Coakley Middle School

Norwood Public Schools

Middle School Building Committee

August 9, 2021

Agenda

June 21 2021

- Review PSR decisions
- VOTE on MSBA PSR submission

August 9, 2021

- PSR & FAS update
- Schedule update
- Design-Bid-Build vs. CM at Risk
- Programming update
- Floor Plan & massing update
- ZNE discussion
- Synthetic Turf & Sports lighting discussion
- Initial phasing concept

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Ai3 Architects, LLC
Compass Project Management

PSR & FAS update

- July 7, 2021 Preferred Schematic Report (PSR) submitted
- July 21, 2021 MSBA PSR review comments received
- July 21, 2021 MSBA Facilities Assessment Subcommittee (FAS) Presentation
- July 27, 2021 MSBA FAS follow-up discussion & documentation reviewed with MSBA staff
- July 30, 2021 MSBA FAS documentation & Revisions submitted to MSBA staff
- August 4, 2021 Responses to MSBA PSR comments submitted to MSBA staff
- Update: MSBA program reimbursement
- August 25, 2021 Project recommended for MSBA Board of Directors' Approval

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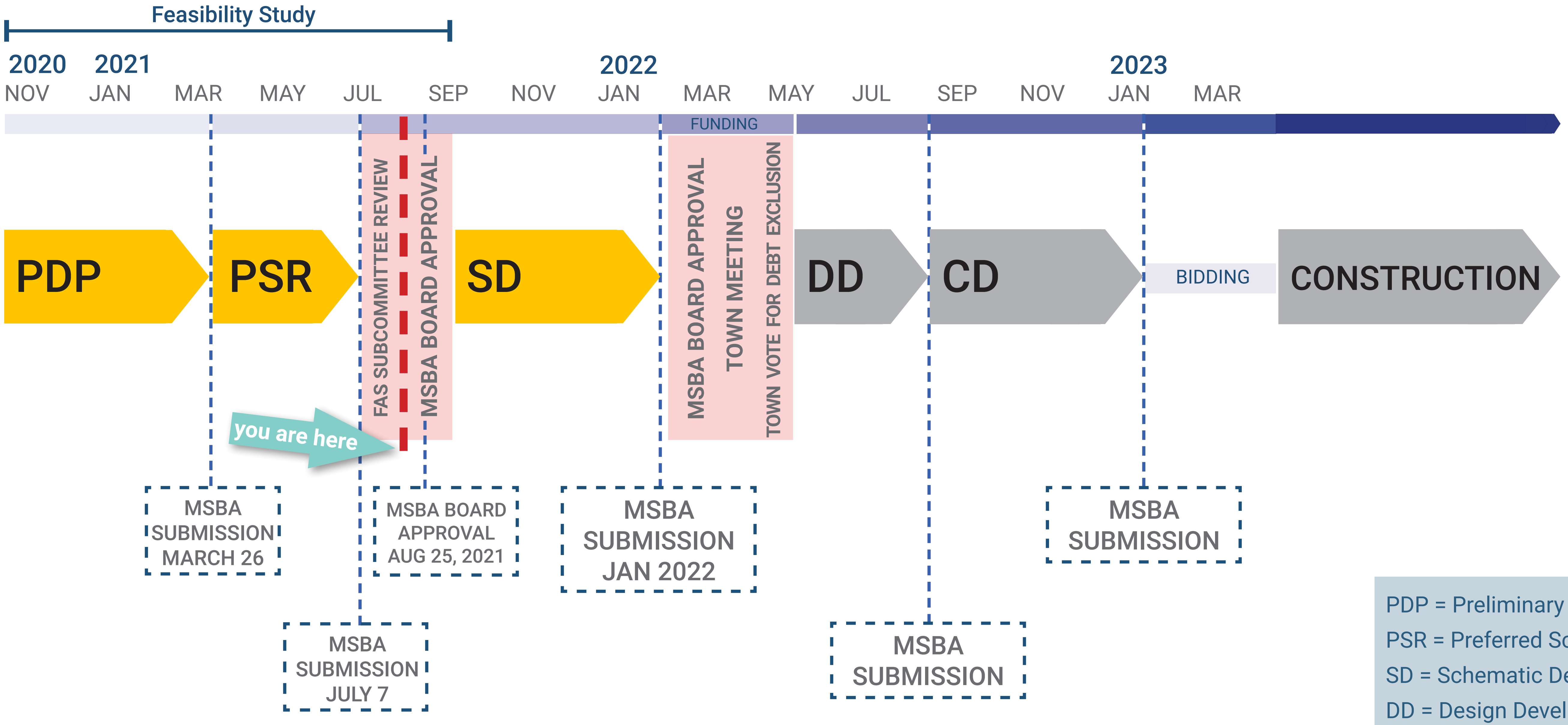
Project Schedule



