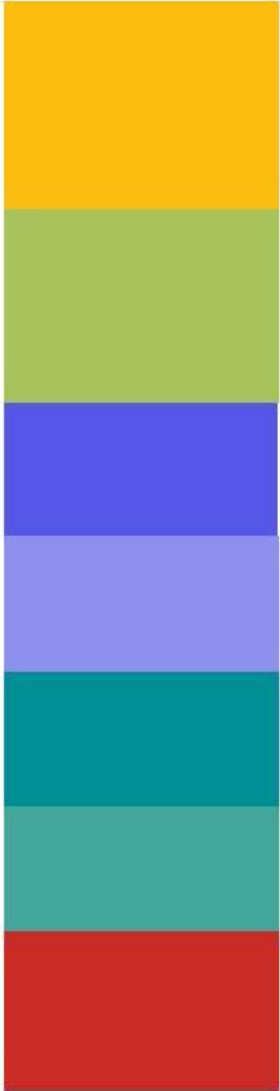


Well-Being

Well-being relates to the thriving of interconnected human and natural systems.

Charlestown State Park

100%



Well-Being

Biodiversity

Air Quality

Climate

Water Quality

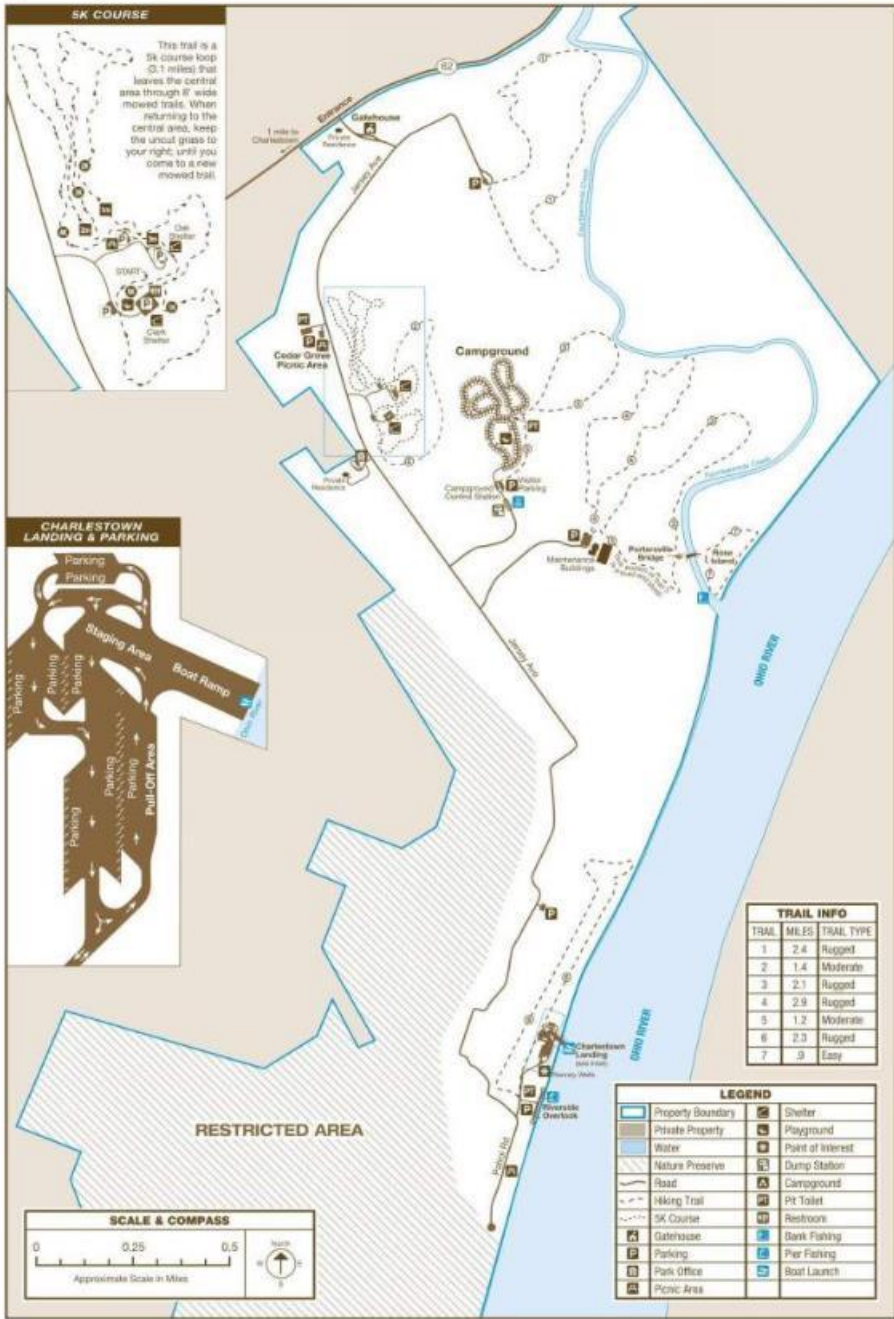
Water Quantity

Soil

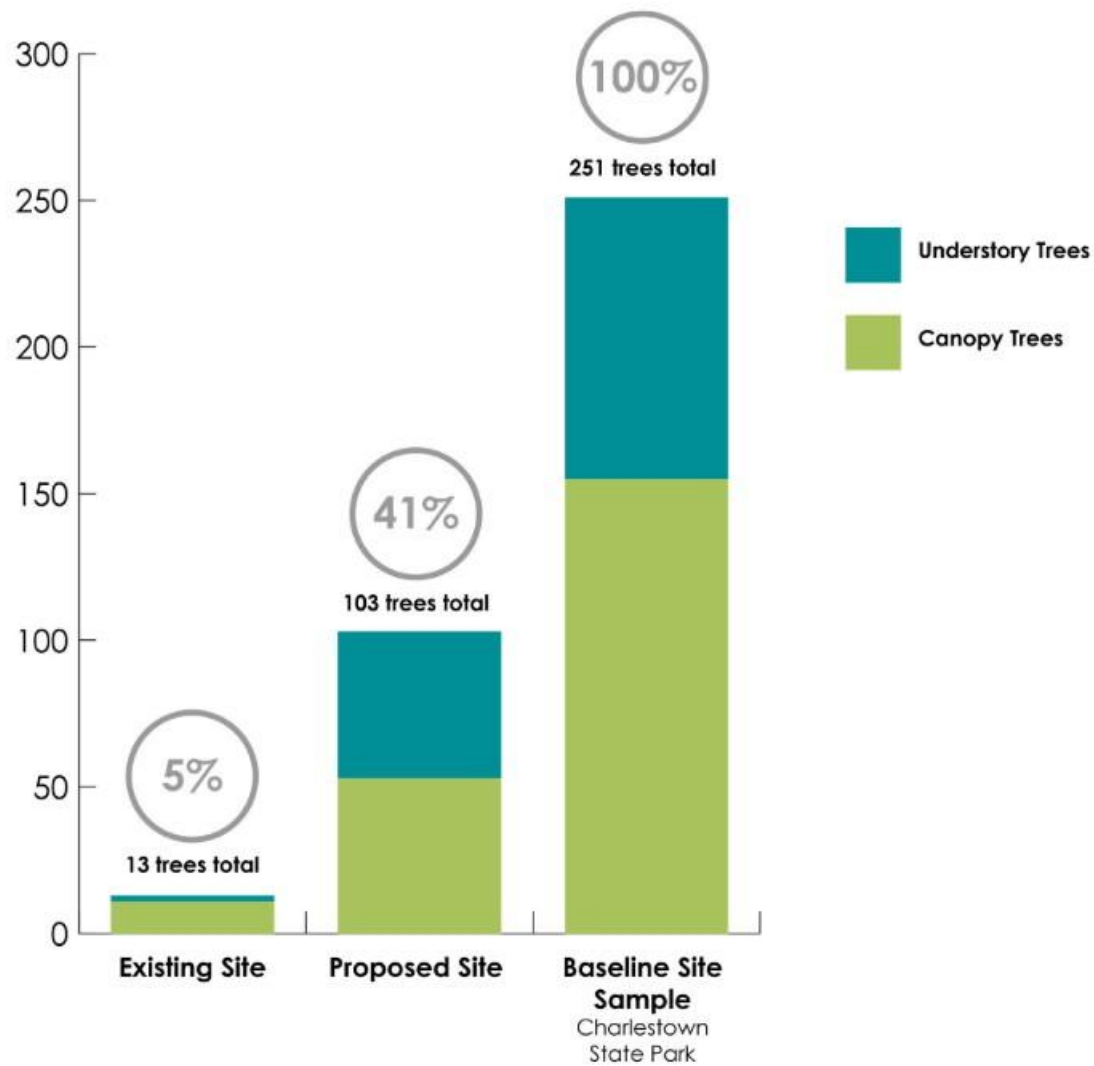


CHARLESTOWN STATE PARK

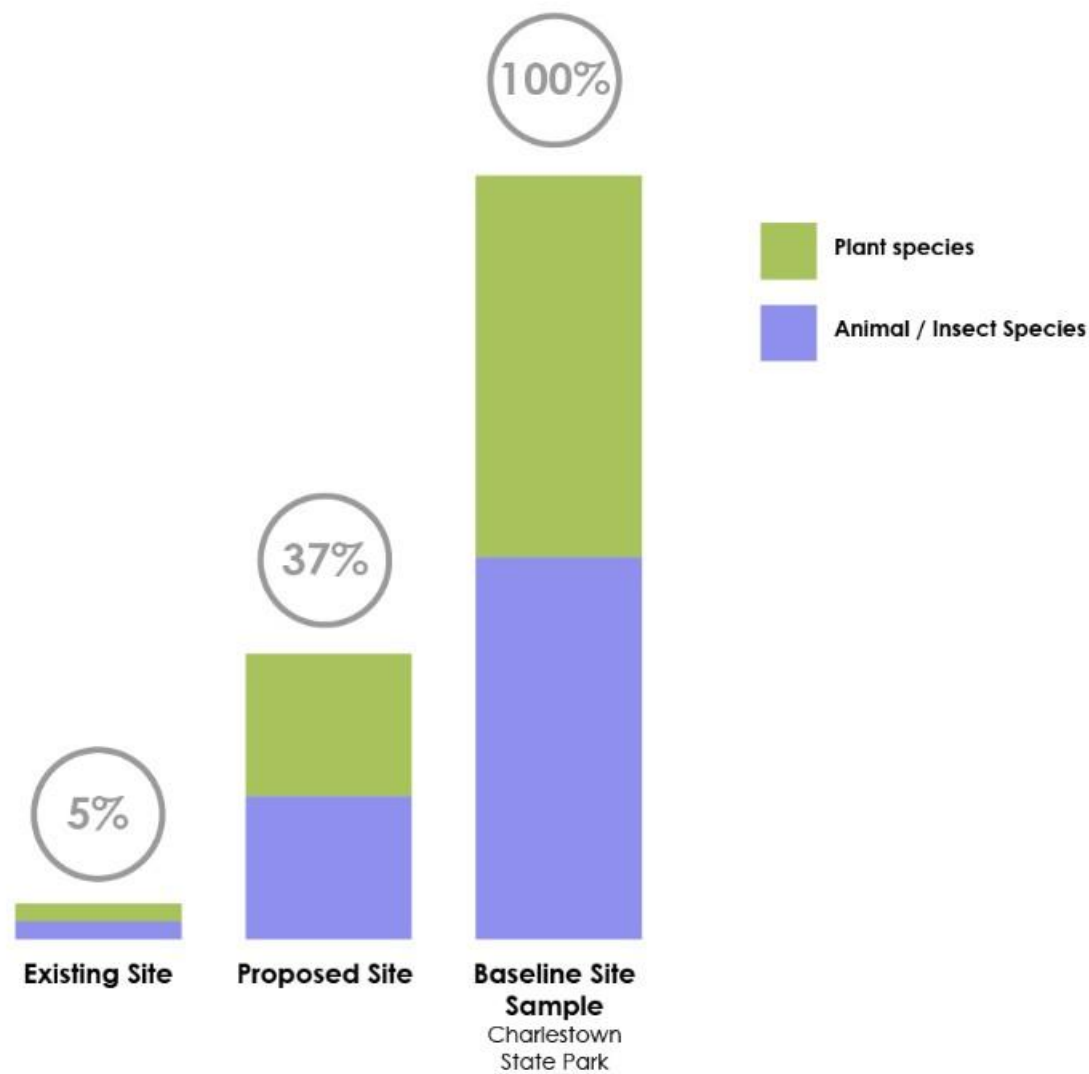
3000 State Park Drive | Charlestown, IN 47111 | 812-256-5600
5,100 Acres | Established 1996



