Massachusetts School Building Authority

FONTAINE + DIMEO

AECOM TISHMAN

LPA | A

OUR TEAM

KATIE CROCKETT | ROB PARA JR. | CHRIS LEE | CHRISTINA BAZELMANS

ARCHITECT | LAMOUREUX PAGANO & ASSOCIATES ARCHITECTS

CHRIS SCHAFFNER | CARRIE HAVEY | ANTHONY HARDMAN | JACOB SAVONA

SUSTAINABILITY CONSULTANT | THE GREEN ENGINEER

KEVIN SEAMAN

MECHANICAL ENGINEER | SEAMAN ENGINEERING CORP.

AZIM RAWJI

ELECTRICAL ENGINEER | ART ENGINEERING

LYNNE GIESECKE | LAUREN SCHUNK

LANDSCAPE ARCHITECT | STUDIO 2112

MATT BRASSARD

CIVIL ENGINEER | NITSCH ENGINEERING

SUSTAINABILITY WORKSHOP 10/5

WORCESTER PUBLIC SCHOOLS

SCHOOLS & PROGRAMS · PORTALS · CONTACT · CALENDAR & EVENTS · ENROLL

Academics · Activities · Current Families · Student Support · About

Doherty Memorial High School Building Project

Home \ Doherty Memorial High School Building Project

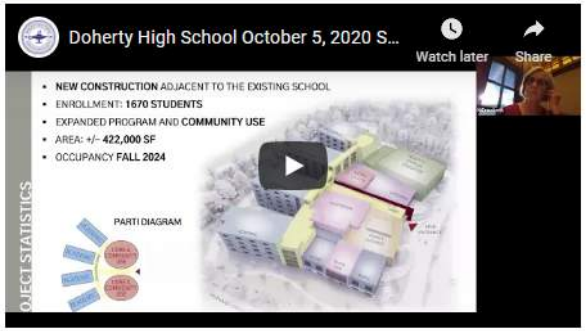
Doherty Memorial High School MSBA Feasibility Study Preferred Schematic Report (PDF). (Very Large File)

News | Meeting Minutes | Community Feedback | Preliminary Design Program

December 23, 2020

October 5, 2020 Public Sustainability Workshop Summary:

- LPAAVExecutive Summary (PDF)
- Sustainability Workshop Presentation (PDF)
- Recording of Sustainability Workshop:



DOHERTY HIGH

- 2020 Doherty High School Graduates
- Advanced Placement
- Alumni Transcript Request Form (PDF)
- Athletics
- DHS Student Schedule – Two Week Cycle (PDF)
- Doherty Memorial High School Building Project
- Engineering and Technology Academy (ETA)
- Guidance
- Health Center
- Library
- Student Athlete Program
- Voting PSA

Instructional Focus

TOPIC 1:

ENERGY

- Fossil Fuel Reduction
- Emergency Resilience
- Renewable Energy
- Future Battery Storage

TOPIC 2:

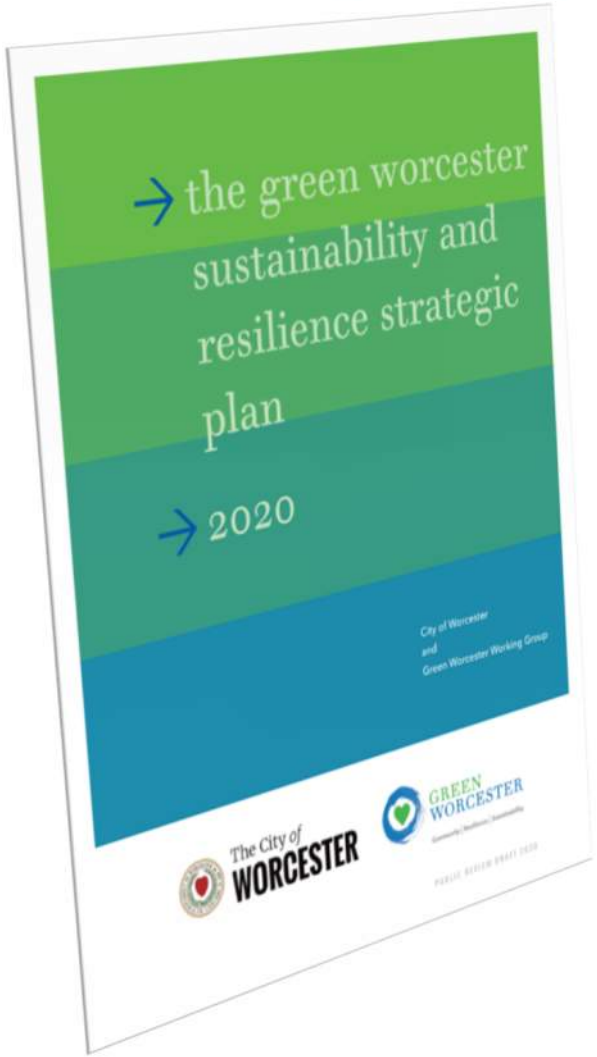
SITE

- Tree Removal / Replacement Strategy
- Biodiversity
- Heat Island Effect
- Pedestrian, Bike and Micro-Mobility