PDP = Preliminary Design Program
PSR = Preferred Schematic Report
SD = Schematic Design
DD = Design Development
CD = Construction Documents

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SCHEMATIC DESIGN (SD)
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Dark Gray - Items related to the Building Options that are required for submission

Light Gray - Items submitted in previous PDP report that are required to be submitted again

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Understanding Your Choices: Chapter 149 or 149A

A comparison of the processes, risks and rewards

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CM at Risk

"During the 1970's, a new type of firm evolved. Most were GC's looking to provide services, work as part of teams, and eliminate adversarial environments on projects. In doing this they raised construction to a higher level of project delivery and added value to the end product"

Project Delivery Systems for Construction published by AGC 2004

Design-Bid-Build

"It is important to note that the constructor's obligation is to satisfy the minimum requirements of the drawing and specifications. In the bidding process, the Owner asks for the lowest possible price to perform only those things that are absolutely required by the drawings and specifications and not more."

Project Delivery Systems for Construction published by AGC 2004

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Key Difference

- **With CM at Risk** - you are hiring a professional service firm which builds buildings

- **With D-B-B** - you are purchasing a building in accordance with detailed plans and specifications

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Key Attributes

CM at Risk (Ch 149A)

- Design Phase Services
- Start before design is complete
- Qualification-based selection with fee proposal
- Negotiated price
- “Open book” accounting
- Owner part of Sub Selection

Design/Bid/Build (Ch 149)

- No Design Phase Services
- Completed design
- Lowest Responsible Bidder (prequalified)
- Lump Sum Payment
- Owner has no say in team (except prequalification of FSB’s)

Finding the Tipping Point

- Bottom Line: Some projects are sufficiently "simple" that the initial cost savings with DBB outweigh the value-added services provided through CMR.

- IG Report on CMR: Owner's view CM at Risk most appropriate for large, complex projects involving phasing, challenging logistics, on occupied campuses and aggressive schedules; DBB as most appropriate for relatively basic new construction on open, clean sites, not time dependent.

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Coakley Middle School Project

Construction Manager at Risk (CMR)

- Pick CM project team by experience
- Early site, foundation, bid packages for less condensed schedule
- Defines phasing & Complexity early
- Cooperation in scheduling & flexibility with users
- Use of contingency for issues that arise

Design-Bid-Build (DBB)

- Good for simple new construction projects
- Initial cost probably 5% lower (CMR typically turn back a few %)
- Good GC's available through pre-qualification
- Limited field staff, but can require added staff

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Coakley Middle School Project

Considerations for CMR vs DBB

- Early site enabling package
- Allow planning for enabling stage
- Maintain construction schedule
- Impacts to existing school, fields and users
- Ability to select a team based on qualifications of staff assigned
- Partnering with a firm that understands Norwood objectives