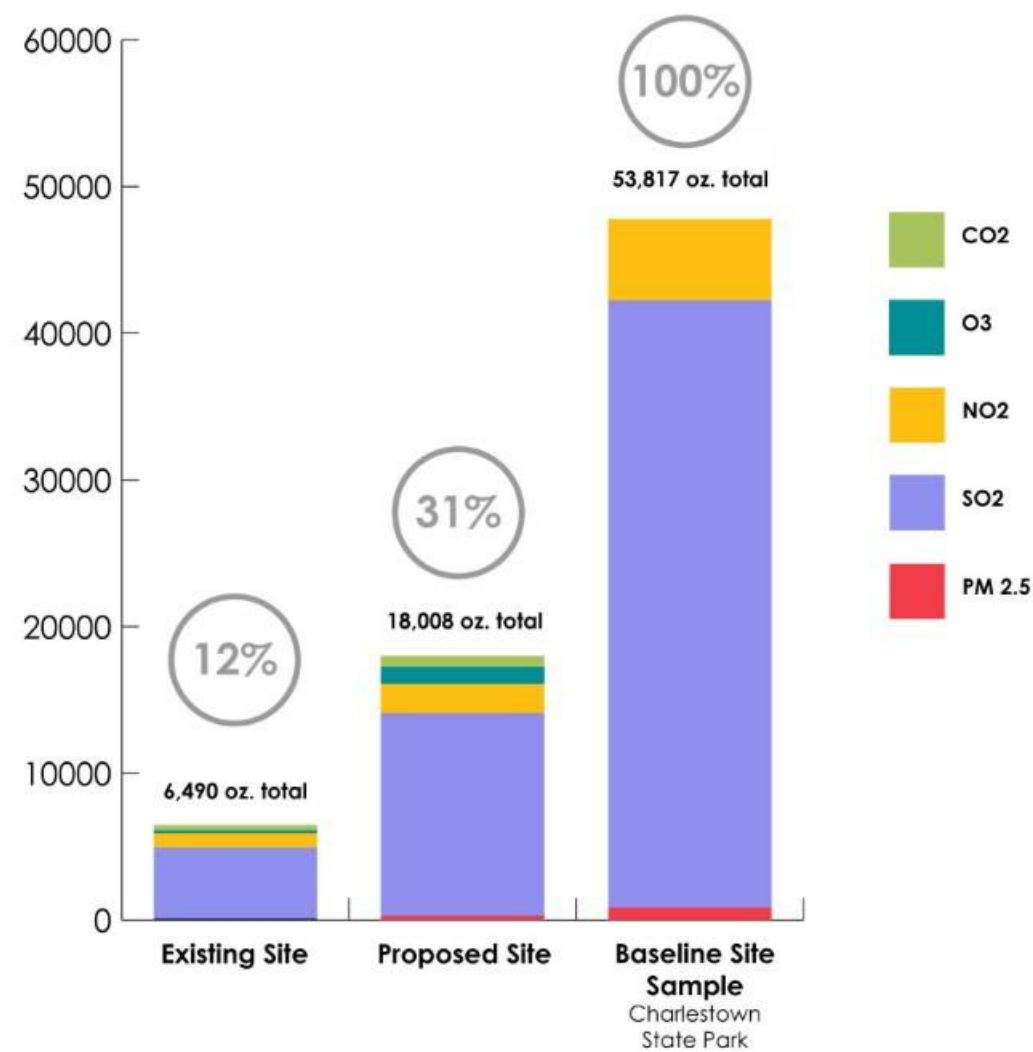
TREE PLANTING COMPARISON



BIODIVERSITY



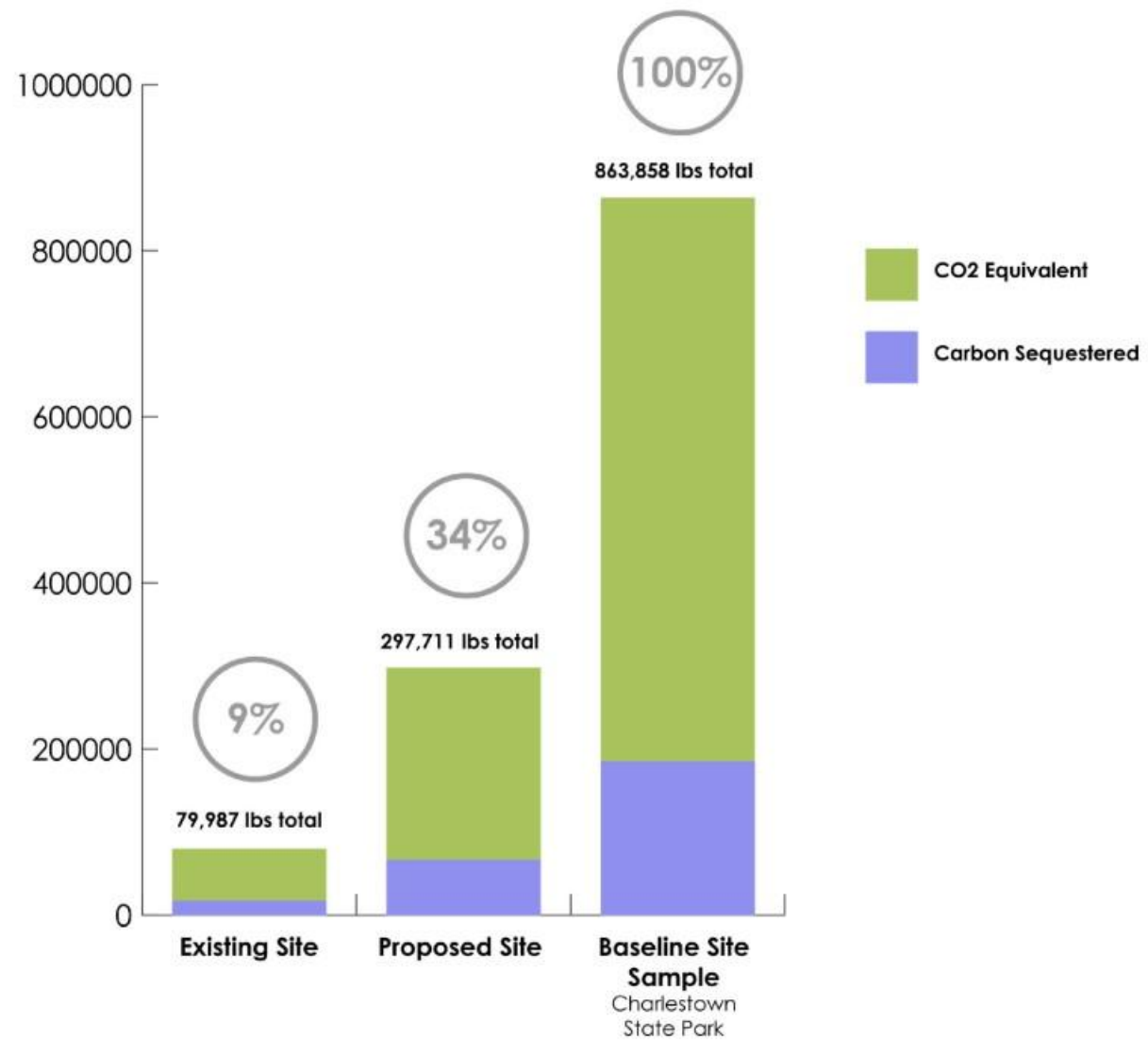
AIR POLLUTION REMOVAL



Certain plants absorb pollution better than others due to their physical structures and chemical makeups. **Strategic selection** and **placement** of vegetation can assist with air pollution removal on a site.



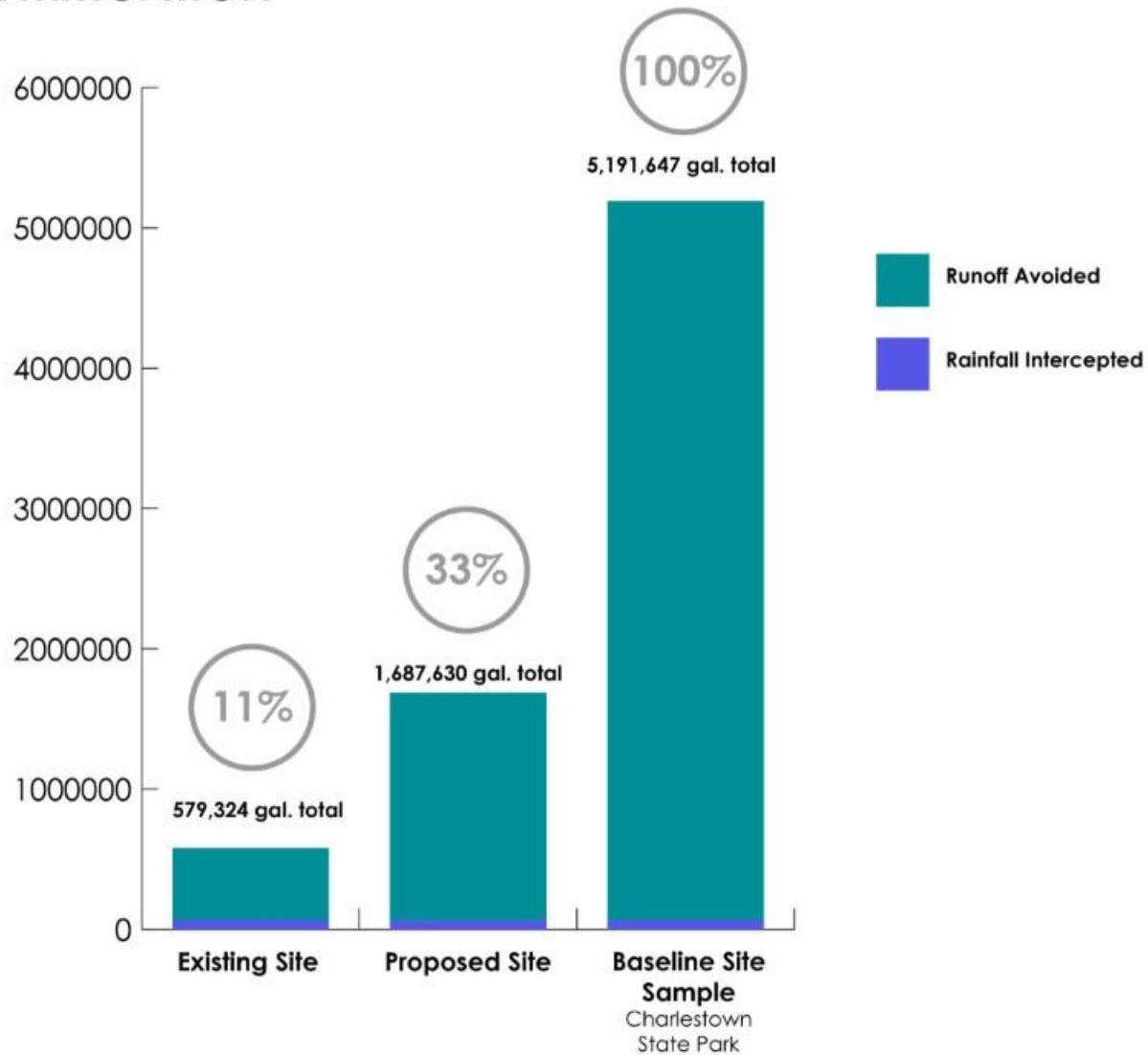
CARBON DIOXIDE UPTAKE



“CO2 Equivalent” refers to the total amount of carbon stored in the tissues of a tree. **“Carbon Sequestered”** is the amount of carbon dioxide absorbed by trees through photosynthesis.



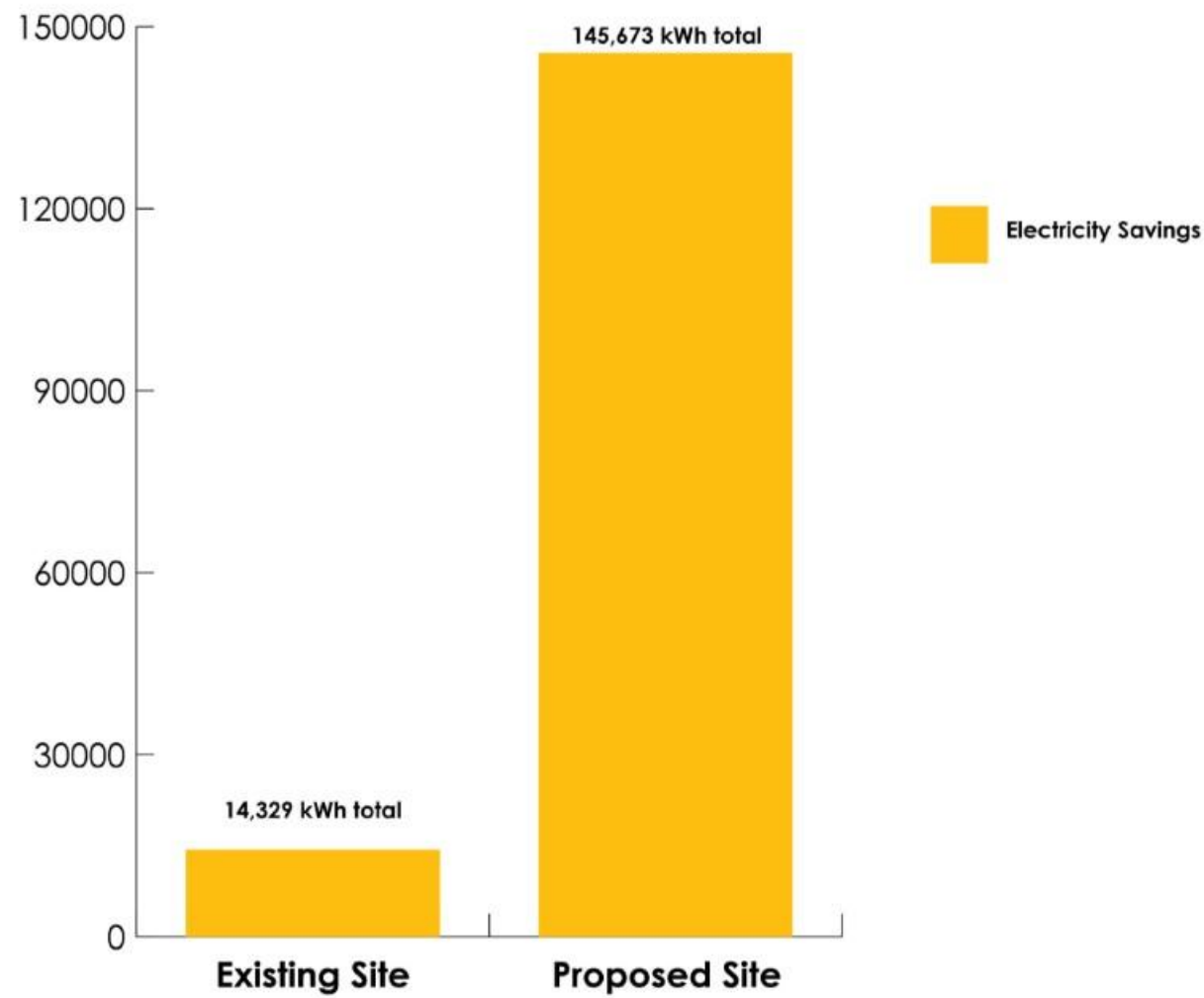
STORMWATER MITIGATION



“Rainfall Intercepted” refers to the portion of precipitation that lands directly on the tree, while **“Runoff Avoided”** reflects the amount of rainfall prevented from becoming surface runoff due to the presence of vegetation.