GREEN WORCESTER PLAN

GREEN WORCESTER

Community | Resilience | Sustainability

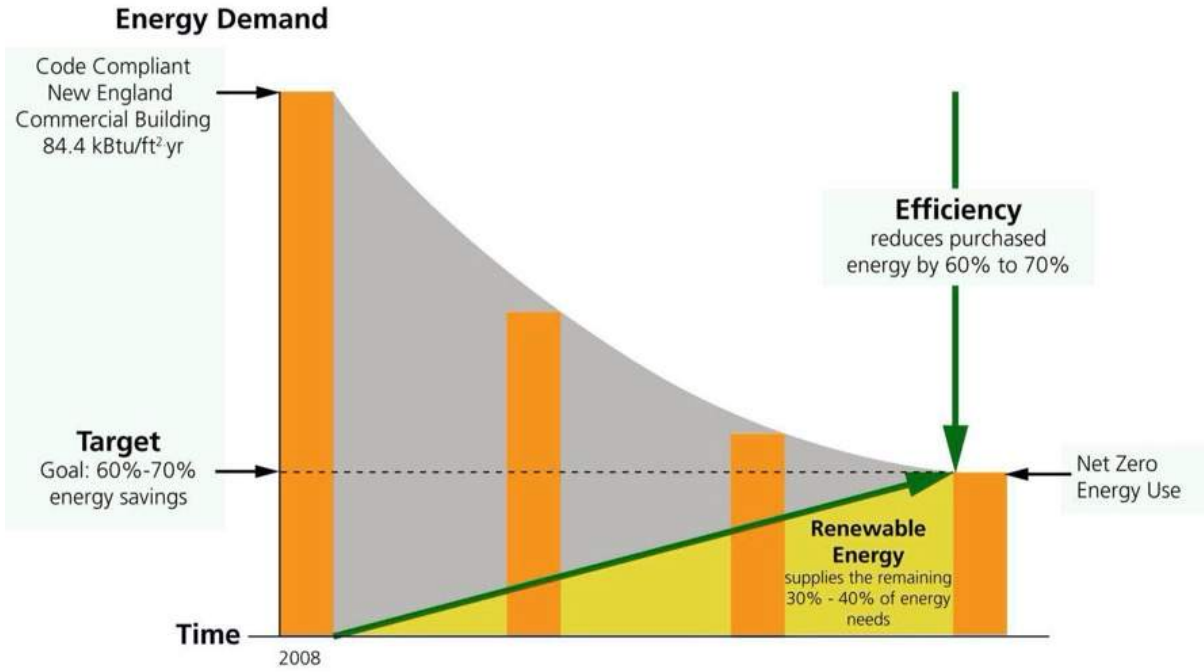


LOW/ ZERO CARBON

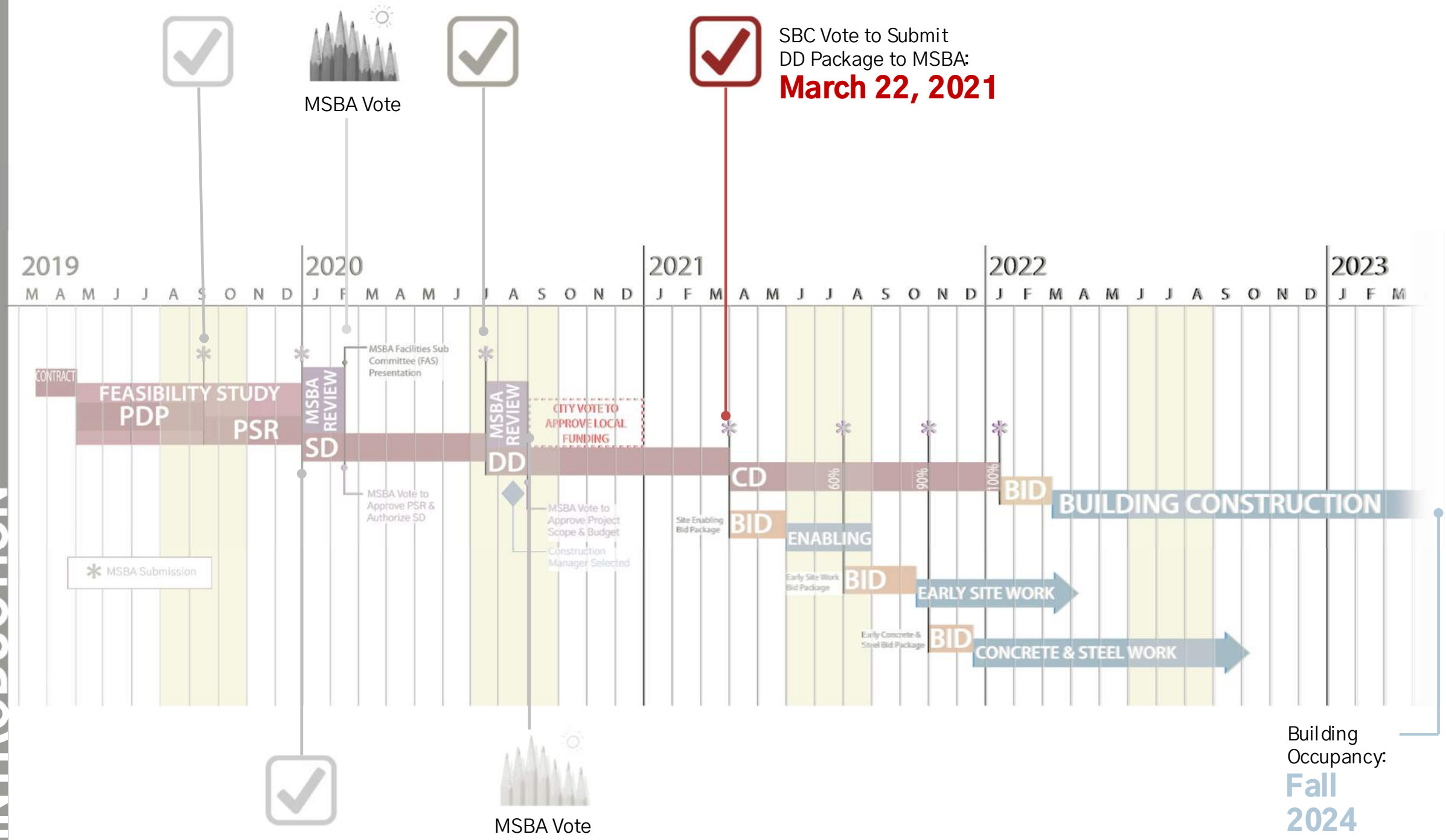
Pathways to Low/Zero Carbon

- Low EUI
- Decarbonization of Heat
- Solar on Site
- Community Renewables

General Approach



Source: Federal R&D Agenda for Zero-Net Energy high Performance Green Buildings, National Science and Technology Council, October 2008


MSBA Vote
SBC Vote to Submit
DD Package to MSBA:
March 22, 2021
2019
2020
2021
2022
2023
M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M
CONTRACT
FEASIBILITY STUDY
PDP
PSR
MSBA REVIEW
SD
MSBA Facilities Sub Committee (FAS) Presentation
MSBA REVIEW
DD
CITY VOTE TO APPROVE LOCAL FUNDING
MSBA Vote to Approve PSR & Authorize SD
MSBA Vote to Approve Project Scope & Budget
Construction Manager Selected
CD
60%
90%
100%
BID
BUILDING CONSTRUCTION
Site Enabling Bid Package
BID
ENABLING
Early Site Work Bid Package
BID
EARLY SITE WORK
Early Concrete & Steel Bid Package
BID
CONCRETE & STEEL WORK
MSBA Submission
MSBA Vote
Building Occupancy:
Fall 2024

PROJECT UPDATE

1. LEED VERSION 4
   BUILDING DESIGN & CONSTRUCTION:
   SCHOOLS
   (MSBA REQUIRES MINIMUM LEED "CERTIFIED" RATING)

2. EXCEED MA ENERGY CODE BY
   MINIMUM 20%
   (USING OPTIMIZE ENERGY PERFORMANCE CREDIT)

3. TARGETING LEED SILVER
   CERTIFICATION
   (50–59 POINTS)

TOPIC 1:
ENERGY

- Fossil Fuel Reduction
- Emergency Resilience
- Renewable Energy
- Future Battery Storage

BASELINE SUSTAINABLE FEATURES

800 kW | ELECTRICITY TARGET PROVIDED BY ROOFTOP SOLAR PV ARRAY

ENERGY USE REDUCTION BEYOND CODE BASELINE | **±35%**

38 Kbtu /SF /yr | TARGET SITE ENERGY USE INTENSITY (EUI)

R VALUES OF SUPER-INSULATED WALLS/ROOF | **25 WALL / 45 ROOF**

BASELINE SUSTAINABLE FEATURES

HIGH PERFORMANCE ENVELOPE

Super-insulation & high performance glazing allows for a reduction in HVAC equipment sizes

ENHANCED ACOUSTIC PERFOMANCE

Reduced background noise for optimized learning environment with acoustic separation between classrooms

FLEXIBLE TECHNOLOGY

Robust technology infrastructure to adapt to remote learning / changing teaching methods

HEALTHY MATERIALS

Low-emitting, durable materials with high recycled content

DISPLACEMENT CHILLED BEAM SYSTEM

Improved efficiency, indoor air quality and comfort with reduced ambient noise and airborne contaminants

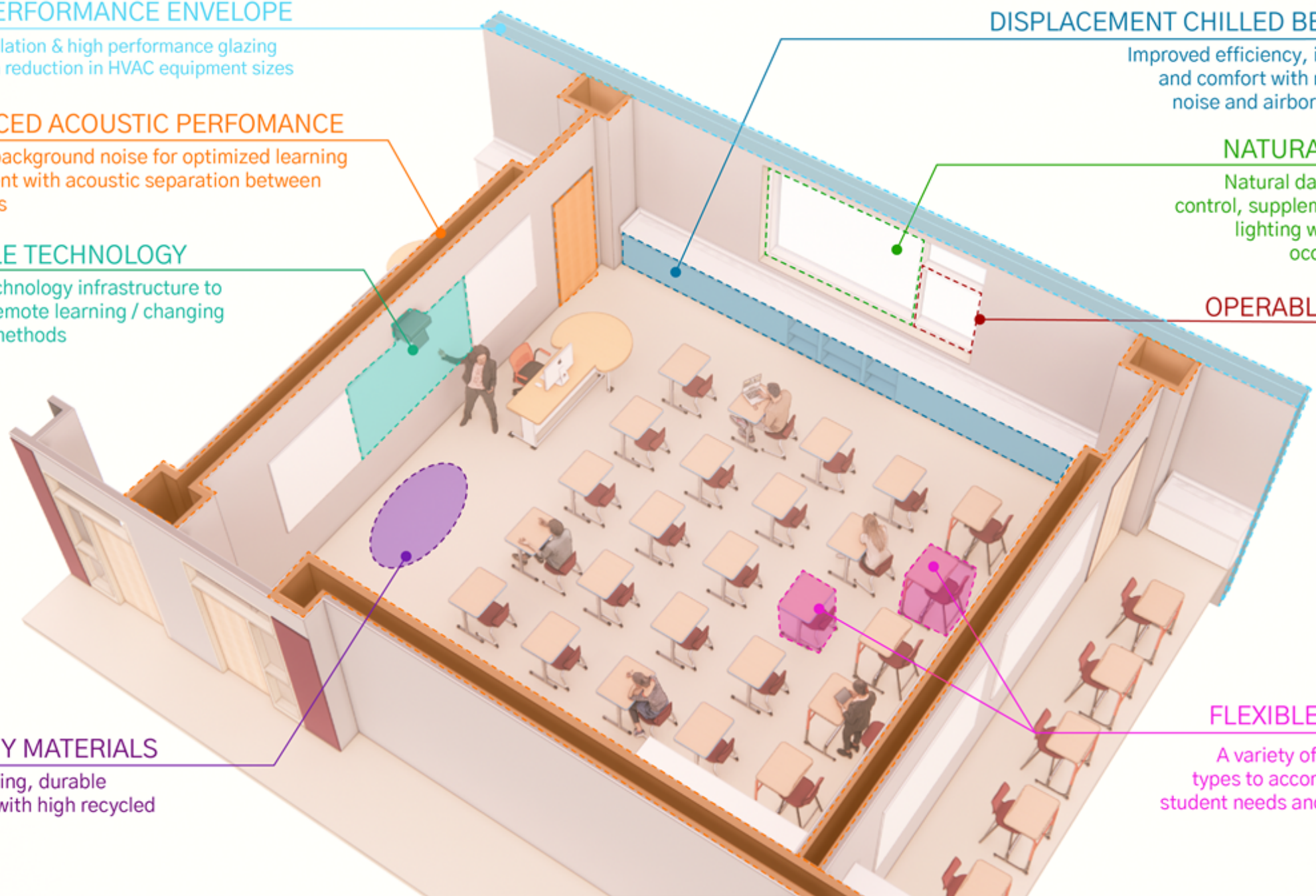
NATURAL DAYLIGHT

Natural daylight with glare control, supplemented with LED lighting with daylight and occupancy sensors