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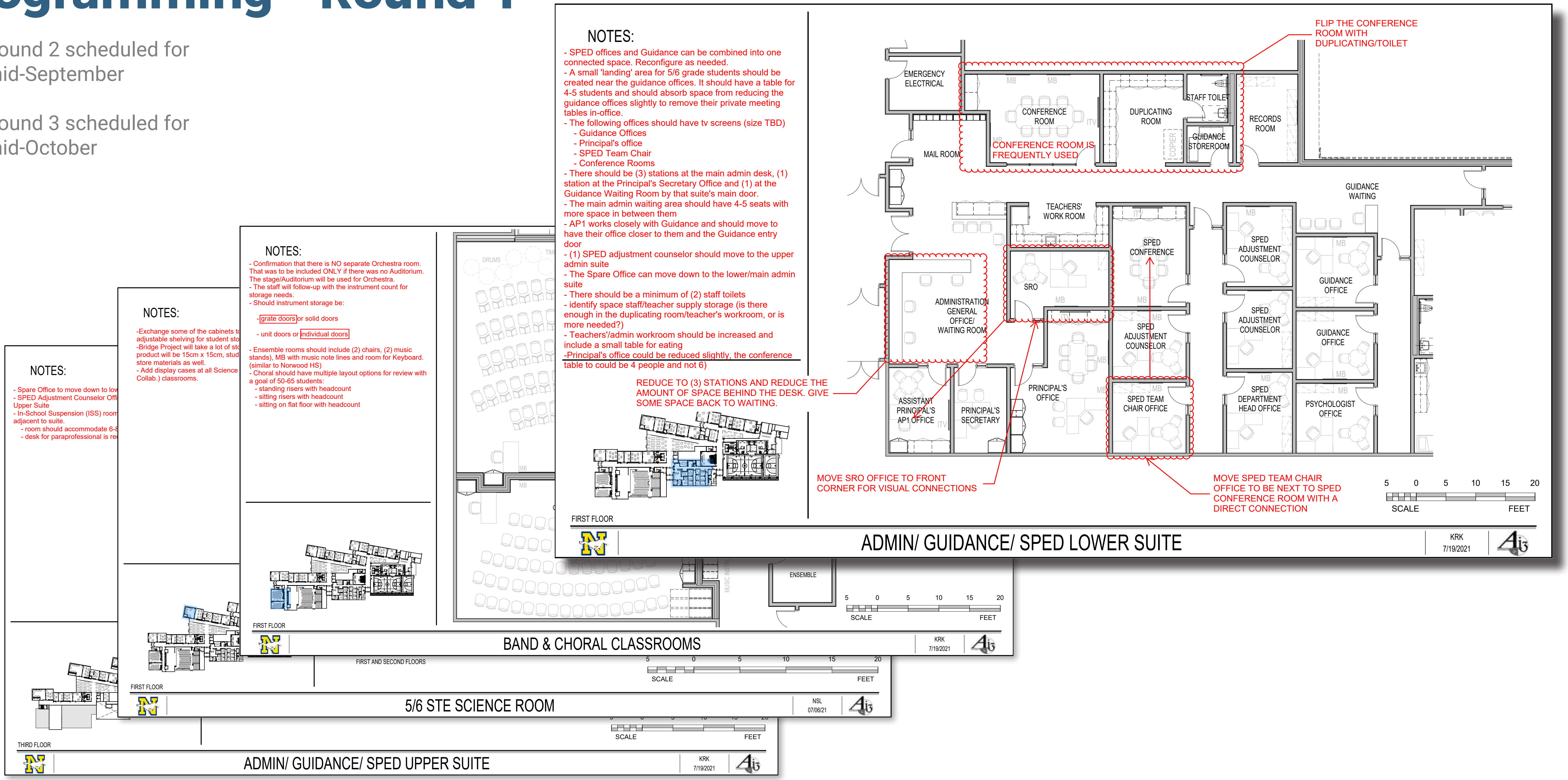
Programming - Round 1