ENERGY CONSUMPTION MITIGATION

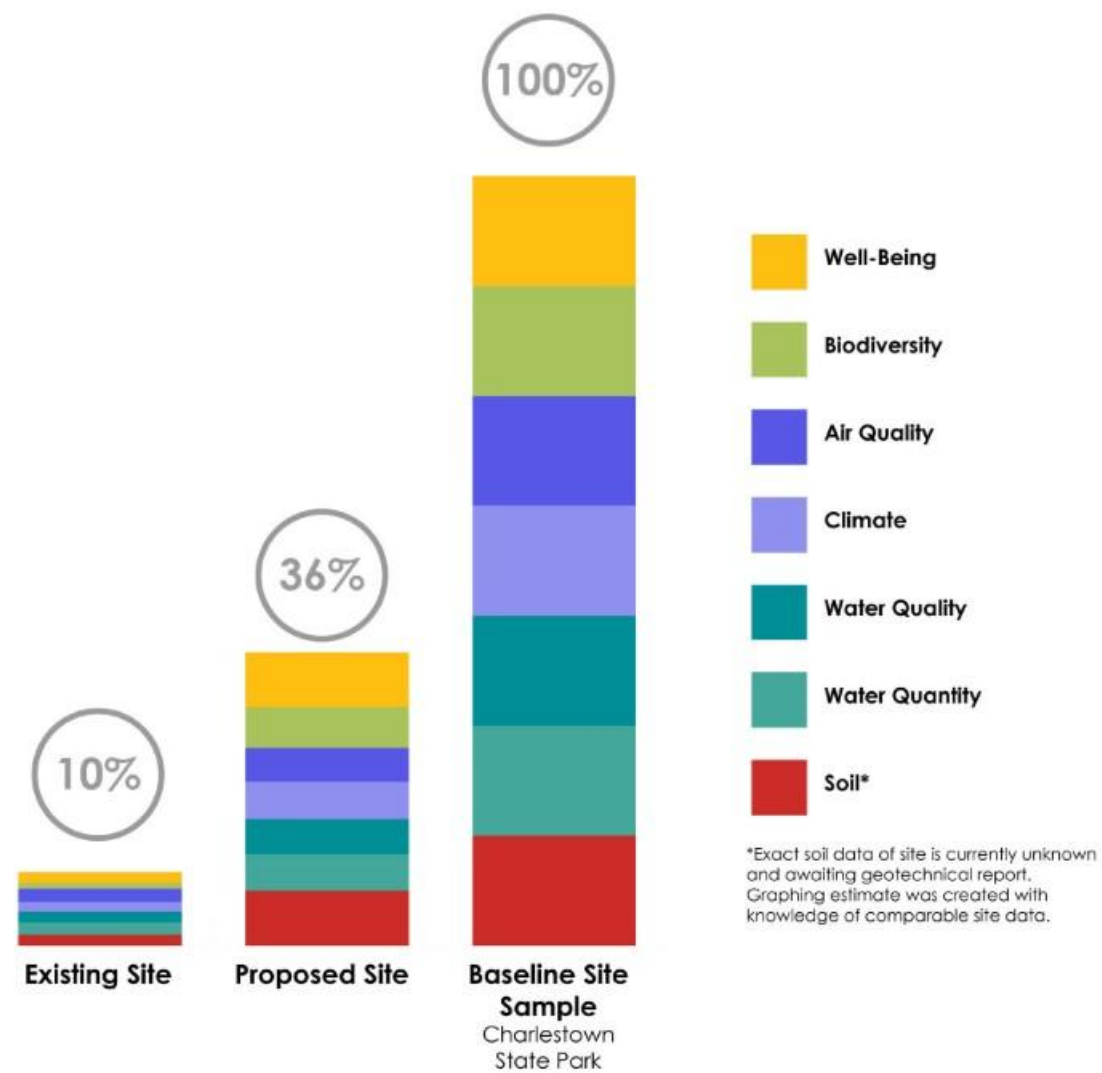


Strategically placed trees can significantly improve a building's energy performance by **providing summer shade, reducing the heat island effect, and blocking harsh winter winds.**

These estimates were based on a typical urban construction project rather than a sustainable design project, so the projected energy savings may be overstated.

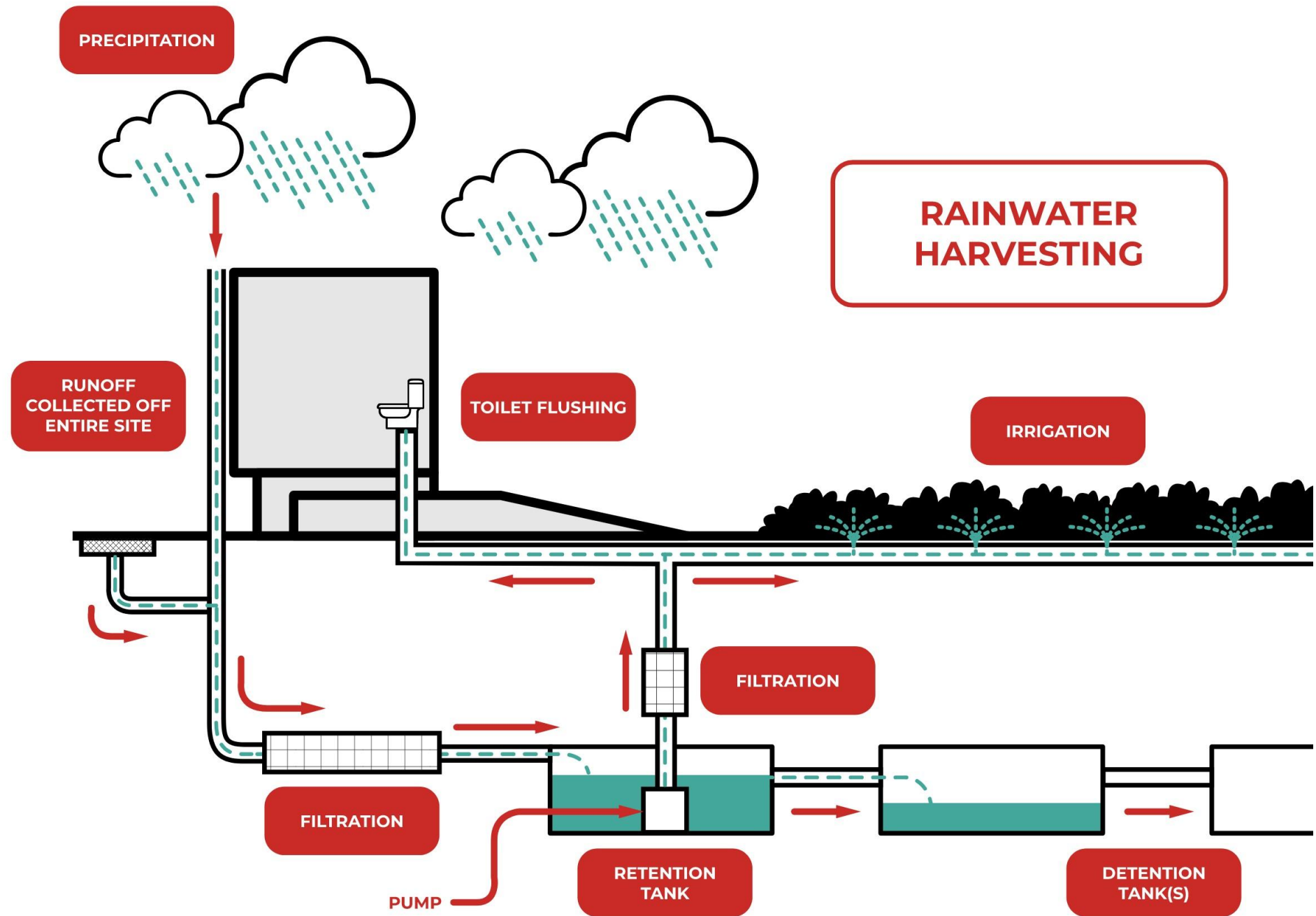


OVERALL SITE SUMMARY





WATER EFFICIENCY



Water Reduction



Low Flow Fixtures



**+50% Water
Use Reduction**

**+2M gal/yr
savings**



MATERIALS & RESOURCES

“Where there is credible evidence that a material might result in harm to the environment or public health, we work to replace it with safer alternatives.”

Kathy Gerwig, Kaiser Permanente



VOCs,
antimicrobials
(preservative or
added)

Formaldehyde
(binder)

perfluorinated
compounds (PVDF
coating)

perfluorinated
compounds (PVDF
coating)

VOCs (adhesives),
formaldehyde (composite
wood binder)

Added flame
retardant,
perfluorinated
compounds (stain
resistant
treatments)

PVC with phthalates,
chloroprene (caulks
and sealants)

flame retardants,
polyurethane or isocyanates

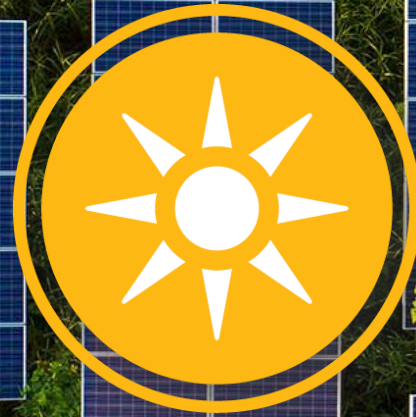
antimicrobials (added),
methyl methacrylate

PVC with phthalates,
VOCs (adhesives,
flooring)

VOCs, flame retardants
(upholstery foam), hexavalent
chromium, PVC (plastic parts),
PVC with phthalates (textile)

HOSPITAL PATIENT ROOM: TYPICAL HAZARDS FOUND

photo courtesy Perkins+Will; may not be used without permission



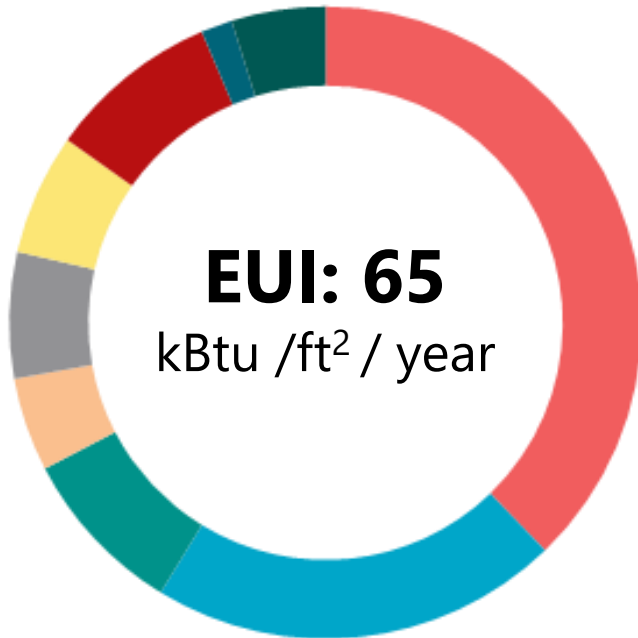
ENERGY & ATMOSPHERE



EUI Comparison

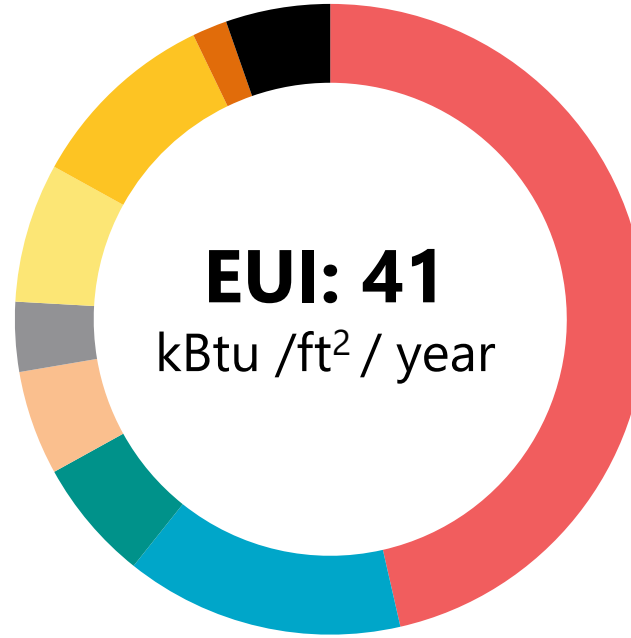
Peer Buildings

Regional CBECS-2018

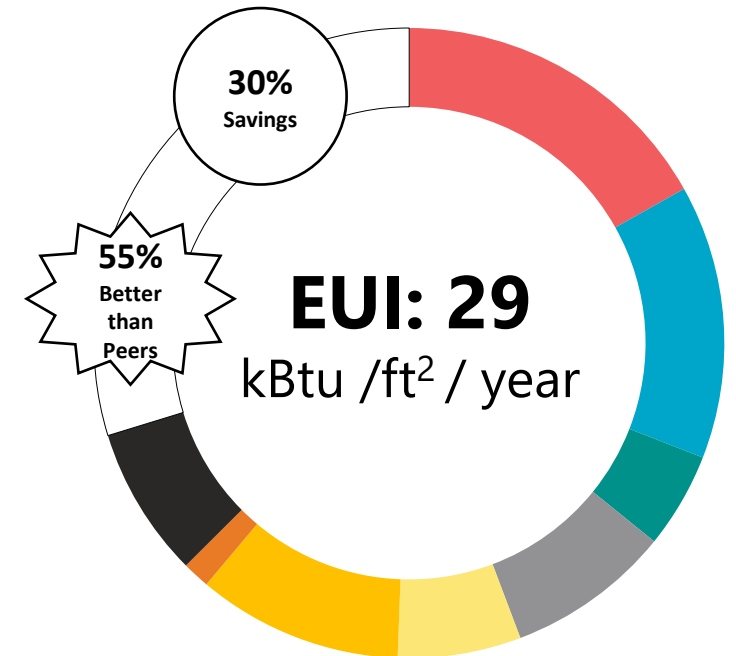


Baseline

90.1-2016 Appendix G



Proposed



■ Space Heating ■ Space Cooling ■ Fans Interior ■ Heat Rejection ■ Pumps
■ Domestic Hot Water ■ Interior Lighting ■ Exterior Lighting ■ Process □ Savings