OPERABLE WINDOWS

FLEXIBLE FURNITURE

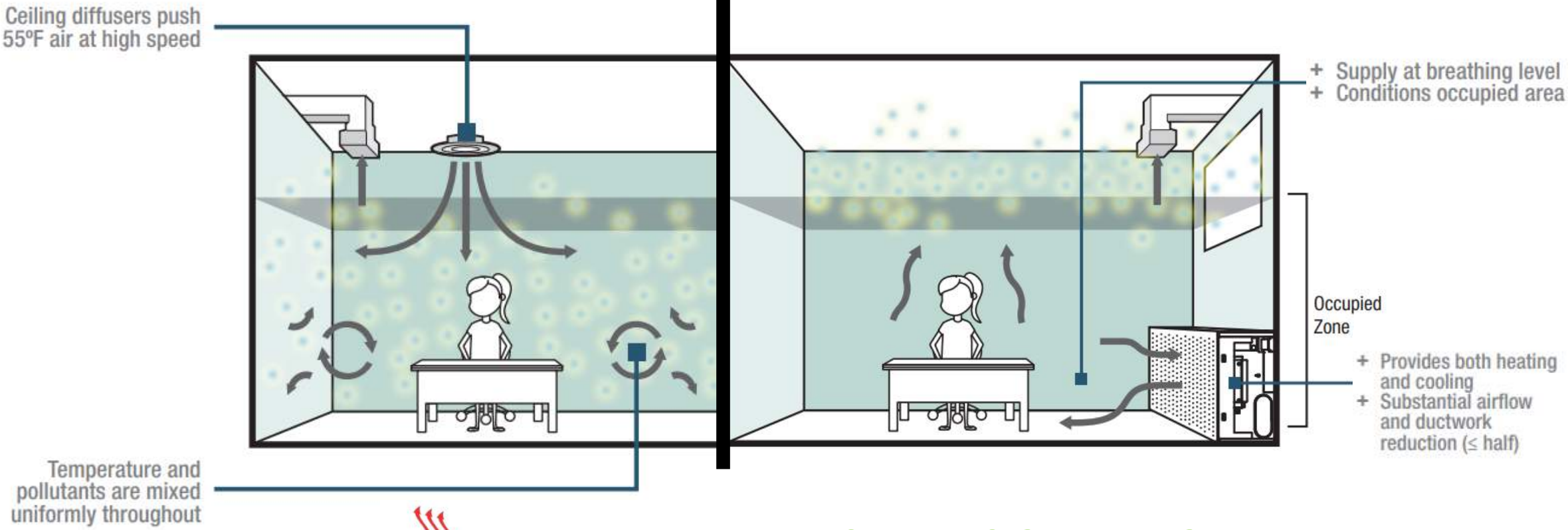
A variety of mobile furniture types to accommodate diverse student needs and teaching styles

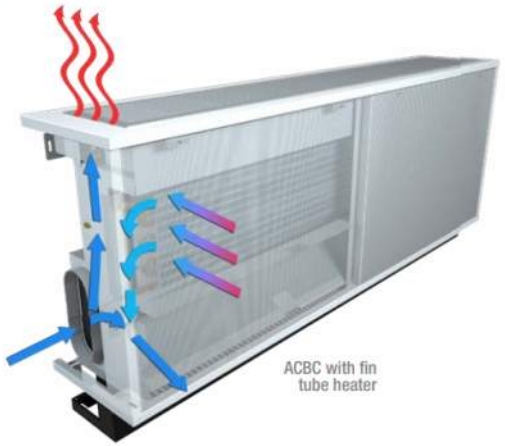


BASELINE SUSTAINABLE FEATURES

TRADITIONAL MIXING VENTILATION

DISPLACEMENT CHILLED BEAM CABINETS

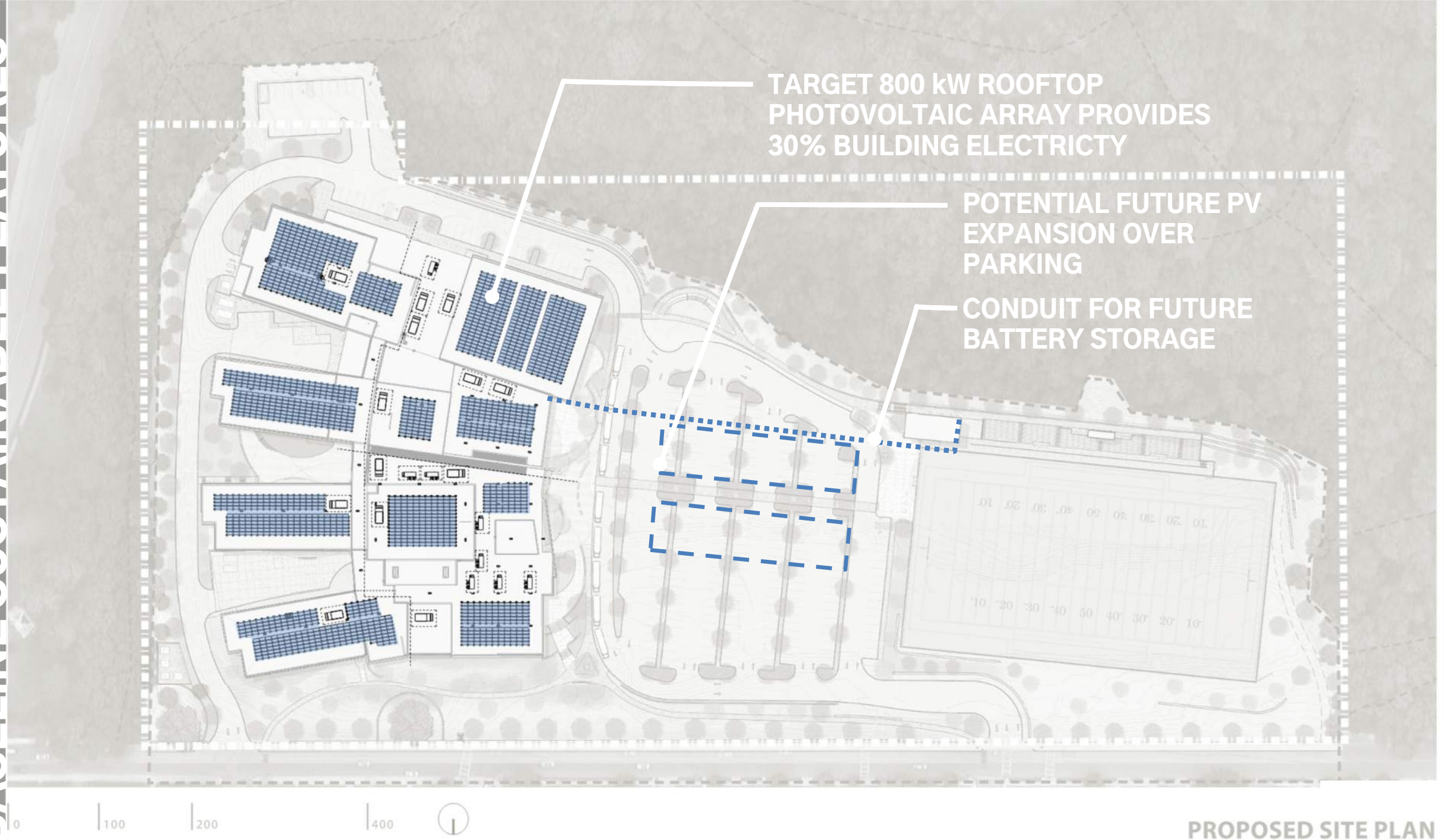




- ✓ LOWER NOISE LEVELS
- ✓ LOWER MAINTENANCE
- ✓ HIGHER INDOOR AIR QUALITY
- ✓ IMPROVED THERMAL COMFORT
- ✓ MORE EFFICIENT
- ✓ LOWER OPERATING COSTS