- Round 2 scheduled for mid-September
- Round 3 scheduled for mid-October



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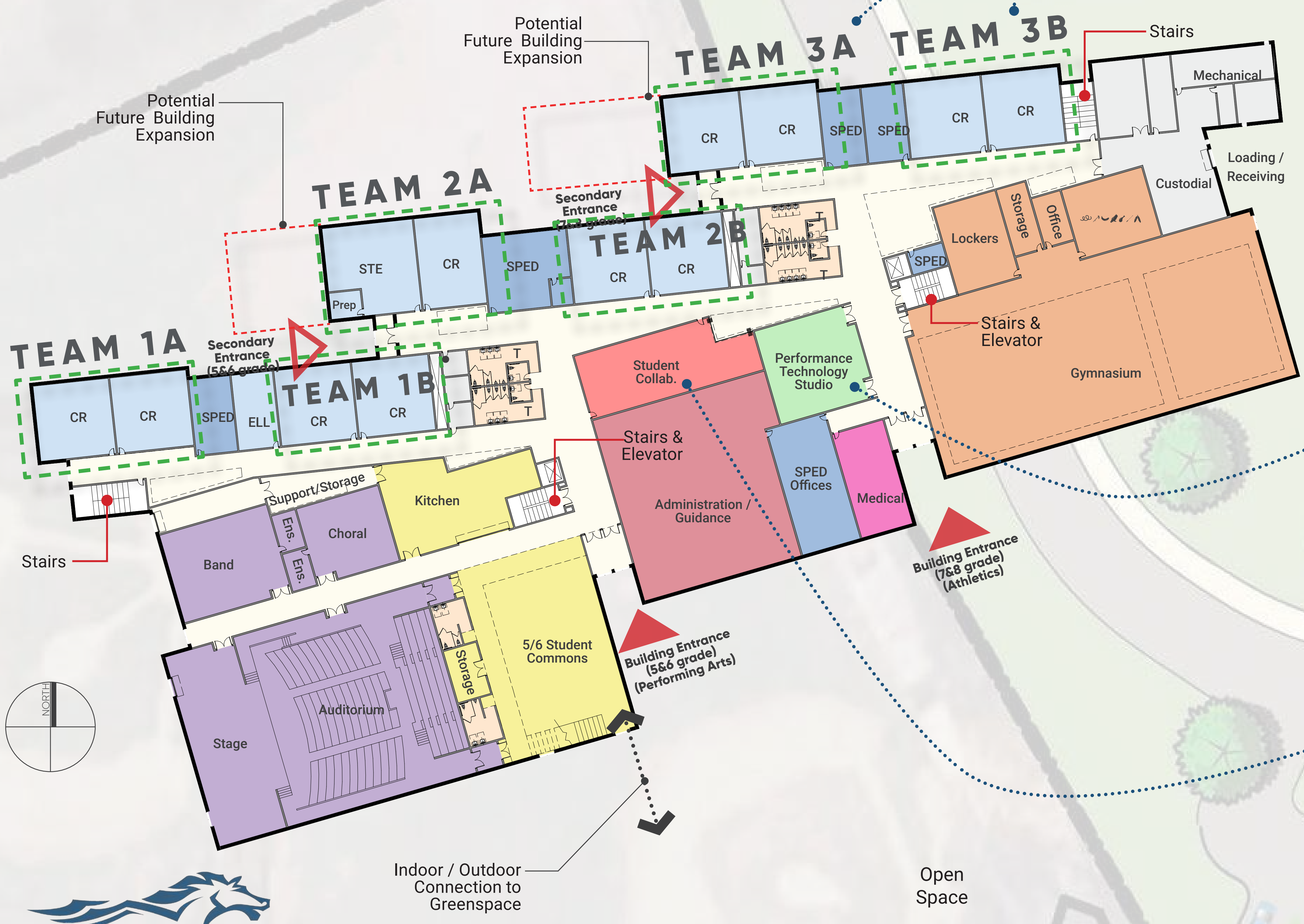
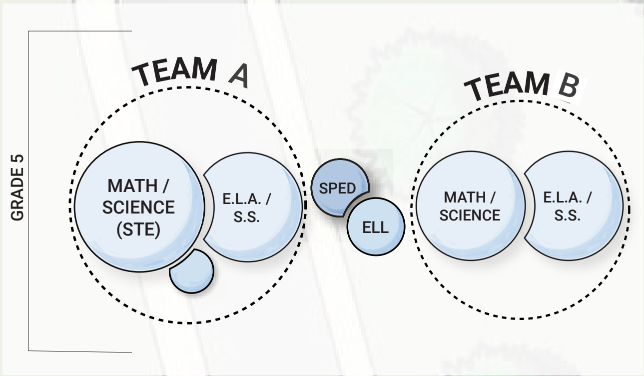
property line
property line
wetland setback
Existing Athletic Fields
Existing Tennis Courts
property line
property line
NORTH SITE ACCESS
Washington Street
New Athletic Field
Open Space
Playground
Outdoor Play
Existing Little League Fields
property line
SOUTH SITE ACCESS
property line
wetland setback
0 25 50 100 200