Energy Model Overview

■ Heating

■ Cooling

■ Fans

■ Pumps

■ DHW Electricity

■ Int. Lighting

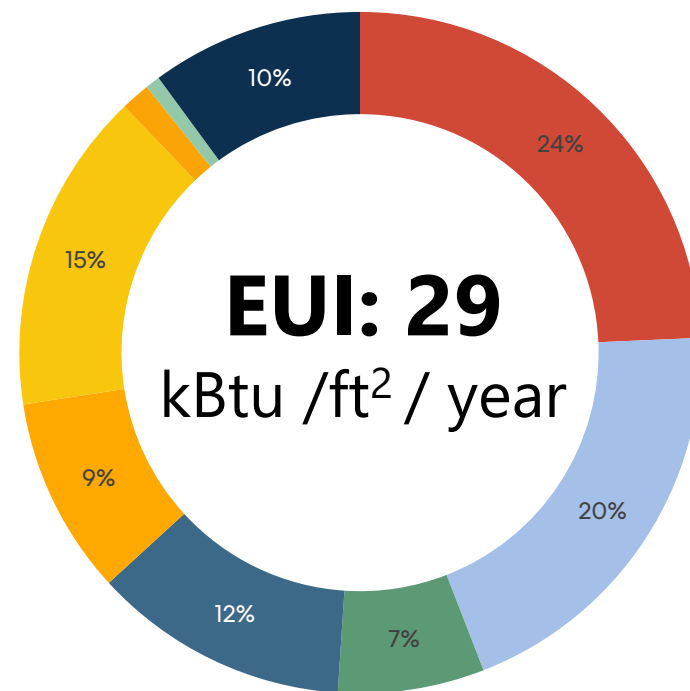
■ Ext. Lighting

■ Recpetacle

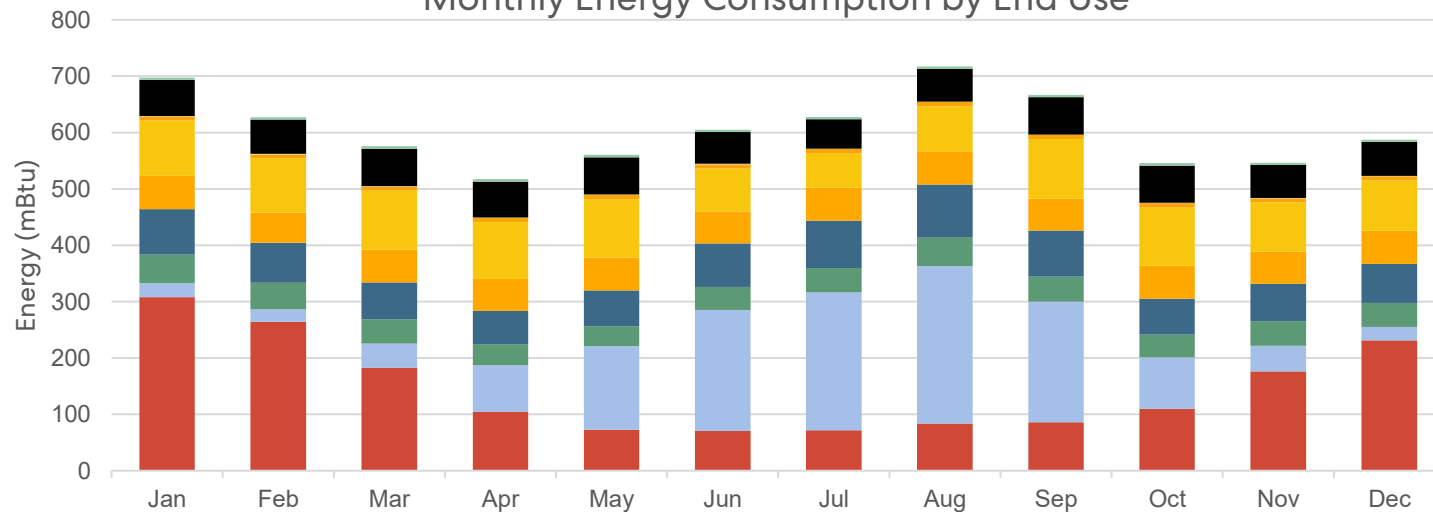
■ Refrigeration

■ Process

Annual Energy Use

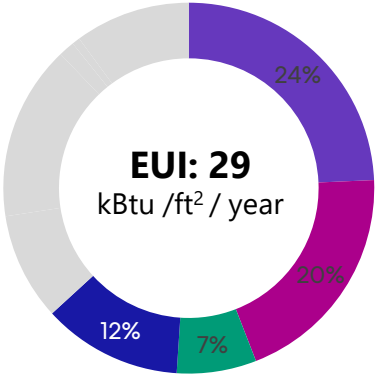


Monthly Energy Consumption by End Use



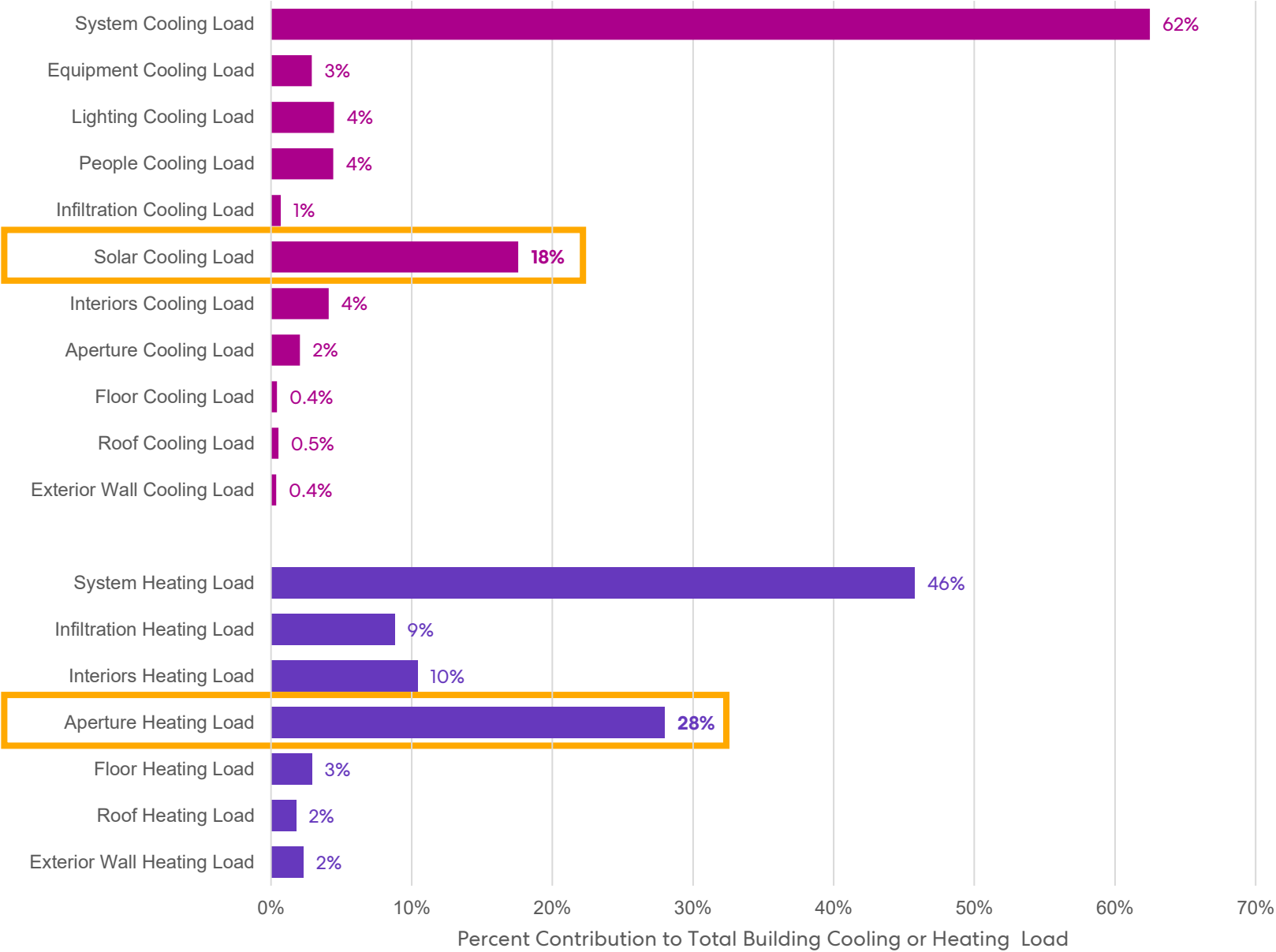
What's Driving HVAC Loads?

■ Heating ■ Cooling ■ Fans ■ Pumps

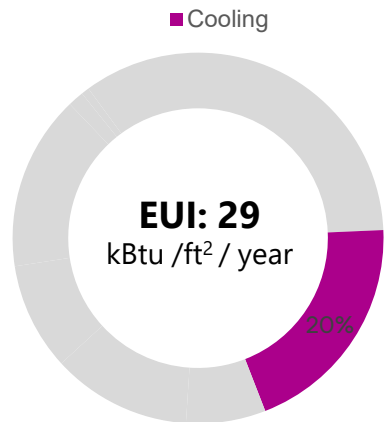


*HVAC accounts for 63% of total building energy.

Building Loads Overview



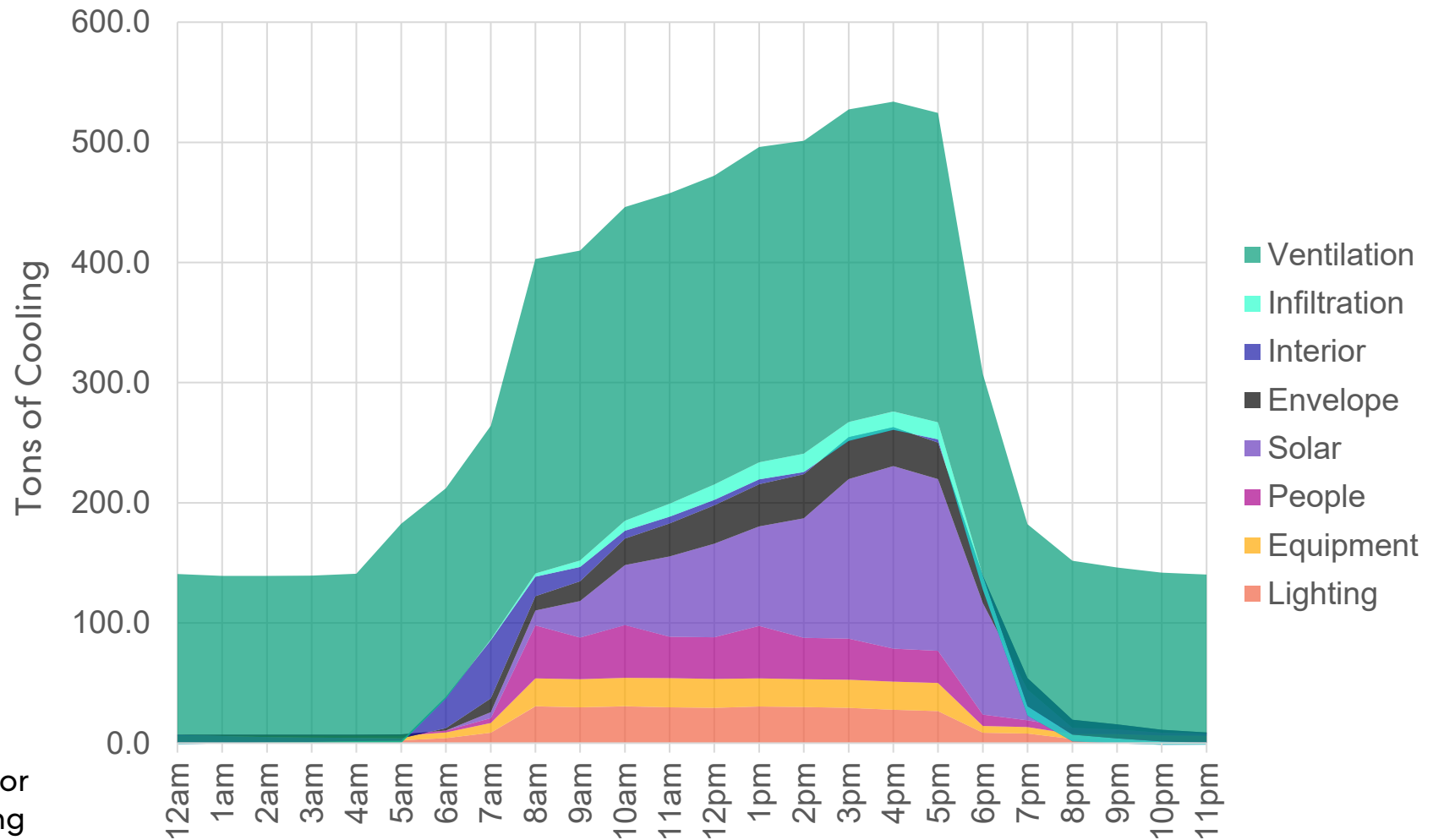
What's Driving Cooling Loads?