Graphics from Price Industries

BASELINE SUSTAINABLE FEATURES



PROPOSED SITE PLAN

KEY DESIGN FACTORS

1. SUSTAINABILITY OF MAINTENANCE
(MINIMIZE STAFFING / FUNDING RESOURCES REQUIRED)

2. INITIAL & LONG-TERM COSTS
(CONSTRUCTION / UTILITY COSTS)

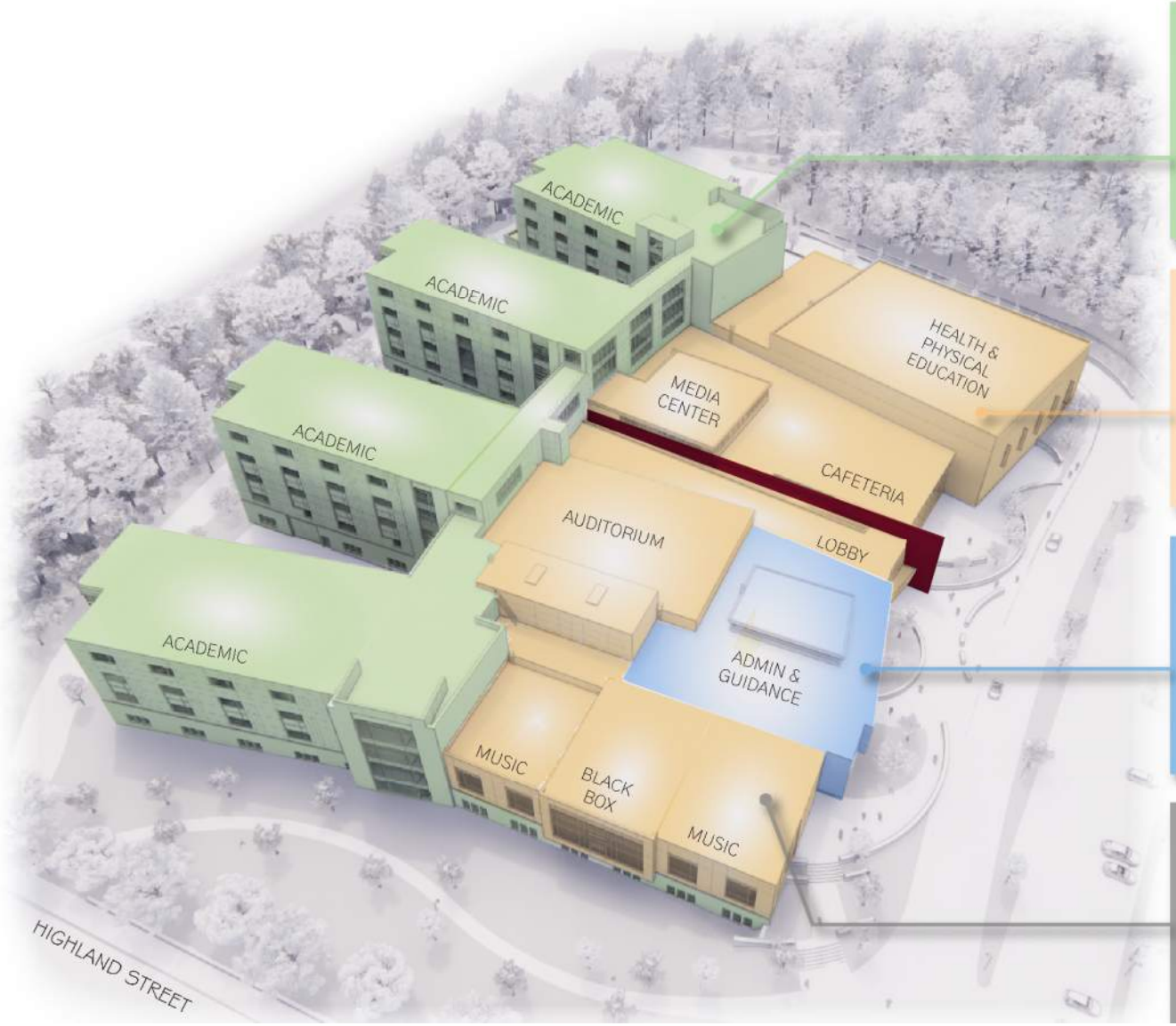
3. APPROPRIATE SYSTEM FOR A LEARNING ENVIRONMENT
(INDOOR AIR QUALITY AND NOISE REDUCTION CONSIDERATIONS)

4. EMERGENCY RESILIENCE
(REDUNDANT FUEL SOURCES / FUNCTION AS A WARMING SHELTER)

INITIAL STUDY

		"As Designed"	Hybrid	Design Adjustments to Reduce Gas Load	Full Electric-No Fossil Fuels	Full Electric-No Fossil Fuels
		BASELINE	FUTURE CONVERSION	REDESIGN	ELECTRIC BOILERS	ALL VRF
Project Area (ft^2)		421,858	421,858	421,858	421,858	421,858
Discount Rate		2.50%	2.50%	2.50%	**2.50%**	**2.50%**
Expected Service Life (n) - HVAC		20.0	20.0	20	20	15
Initial Costs	Install Cost HVAC ($) 3	$ 21,012,747	$ 21,223,676	$ 21,645,534	$ 21,434,605	$ 20,590,889
	Additional Costs Electrical ($) 3	$ 0	$ 0	$ 1,500,000	$ 2,500,000	$ 2,500,000
	Total Initial Costs ($)	**$ 21,012,747**	**$ 21,223,676**	**$ 23,145,534**	**$ 23,934,605**	**$ 23,090,889**
Operating Costs	Annual Maintenance Costs ($)	$97,027	$ 97,027	$ 118,120	$ 97,027	$ 139,213
	Natural Gas Cost ($)2	$49,054	$ 46,110	$ 12,263	$ 0	$ 0
	Electricity Cost ($)1	$513,451	$ 519,408	$ 602,811	$ 662,925	$ 619,253
	Total Annual Operating Cost ($)	**$659,532**	$ 662,546	$ 733,194	$ 759,953	$ 758,466
TEAC Calcs	Annual Operating Cost ($)	$ 659,532	$ 662,546	$ 733,194	$ 759,953	$ 758,466
	Amortized Cost - HVAC + Electrical	$ 1,347,907	$ 1,361,438	$ 1,469,913	$ 1,510,658	$ 1,798,743
Total Equivalent Annual Cost ($)		**$ 2,007,439**	**$ 2,023,984**	**$ 2,203,107**	**$ 2,270,611**	**$ 2,557,209**
TEAC (Incremental Cost/SF)		**$ 4.76**	**$ 4.80**	**$ 5.22**	**$ 5.38**	**$ 6.06**
Electricity Consumption (kWh)		**3,111,823**	**3,147,928**	**3,653,398**	**4,017,729**	**3,753,047**
Gas Consumption (therms)		**54,504**	**51,234**	**13,626**	**0**	**0**
GHG Emissions (MTCO2e) - Energy Star Carbon Factors		**1031**	**1023**	**943**	**958**	**895**
GHG Emissions (MTCO2e) - 40% Green Power		**586**	**572**	**421**	**383**	**358**
GHG Emissions (MTCO2e) - 100% Green Power		**289**	**272**	**72**	**0**	**0**
Source Energy Use Intensity (kBTU/SF)		**83.8**	**83.8**	**85.8**	**90.7**	**84.7**
Site Energy Use Intensity (kBTU/SF) 4		**38.0**	**37.5**	**32.7**	**32.4**	**30.2**