Preferred Solution

Option 3A (5-8) – Proposed First Floor Plan – Grade 5





Plymouth South High School - Ai3 Architects

Beverly Middle School - Ai3 Architects

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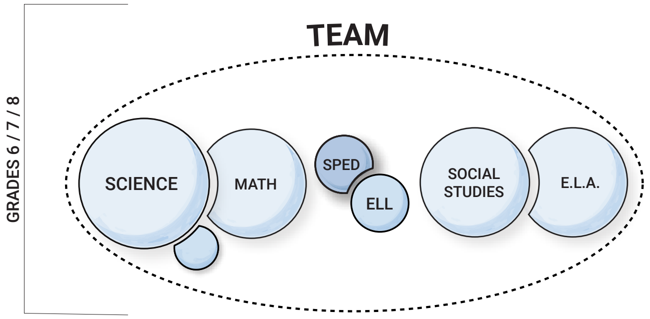
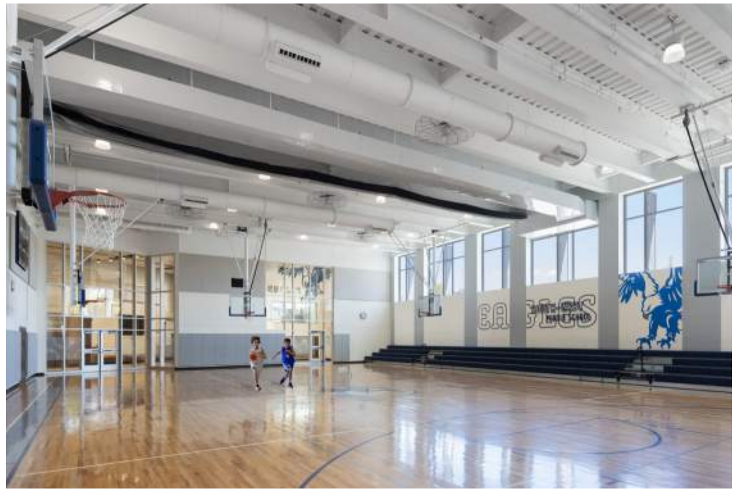
Preferred Solution