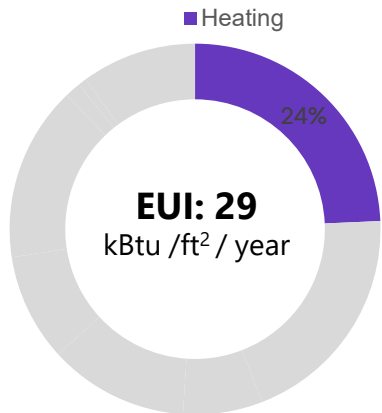
*Cooling accounts for 20% of total building energy.

Diversity Factor	TOTAL GSF	Peak Tonnage	SF/Ton
0.85	253,381	533.88	505

Peak Cooling Loads - Design Day



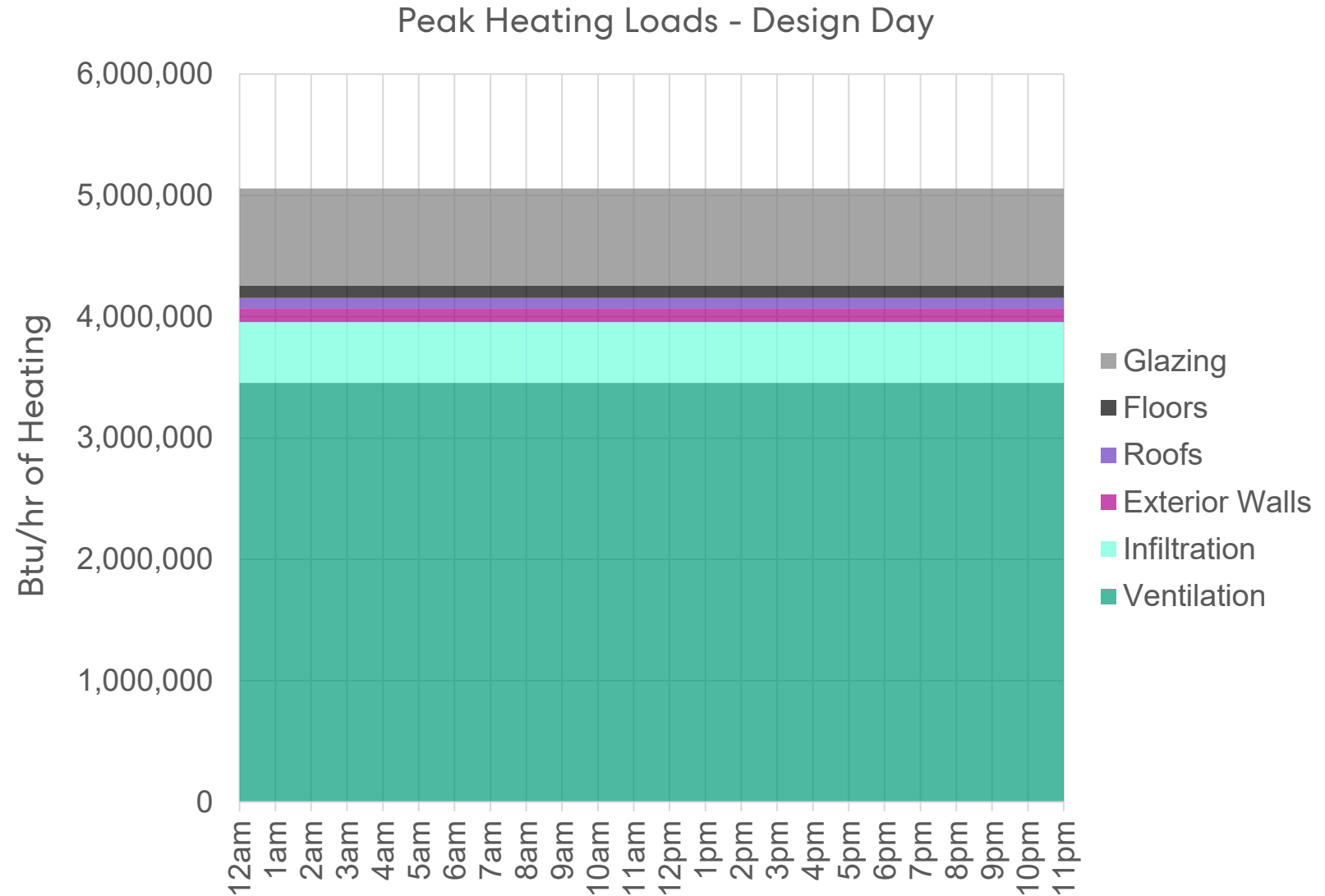
What's Driving Heating Loads?



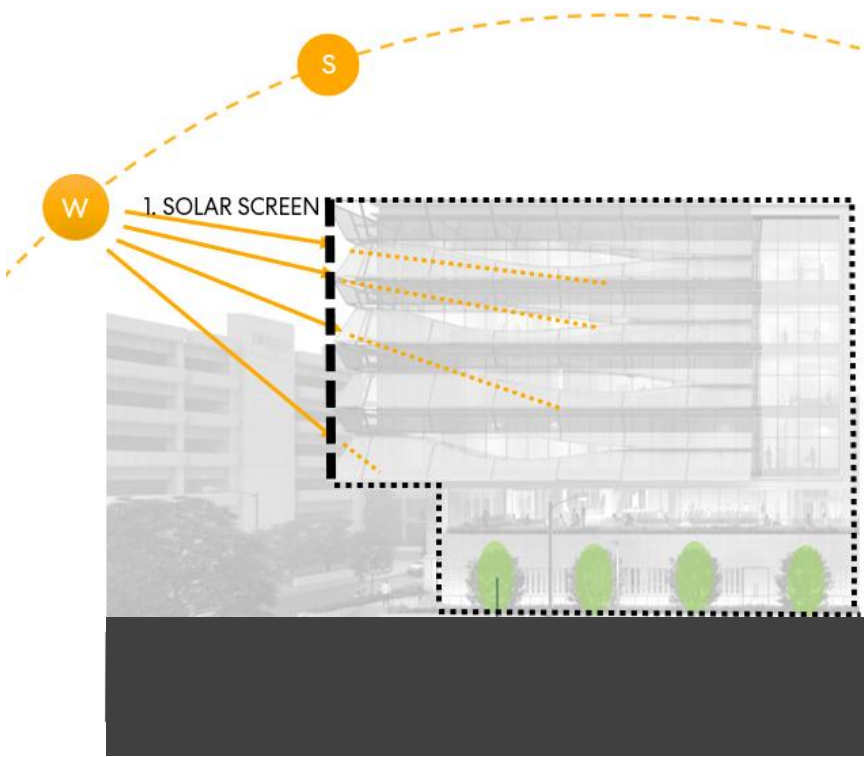
*Heating accounts for 24% of total building energy.

Diversity Factor	TOTAL GSF	Peak BTU/hr
0.85	253,381	5,056,878

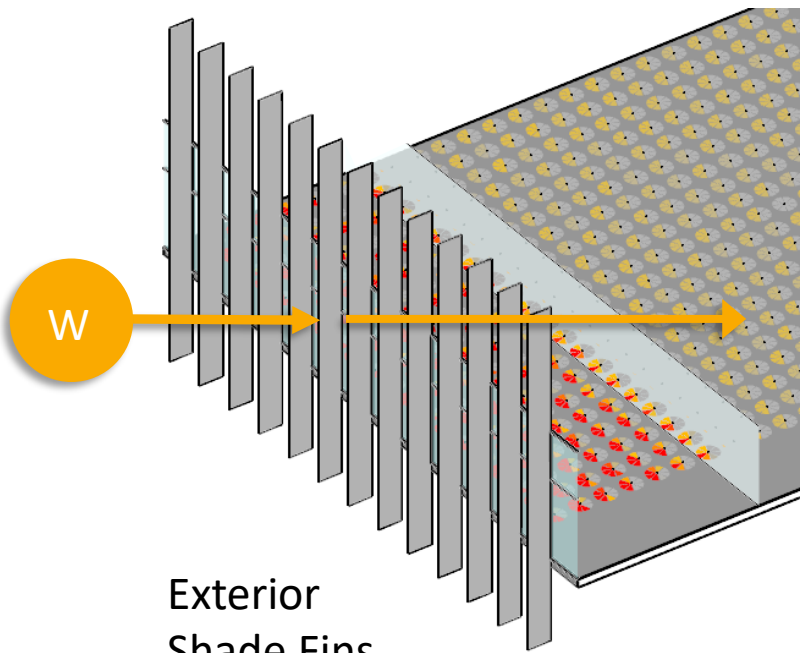
Peak (less ventilation)	BTU/hr/SF (with Ventilation)	BTU/hr/SF (No Ventilation)
1,601,737	20	6



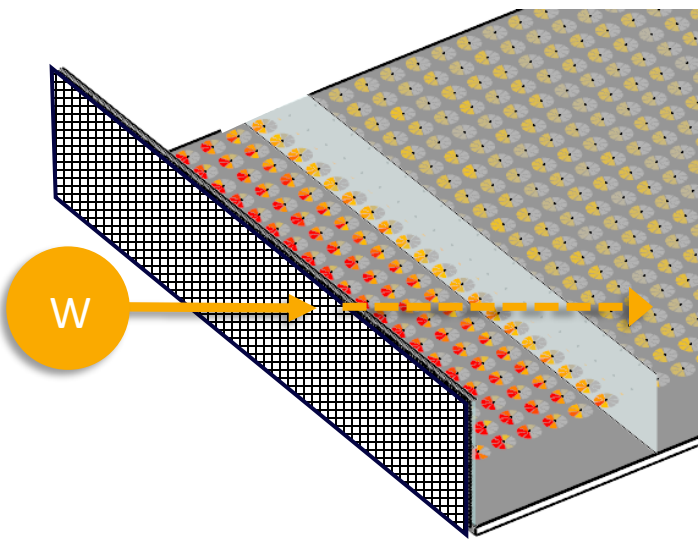
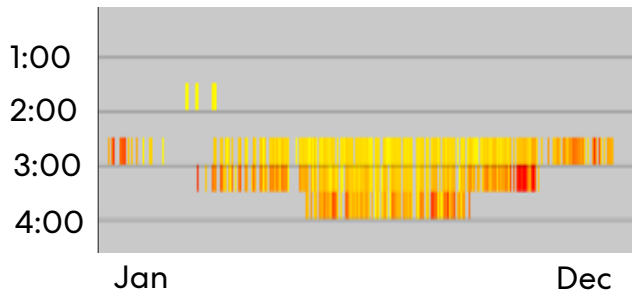
Glare & Solar Heat Gain Analysis: Research Phase I



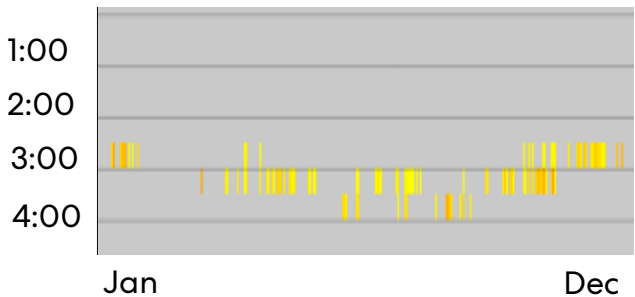
Study Area



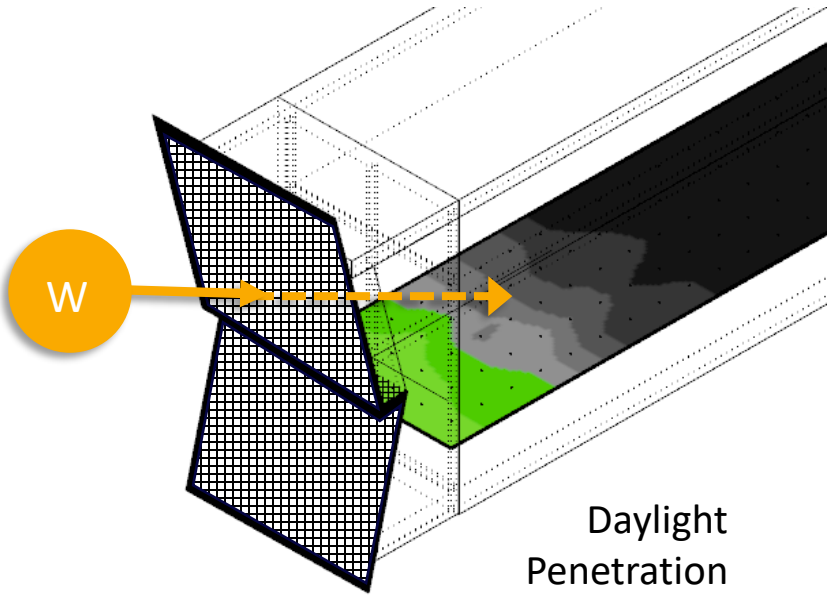
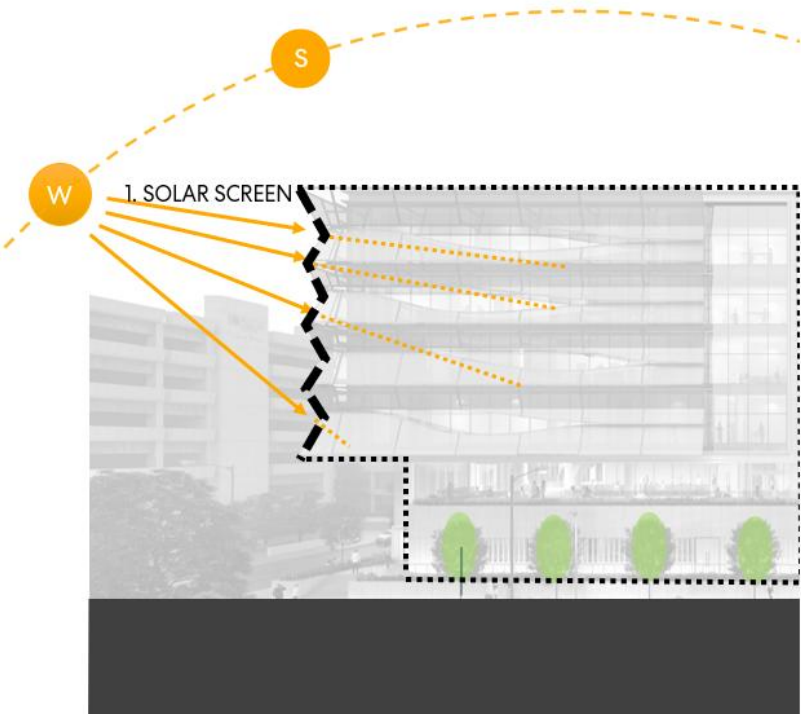
Exterior
Shade Fins