DD HVAC DESIGN UPDATES

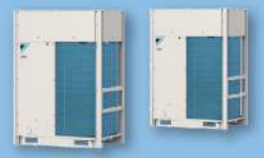


DISPLACEMENT CHILLED BEAMS WITH HYDRONIC HEAT & DEDICATED OUTDOOR AIR HEAT PUMP SYSTEM

SUPERIOR VENTILATION EFFECTIVENESS & INDOOR AIR QUALITY

AIR SOURCE HEAT PUMP ROOF TOP UNITS

HYDRONIC HEAT BACK-UP



VARIABLE REFRIGERANT FLOW (VRF) HEAT PUMPS WITH DEDICATED OUTDOOR AIR HEAT PUMP SYSTEM

IMPROVED INDIVIDUAL ZONE CONTROL

AIR COOLED HEAT RECOVERY CHILLER / HEATER

SIMULTANEOUS HOT AND COLD WATER FOR ALL BUILDING SYSTEMS

BASELINE SUSTAINABLE ENVELOPE / SYSTEMS

+ HEAT RECOVERY CHILLER

+ VRF HEAT PUMPS

+ AIR SOURCE HEAT PUMP RTU'S

85% REDUCTION

IN PROJECTED FOSSIL FUEL USE

PRELIMINARY CALCULATIONS

		Baseline	REDESIGN - DD
Project Area (ft^2)		421,858	421,858
Discount Rate		2.50%	2.50%
Expected Service Life (n) - HVAC		20.0	19
Initial Costs	Install Cost HVAC ($) 3	$ 21,012,747	$ 21,856,463
	Additional Costs Electrical ($) 3	$ 0	$ 1,500,000
	Total Initial Costs ($)	**$ 21,012,747**	**$ 23,356,463**
Operating Costs	Annual Maintenance Costs ($)	$97,027	$ 126,557
	Natural Gas Cost ($)2	$49,054	$ 7,358
	Electricity Cost ($)1	$513,451	$ 589,182
	Total Annual Operating Cost ($)	**$659,532**	$ 723,097
TEAC Calcs	Annual Operating Cost ($)	$ 659,532	$ 723,097
	Amortized Cost - HVAC + Electrical	$ 1,347,907	$ 1,540,565
Total Equivalent Annual Cost ($)		**$ 2,007,439**	**$ 2,263,662**
TEAC (Incremental Cost/SF)		**$ 4.76**	**$ 5.37**
Electricity Consumption (kWh)		**3,111,823**	**3,570,798**
Gas Consumption (therms)		**54,504**	**8,176**
GHG Emissions (MTCO2e) - Energy Star Carbon Factors		**1031**	**895**
GHG Emissions (MTCO2e) - 40% Green Power		**586**	**384**
GHG Emissions (MTCO2e) - 100% Green Power		**289**	**43**
Source Energy Use Intensity (kBTU/SF)		**83.8**	**82.6**
Site Energy Use Intensity (kBTU/SF) 4		**38.0**	**30.7**

TOPIC 2:
SITE

- Tree Removal and Replacement Strategy
- Biodiversity
- Heat Island Effect
- Pedestrian, Bike and Micro-Mobility

KEY SITE FEATURES

1. INCREASED BIODIVERSITY

(REMOVE INVASIVE SPECIES / AVOID ASIAN LONGHORN BEETLE SUSCEPTIBLE PLANTINGS)

2. EXCEED EXISTING CANOPY WITHIN 10 YEARS

(150,000 SF OF NEW TREE CANOPY, 12% INCREASE FROM EXISTING CANOPY)

3. HEAT ISLAND REDUCTION STRATEGIES

(WHITE ROOF, INCREASED TREE CANOPY, PARKING BELOW BUILDING)

4. PERMEABLE SYNTHETIC TURF FIELD

(HIGHER UTILIZATION, LOWER MAINTENANCE THAN NATURAL TURF)

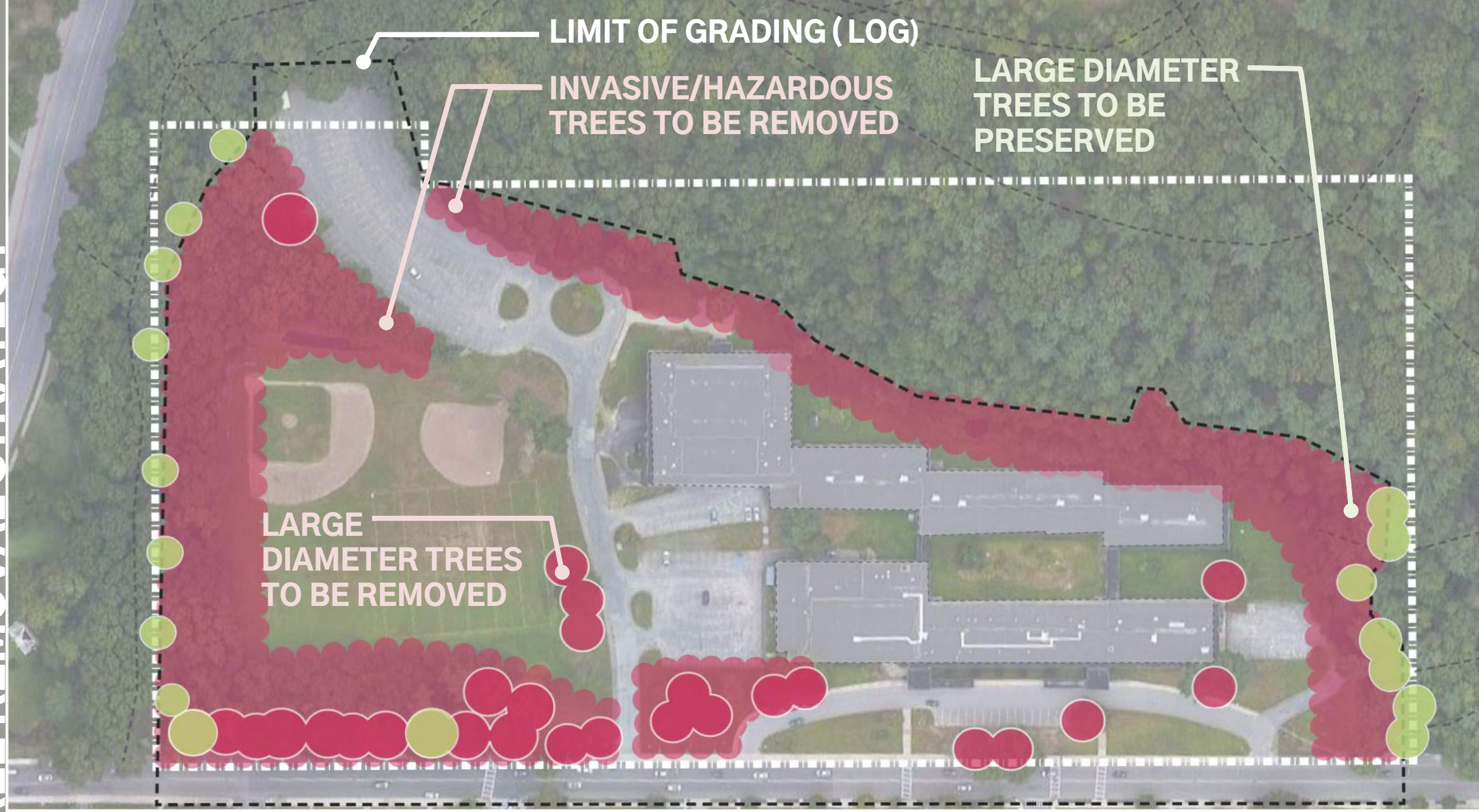
PROPOSED TREE CANOPY

+300 | NEW TREES WILL BE PLANTED AS PART OF THE PROJECT SCOPE

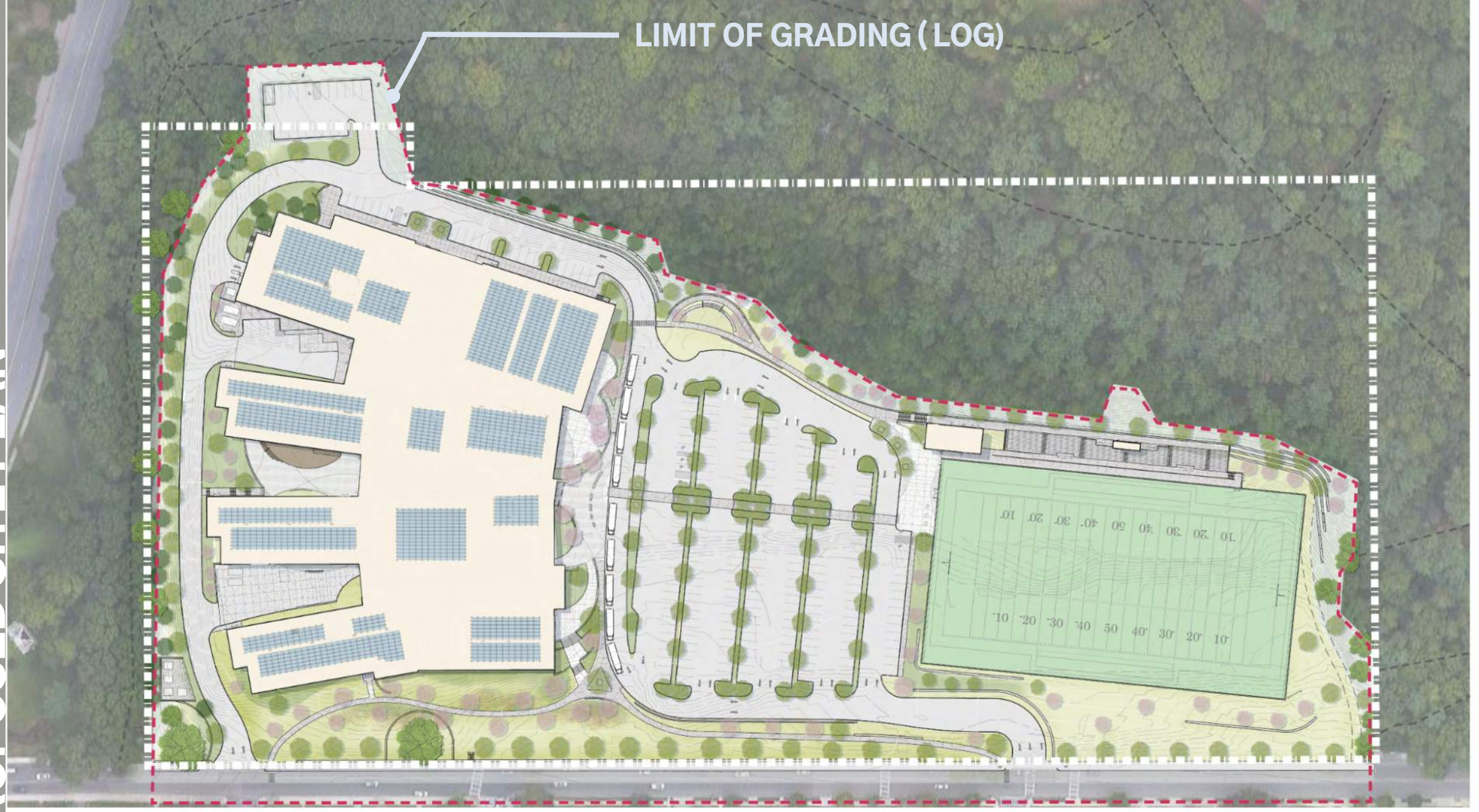
AREA OF TREE CANOPY AFTER 10 YEARS OF GROWTH (WITHIN LIMIT OF GRADING) | **150,000 SF**