Option 3A (5-8) - Proposed Second Floor Plan - Grade 6





Collaboration "Zone" within larger space

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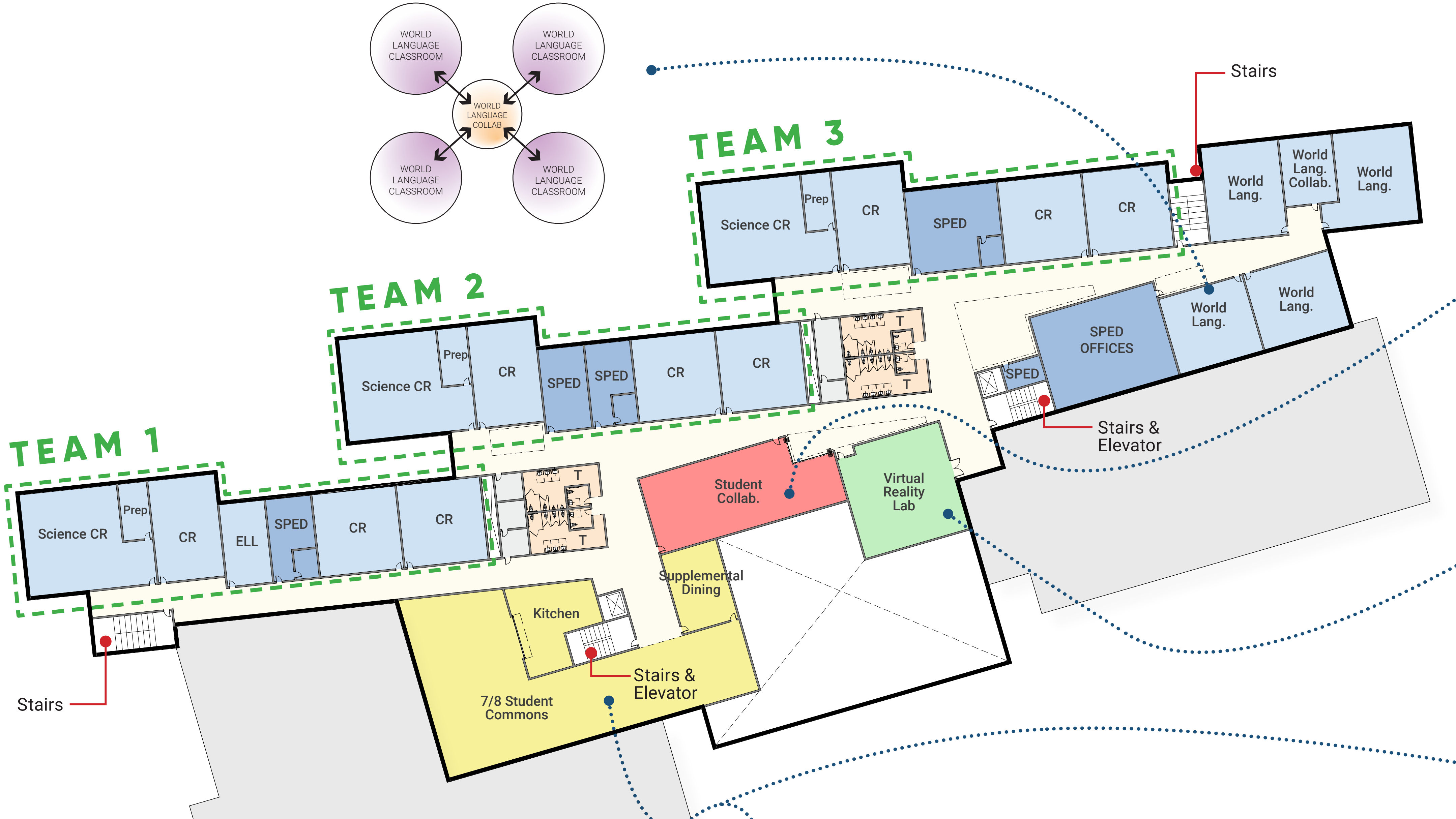
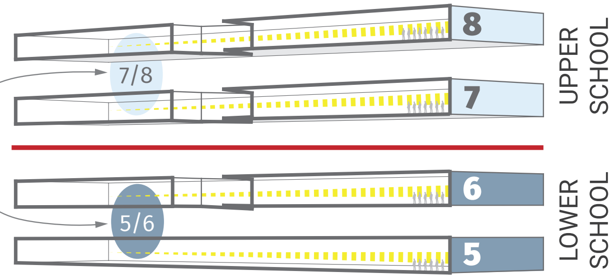
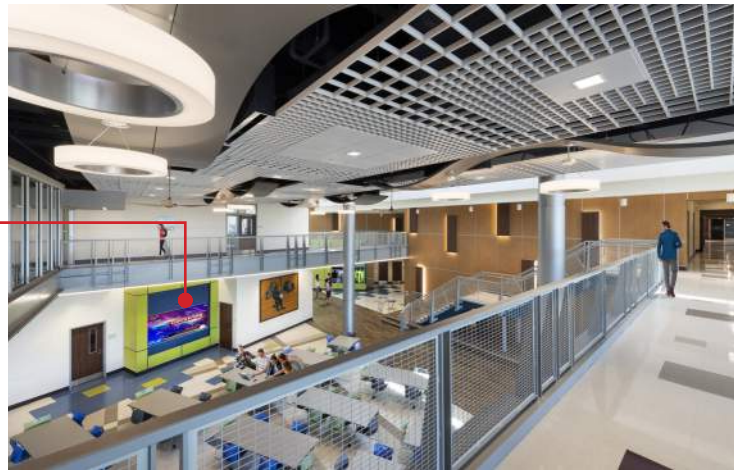
Preferred Solution