Exterior
Shade Screen



Glare & Solar Heat Gain Analysis: Research Phase II



10,000+

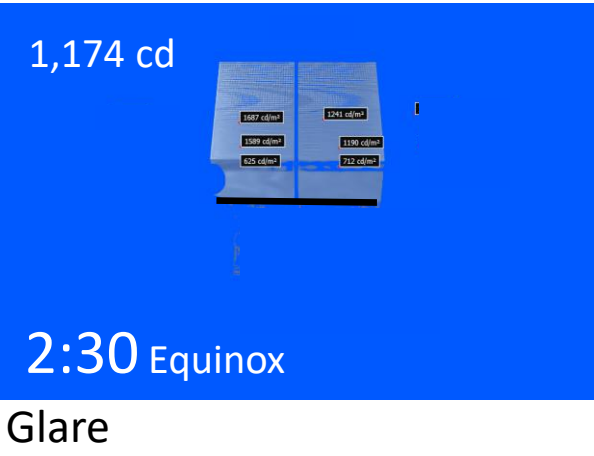
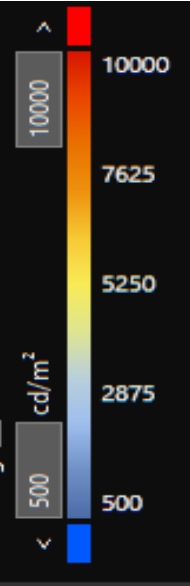
Intolerable

5000
3000

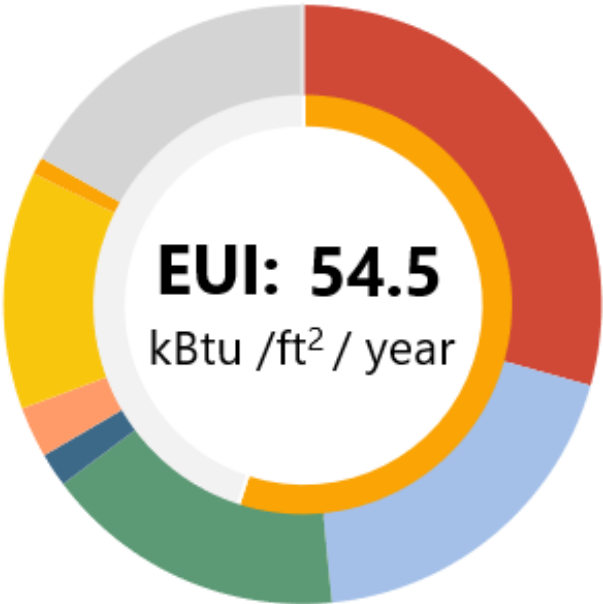
Likely
Uncomfortable

2,500
1,500

Likely
Comfortable



Iteration 1 – Higher Ed. Stand Alone Building



End Use	EUI	%
Heating	16.0	29%
Cooling	10.4	19%
Fans	8.9	16%
Pumps	1.0	2%
DHW Electricity	1.5	3%
Int. Lighting	7.0	13%
Ext. Lighting	0.5	1%
Receptacle	9.2	17%
Cooking	0.0	0%
Refrigeration	0.0	0%
Process	0.0	0%
Savings	0.0	
New EUI	54.5	
Total EUI		
Savings		0%

5
6

- Plant CW

Plant HW

Ventilation

Space Conditioning

Glass

Envelope

Infiltration

Lighting
- Water Cooled Chiller

Condensing Boiler

DOAS w/ VAV

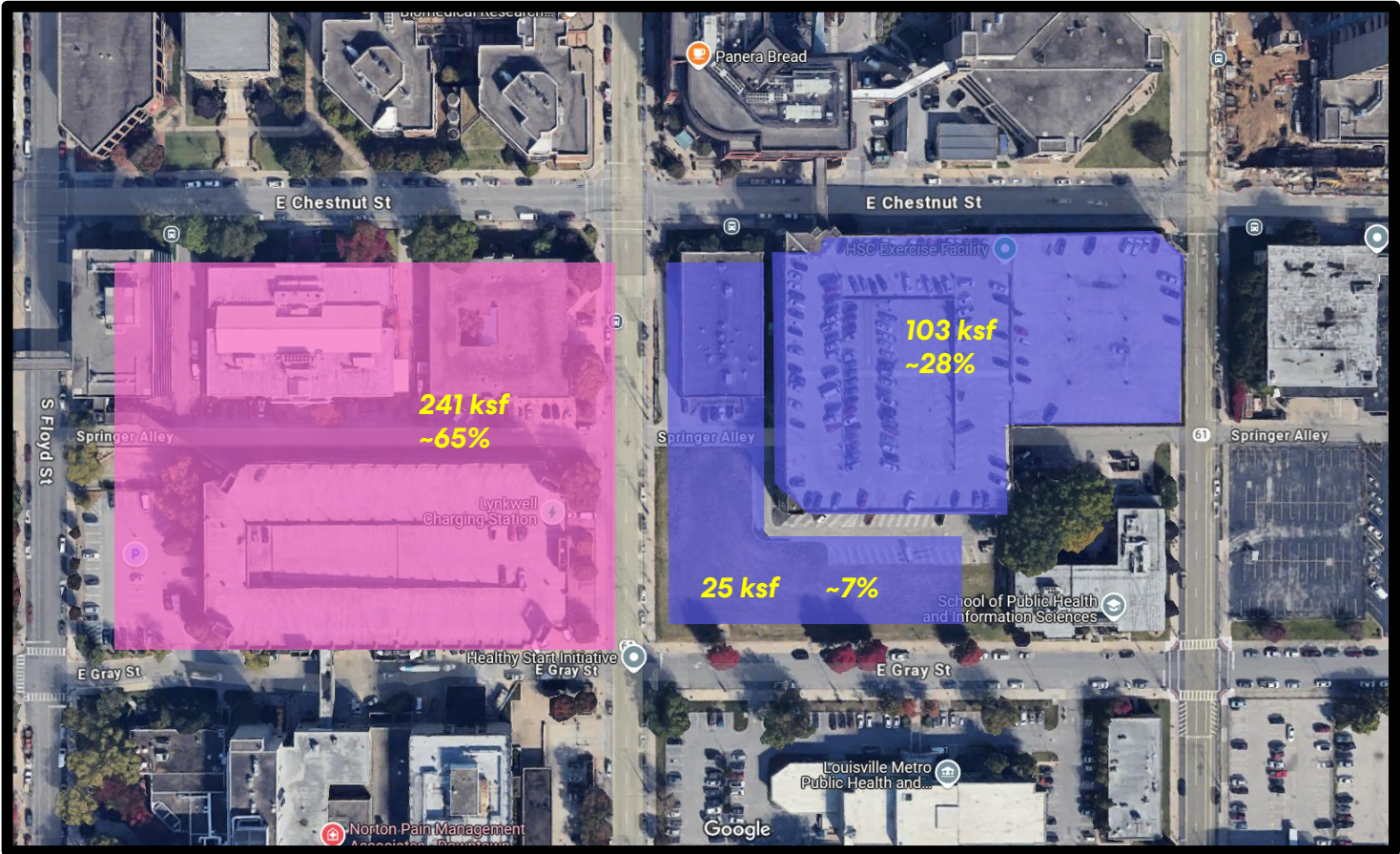
AHU w/ VAV

ASHRAE baseline

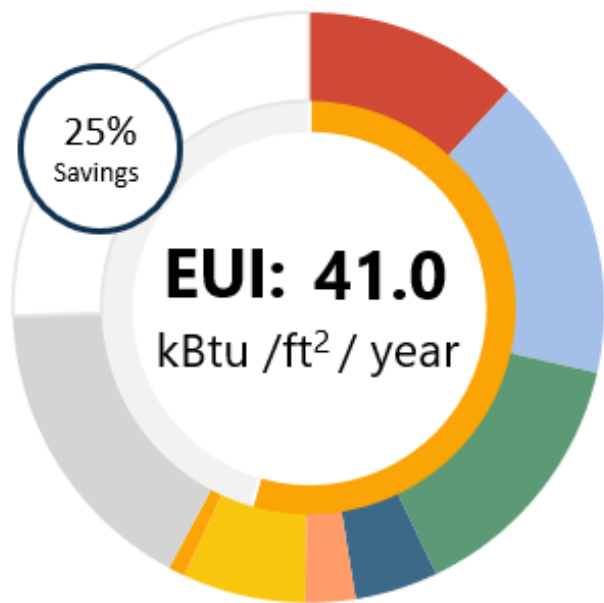
ASHRAE baseline

ASHRAE baseline

ASHRAE baseline



Iteration 2 – Geothermal & Better Glass/Lighting



End Use	EUI	%
Heating	6.5	16%
Cooling	9.2	22%
Fans	7.9	19%
Pumps	2.5	6%
DHW Electricity	1.5	4%
Int. Lighting	3.7	9%
Ext. Lighting	0.5	1%
Recpetacle	9.2	22%
Cooking	0.0	0%
Refrigeration	0.0	0%
Process	0.0	0%
Savings	14.0	
New EUI	41.0	

55% Savings 45% 25%

- Plant CW

Plant HW

Ventilation

Space Conditioning

Glass

Envelope

Infiltration

Lighting
- Geo Water/Water HP

Geo Water/Water HP

DOAS w/ VAV

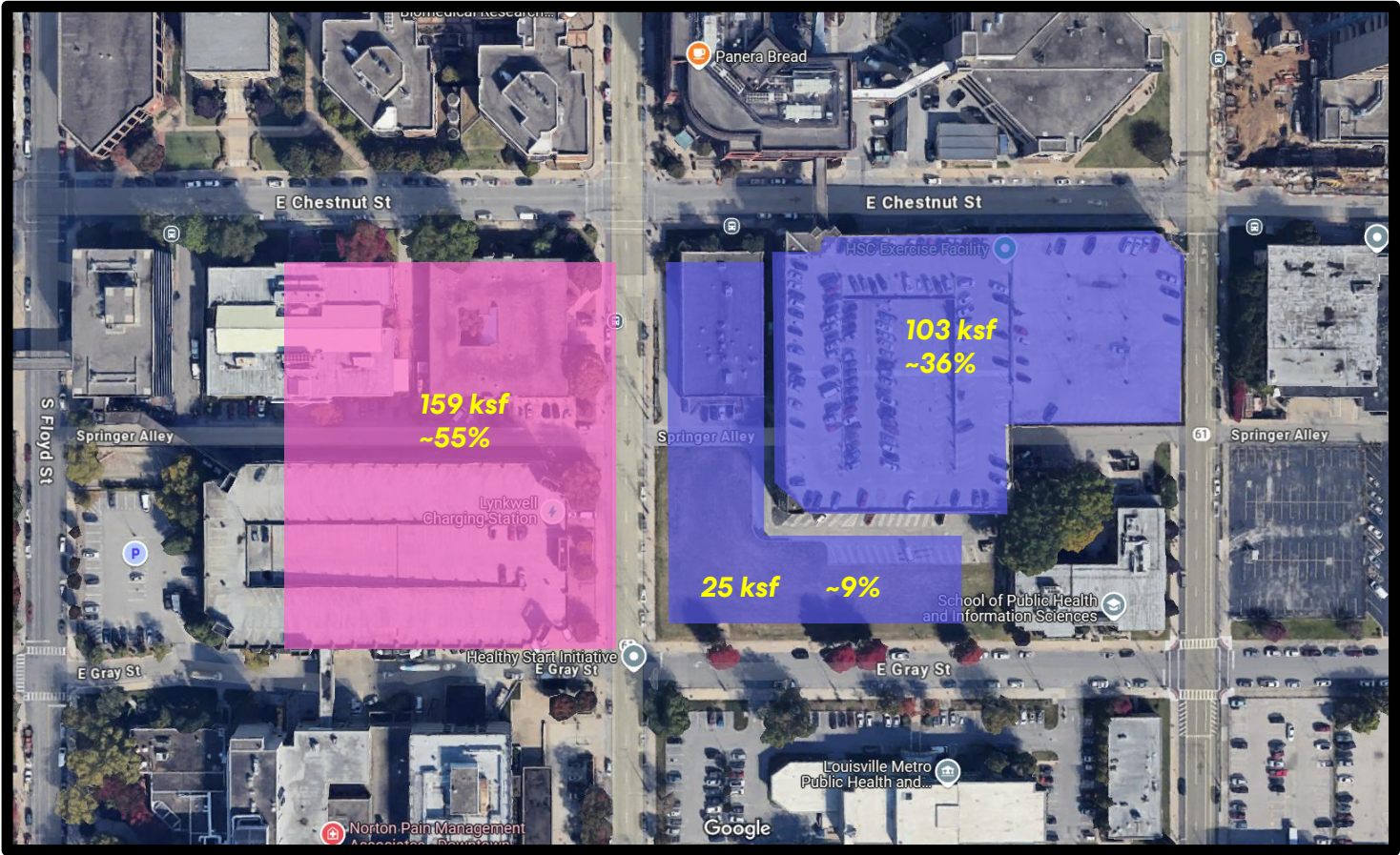
AHU w/ VAV

High Performance

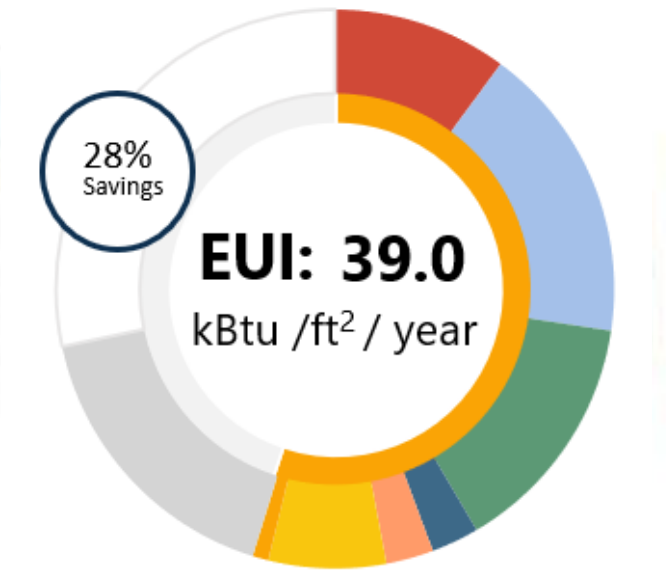
ASHRAE baseline

ASHRAE baseline

High Performance



Iteration 3 – Geothermal High Performance Envelope & Lighting



End Use	EUI	%
Heating	5.5	14%
Cooling	9.4	24%
Fans	7.7	20%
Pumps	1.5	4%
DHW Electricity	1.5	4%
Int. Lighting	3.7	9%
Ext. Lighting	0.5	1%
Receptacle	9.2	24%
Cooking	0.0	0%
Refrigeration	0.0	0%
Process	0.0	0%
Savings	15.4	
New EUI	39.0	