+12% | INCREASE IN TREE CANOPY COVERAGE AFTER 10 YEARS OF GROWTH

TREE REMOVAL STRATEGY



PROPOSED SITE PLAN

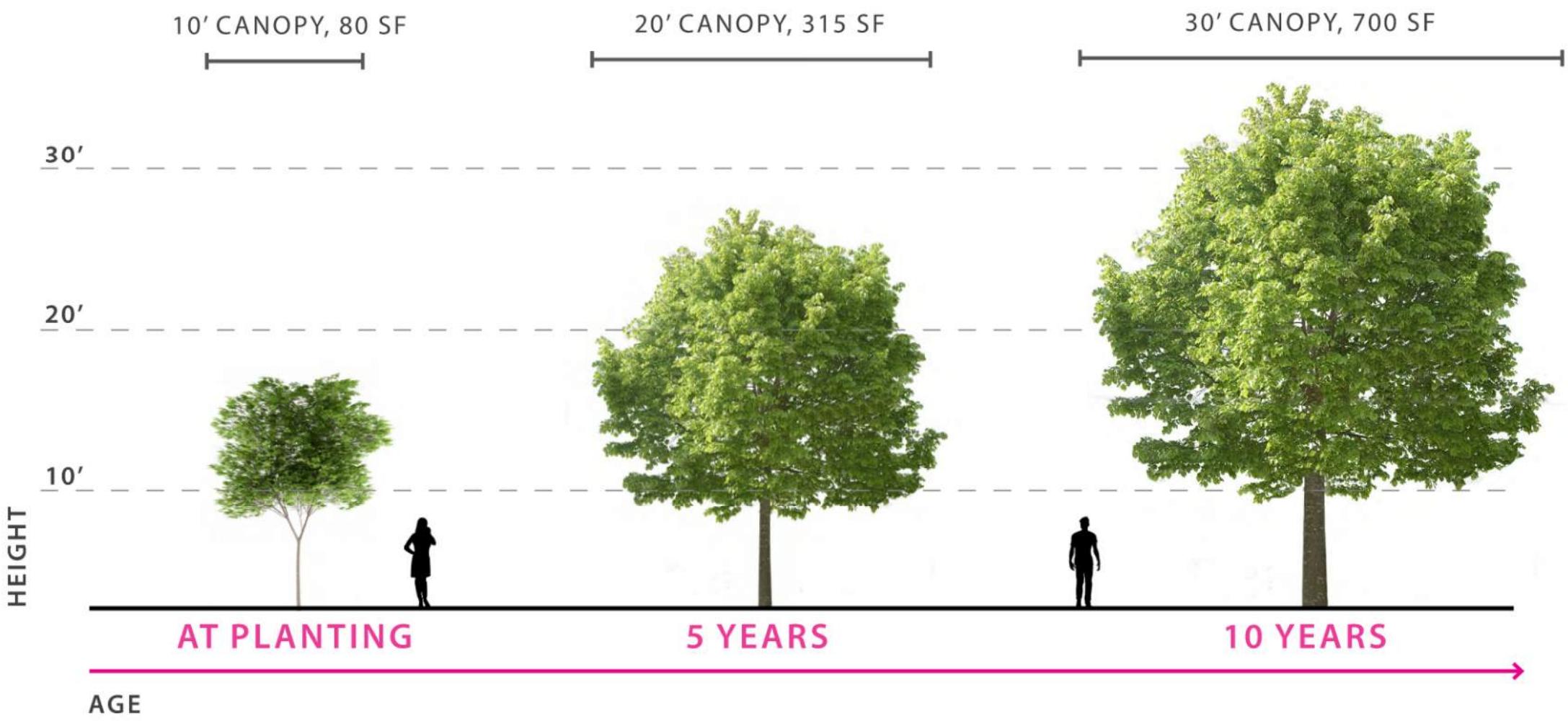


PROPOSED SITE PLAN

NEW TREES PLANTED

PROPOSED SITE PLAN

CANOPY GROWTH



TREE CANOPY STAGES

BIODIVERSITY

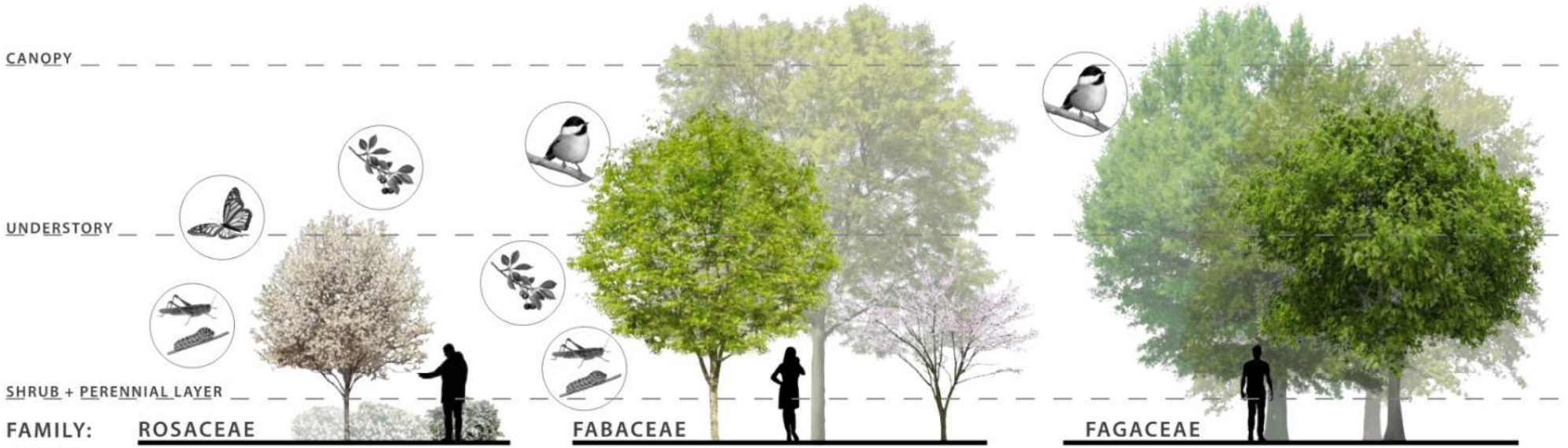
HABITAT LEGEND:

- BIRDS
- FRUITING SPECIES
- POLLINATORS
- LARVAL HOST

<10%
OF ANY SPECIES

<20%
OF ANY GENUS

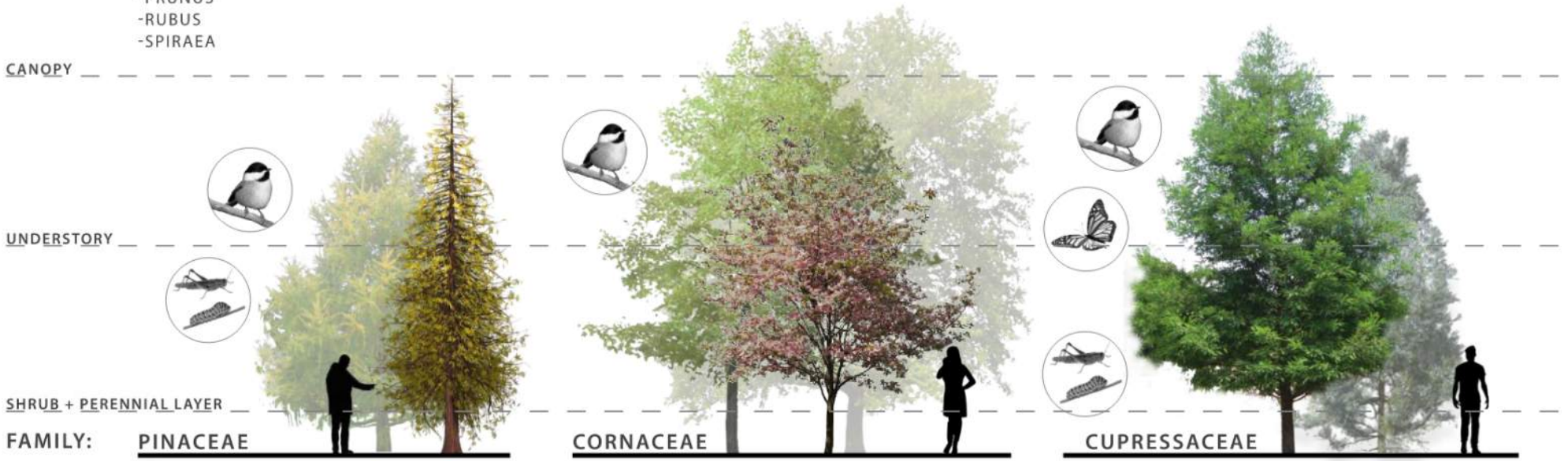
<30%
OF ANY FAMILY



FAMILY: ROSACEAE
GENUS:
-AMELANCHIER
-CRATAEGUS
-MALUS
-PRUNUS
-RUBUS
-SPIRAEA

FABACEAE
-CERCIS
-CLADRASTIS
-GLEDITSIA

FAGACEAE
-FAGUS
-QUERCUS



FAMILY: PINACEAE
GENUS:
-ABIES
-LARIX
-PICEA
-PINUS

CORNACEAE
-CORNUS
-NYSSA

CUPRESSACEAE
-JUNIPERUS
-METASEQUOIA
-TAXODIUM

10-20-30 GOAL

HEAT ISLAND REDUCTION

61,600 SF

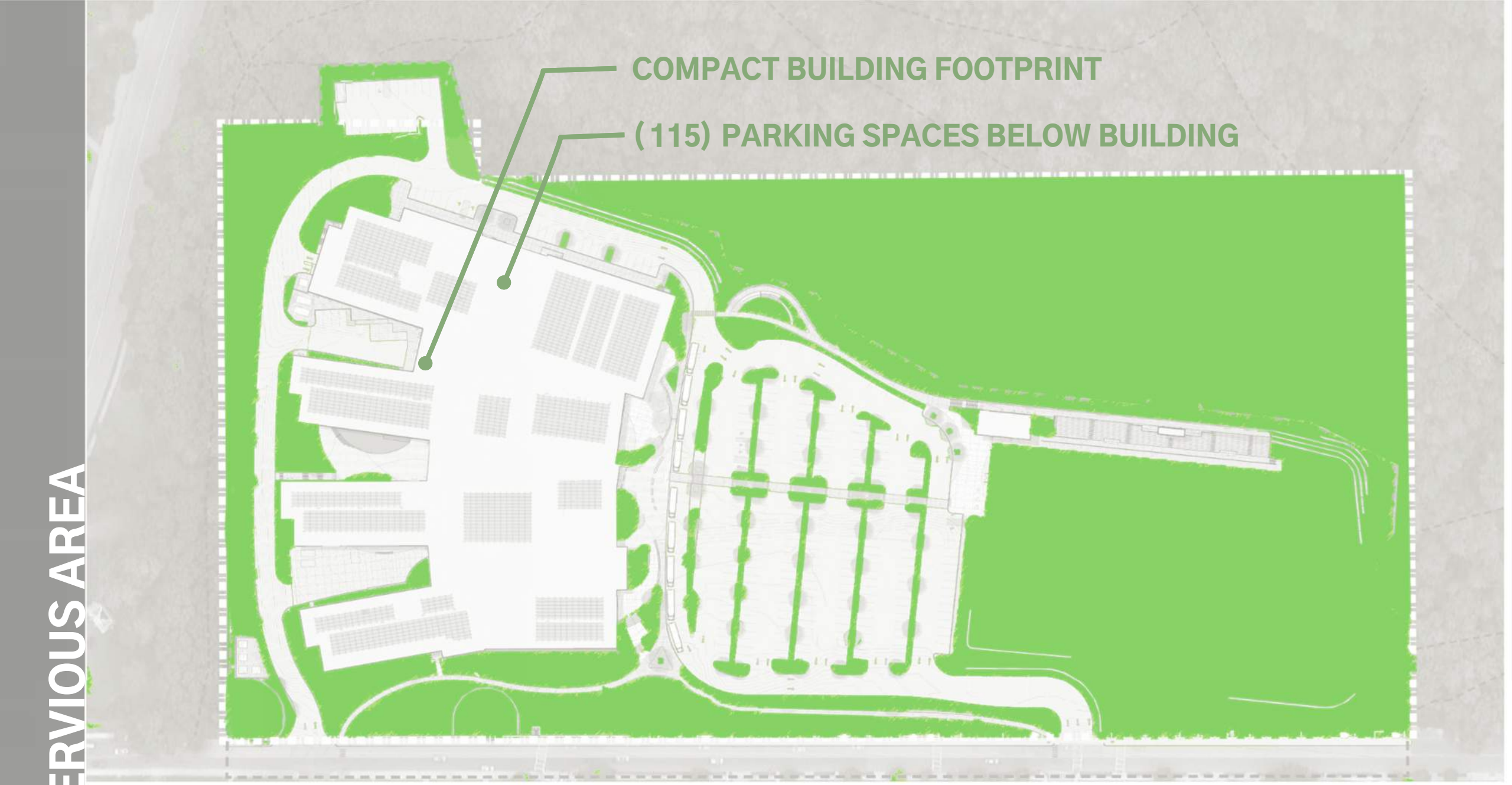
HIGH REFLECTANCE CONCRETE PAVERS & SIDEWALKS