15% Savings 28%

- Plant CW

Plant HW

Ventilation

Space Conditioning

Glass

Envelope

Infiltration

Lighting
- Geo Water/Water HP

Geo Water/Water HP

DOAS w/ VAV

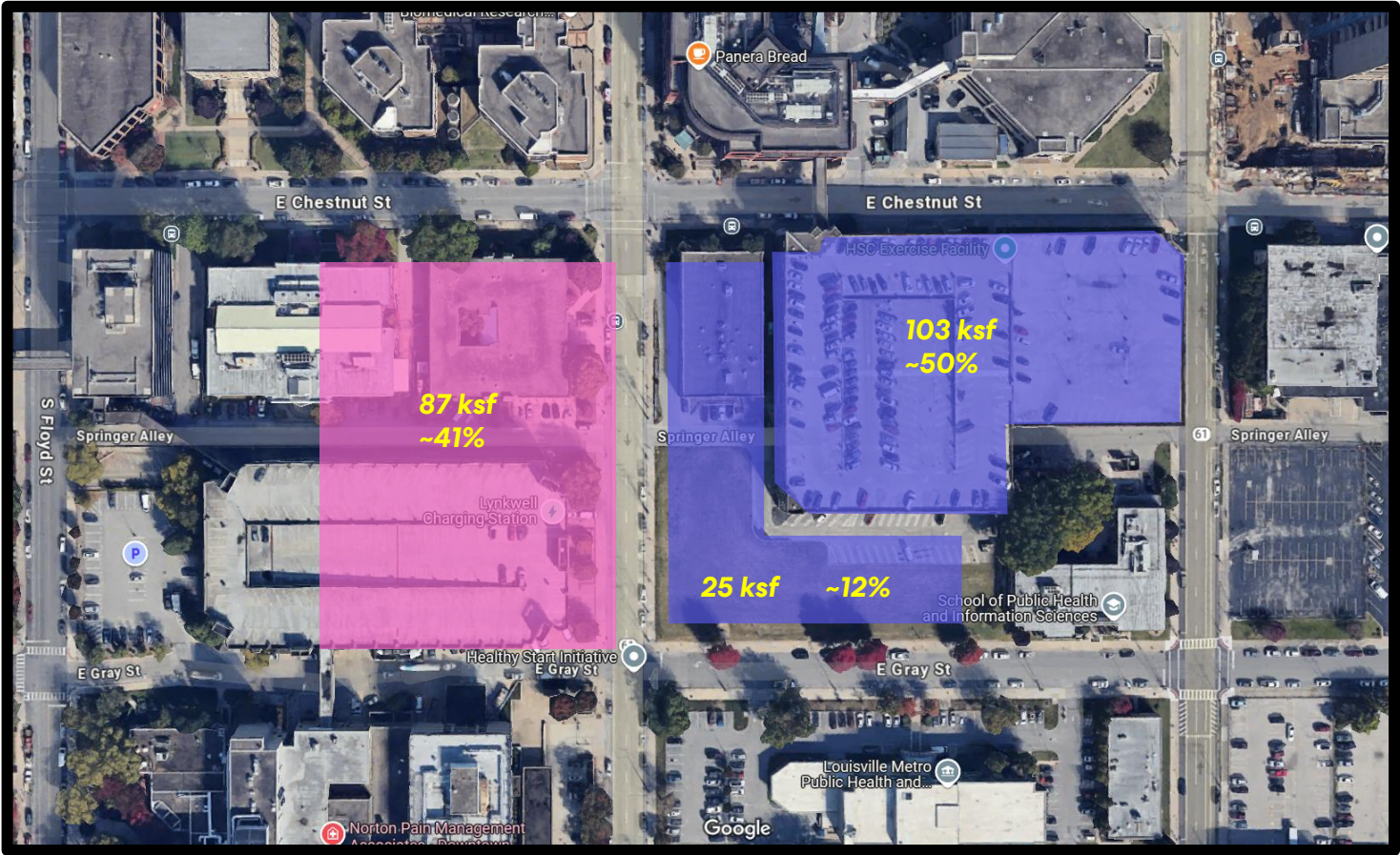
AHU w/ VAV

High Performance

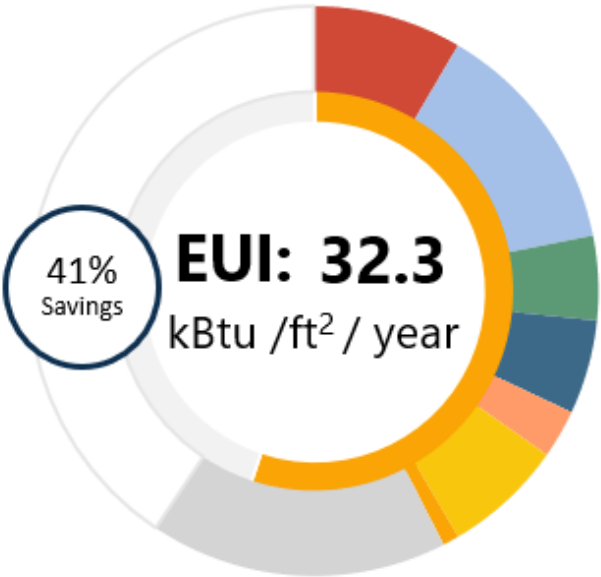
High Performance

High Performance

High Performance



Iteration 4 – Geothermal & Chilled Beam



End Use	EUI	%
Heating	4.6	14%
Cooling	7.3	23%
Fans	2.6	8%
Pumps	2.9	9%
DHW Electricity	1.5	5%
Int. Lighting	3.7	11%
Ext. Lighting	0.5	2%
Recpetacle	9.2	28%
Cooking	0.0	0%
Refrigeration	0.0	0%
Process	0.0	0%
Savings	22.1	
New EUI	32.3	

5%
5%
41%

- Plant CW

Plant HW

Ventilation

Space Conditioning

Glass

Envelope

Infiltration

Lighting
- Geo Water/Water HP

Geo Water/Water HP

DOAS w/ Chilled Beam

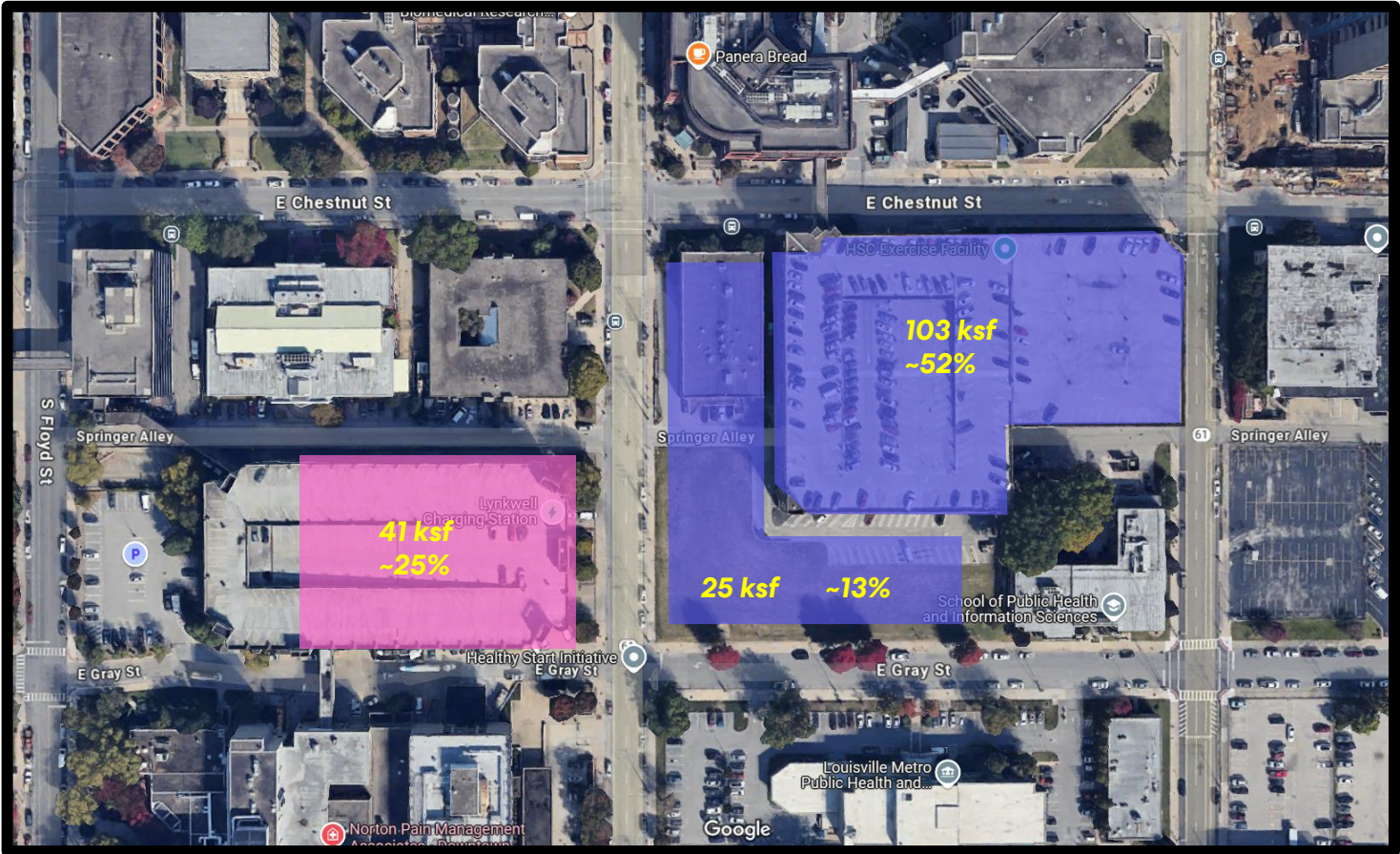
Chilled Beam

High Performance

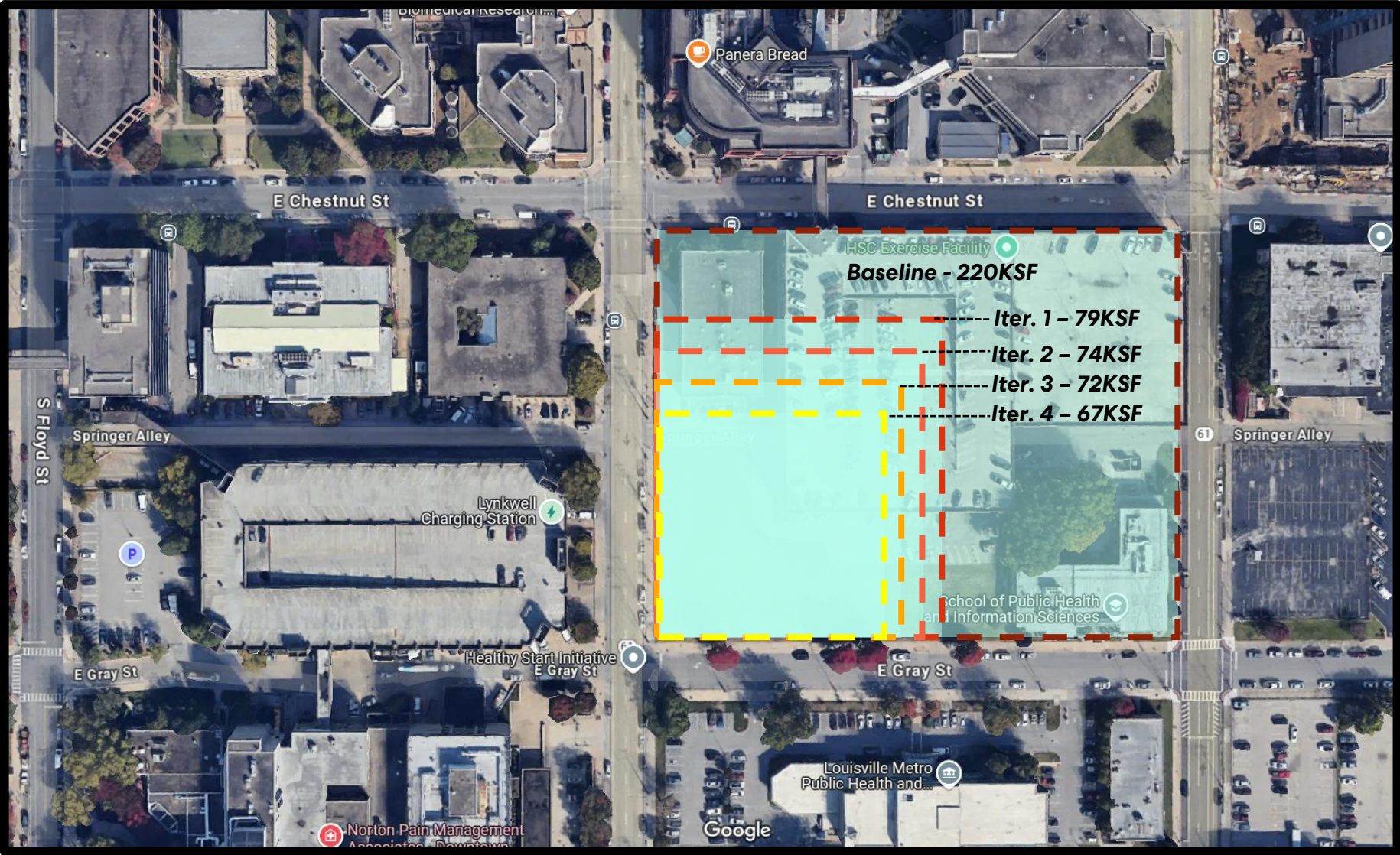
High Performance

High Performance

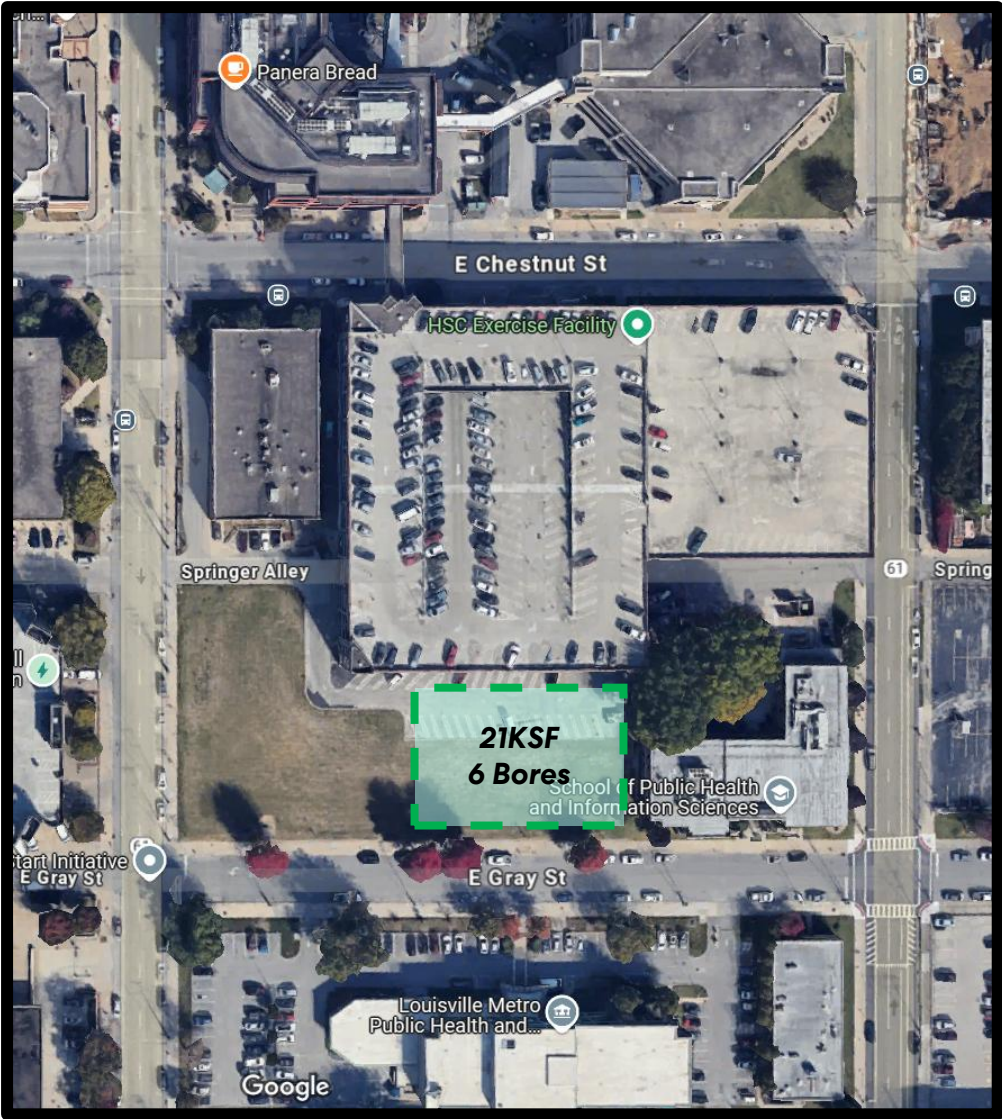
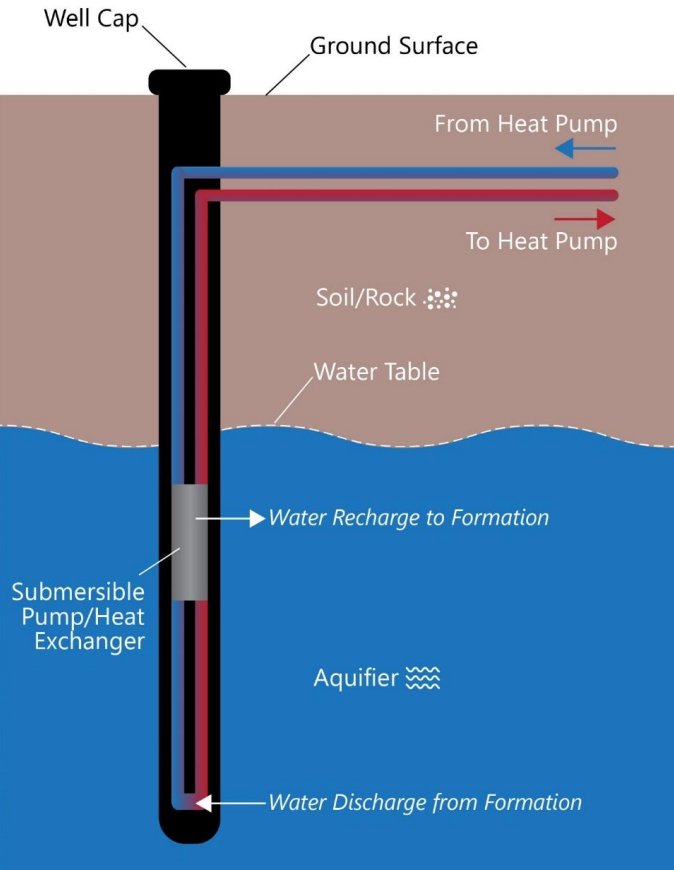
High Performance



Site Geothermal Sizing Analysis



Site Geothermal Sizing Analysis

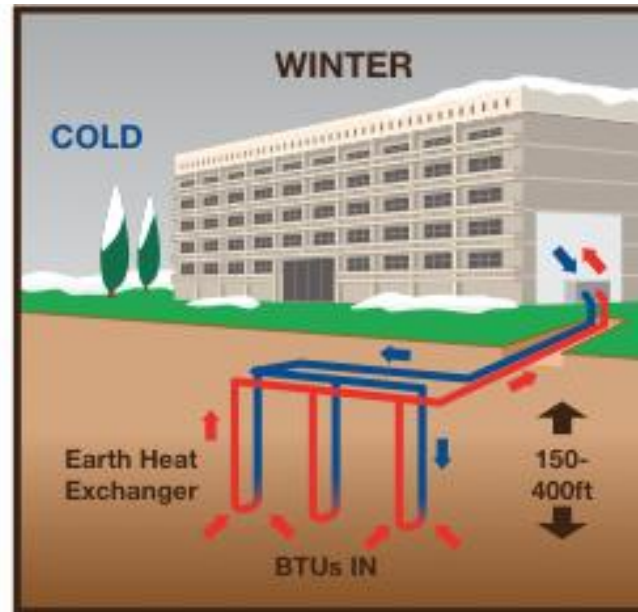
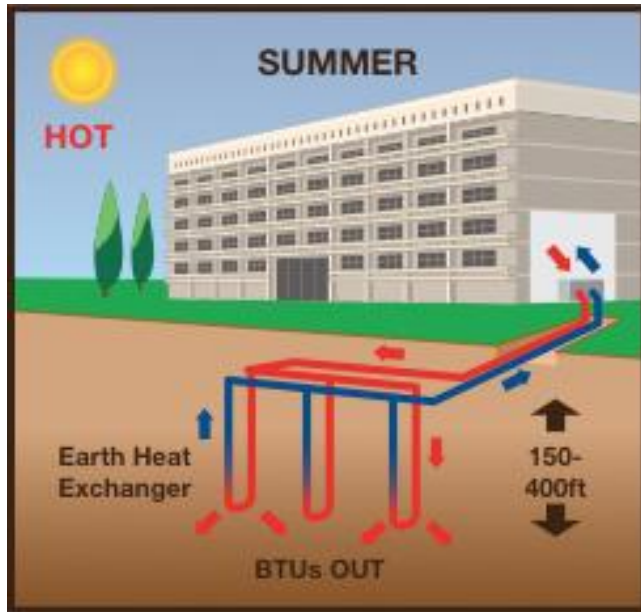


High Performance Sustainable Systems

- Use the ground as heat sink
- Heat recovery systems to maximize efficiency



Solar Ready



Aquifer based Geo-exchange



Heat Pumps

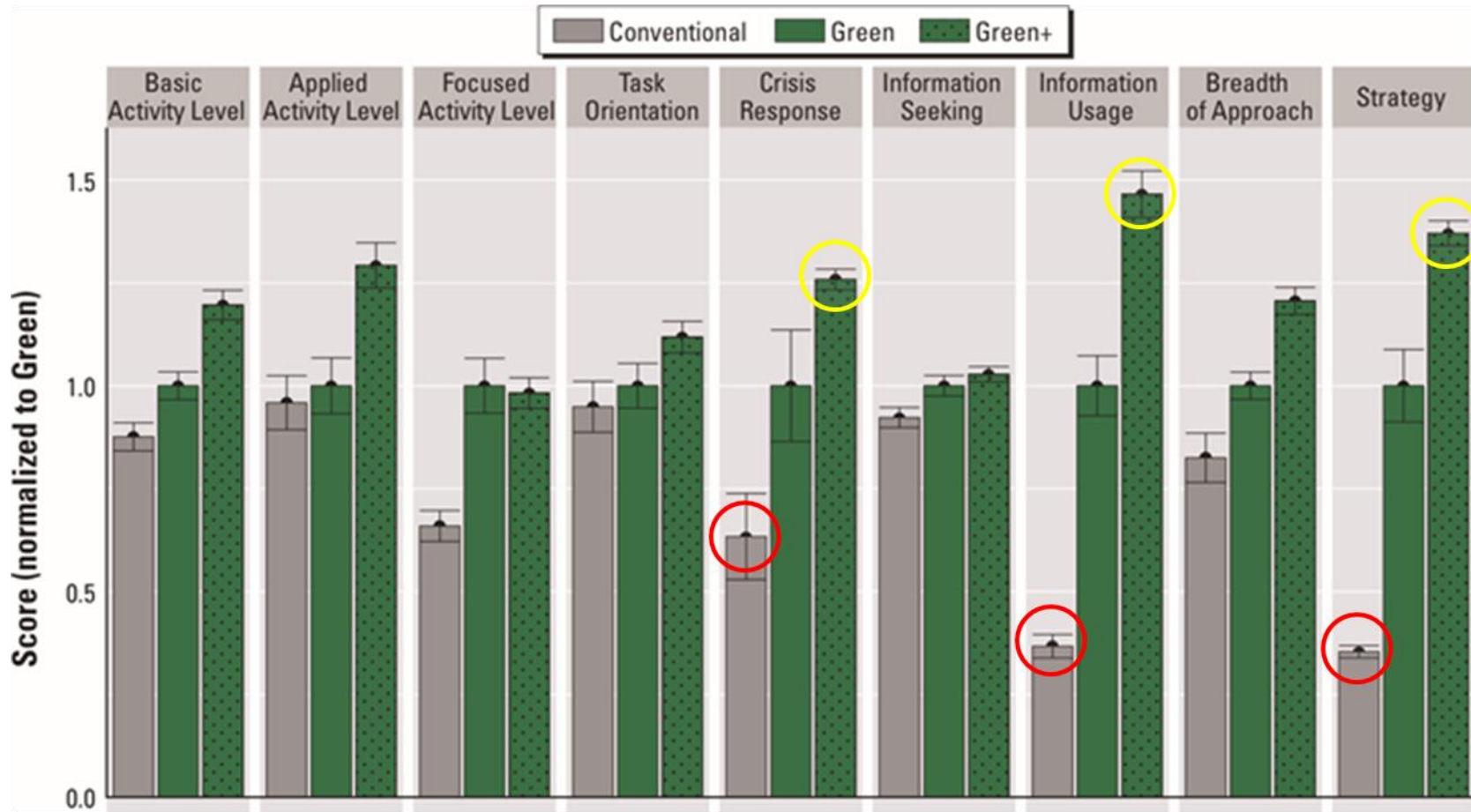




INDOOR ENVIRONMENTAL QUALITY (Human Health)

Indoor Air Quality

Cognitive Performance Impact



NASA concluded astronauts were NOT FOLLOWING DIRECTIONS as CO₂ levels increased

Indoor Air Quality – Triple Bottom Line Success



Social

Optimize Indoor Air Quality and Pandemic Resilience – Student Success



TOOLBOX

Filtration

Air Changes

Ventilation

**Material
Selection**

**Tight Building
Envelope**

**Positive
Pressure**



Economic

**Tight Envelope Reduces Energy
Costs & HVAC System First Costs**

**Shift Cost Saving to Increased Ventilation,
Enhanced Filtration & Material Selection**



Environmental

Reduced Energy Consumption

Reduced Production of Materials

Reduced Refrigerants Used



THANK YOU!