SOLAR REFLECTANCE INDEX (SRI) LIGHT COLORED ROOF

82 SRI ROOF

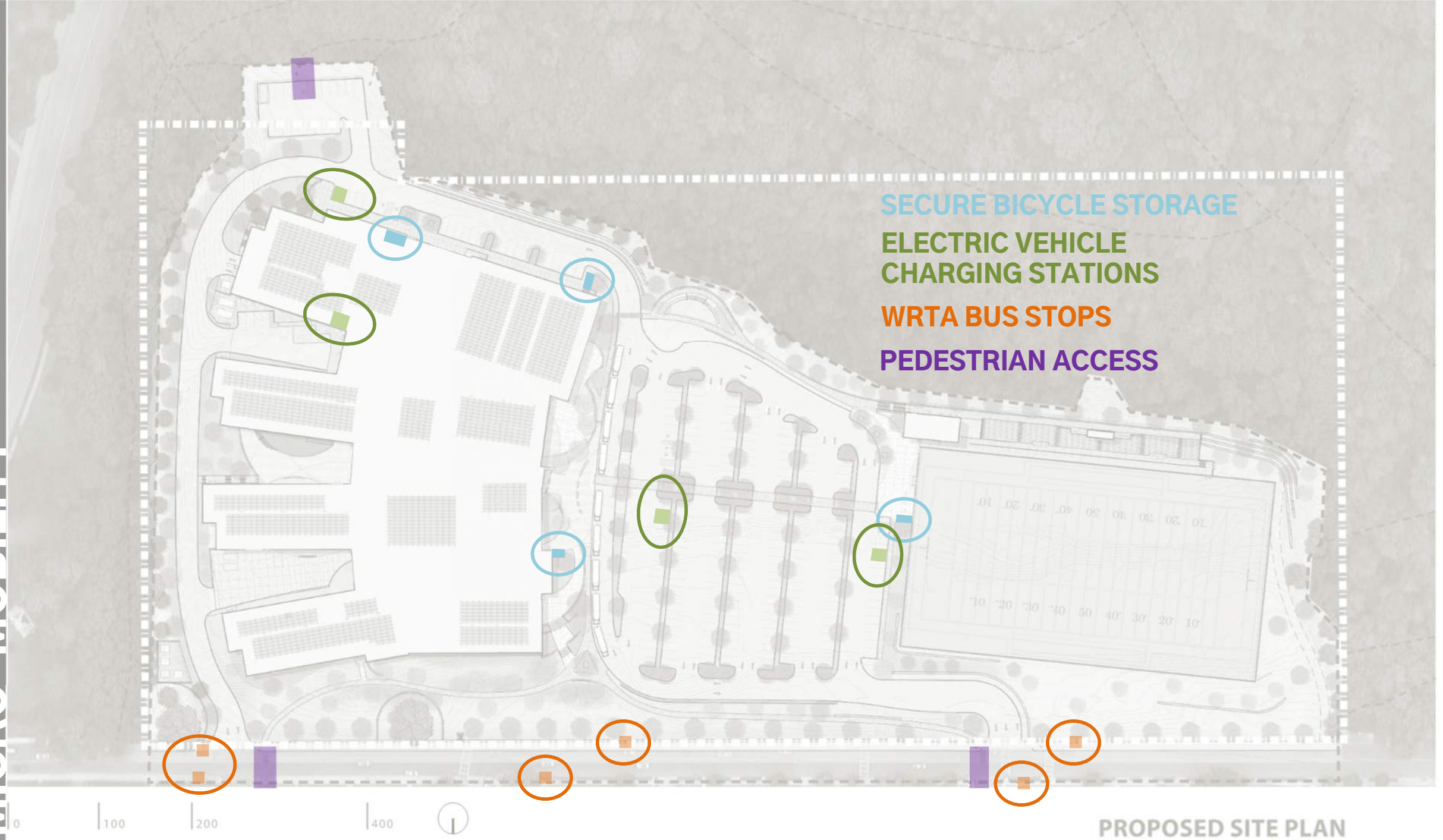
115

PARKING SPACES LOCATED BENEATH THE BUILDING



PROPOSED SITE PLAN

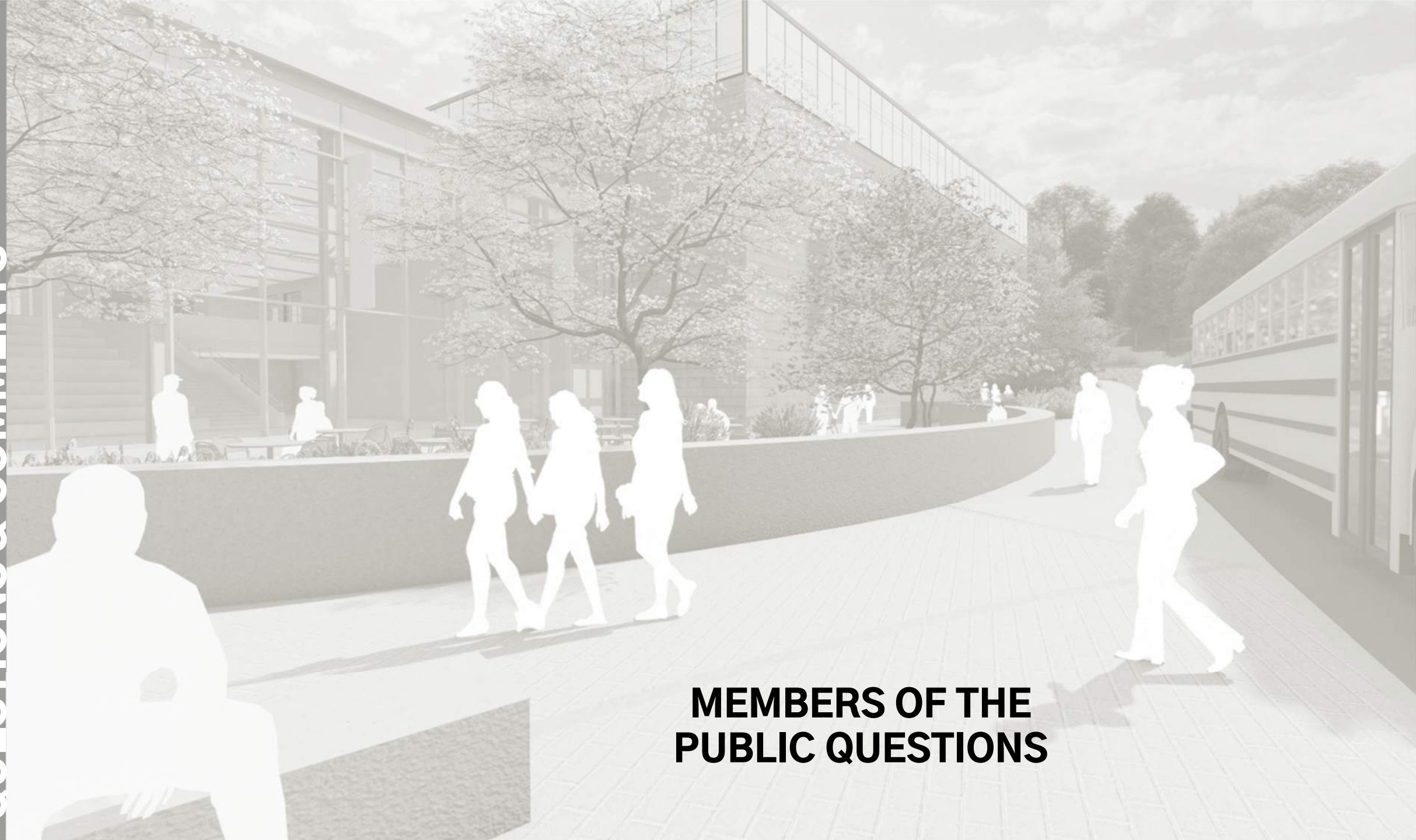
MICRO-MOBILITY



PROPOSED SITE PLAN

CONCLUSION

QUESTIONS & COMMENTS

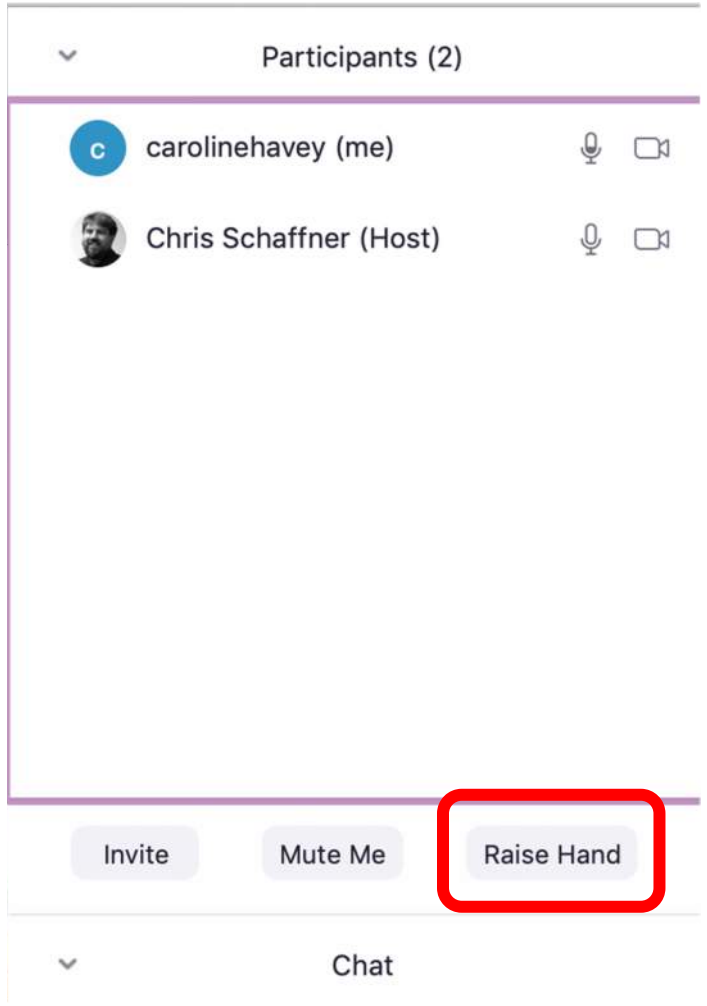


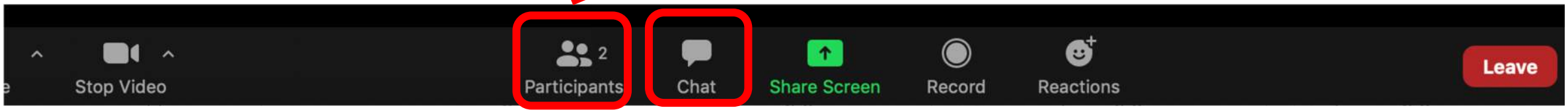
MEMBERS OF THE PUBLIC QUESTIONS

MEETING FORMAT

TO ASK QUESTIONS:

- PLEASE RAISE YOUR HAND OR UTILIZE THE CHAT FEATURE
- IF JOINING BY PHONE:
  - *9 – RAISE HAND
  - *6 – TOGGLE MUTE/UNMUTE
- PLEASE ANNOUNCE YOUR NAME BEFORE YOUR QUESTION/COMMENT
- PLEASE RE-MUTE YOURSELF AFTER YOUR TURN





Massachusetts School Building Authority

FONTAINE + DIMEO

AECOM TISHMAN

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Additional Comments/Questions?

www.lpaa.com/get-in-touch