Option 3A (5-8) – Proposed Third Floor Plan – Grade 7



(2) Student Commons / Dining Areas





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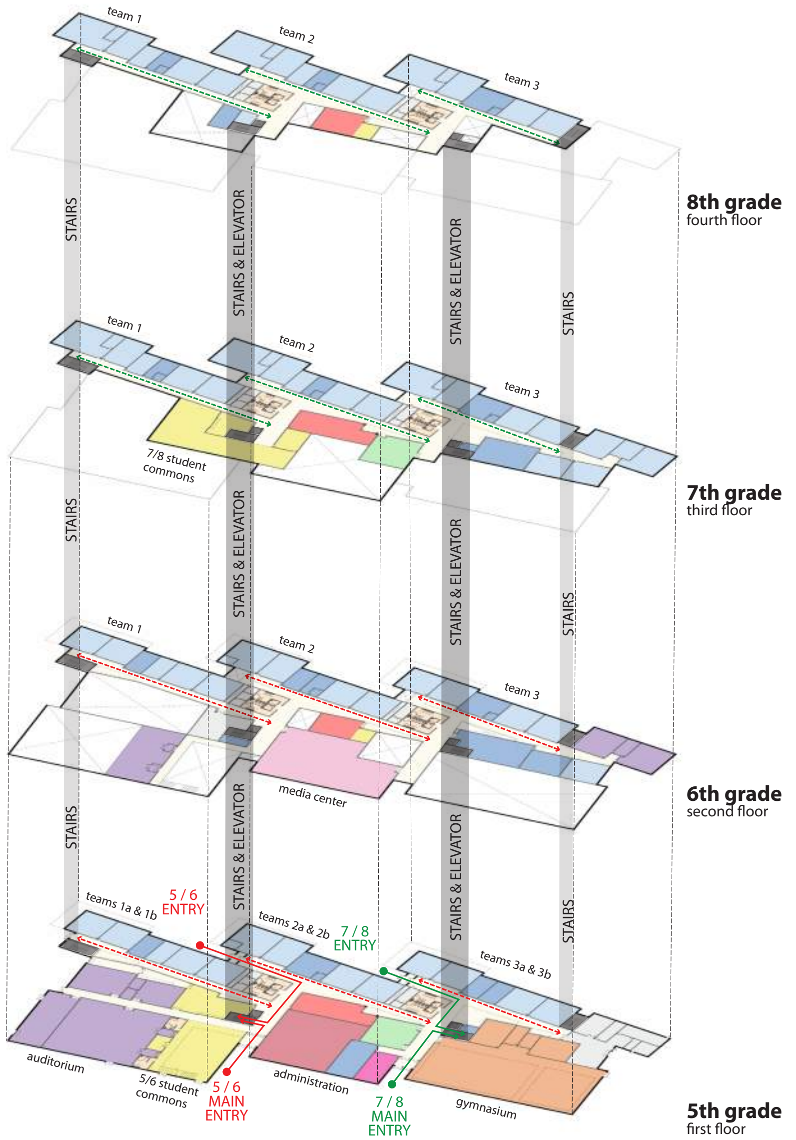
Preferred Solution

Option 3A (5-8) - Proposed Fourth Floor Plan - Grade 8



Circulation Diagram - Vertical & Horizontal Access

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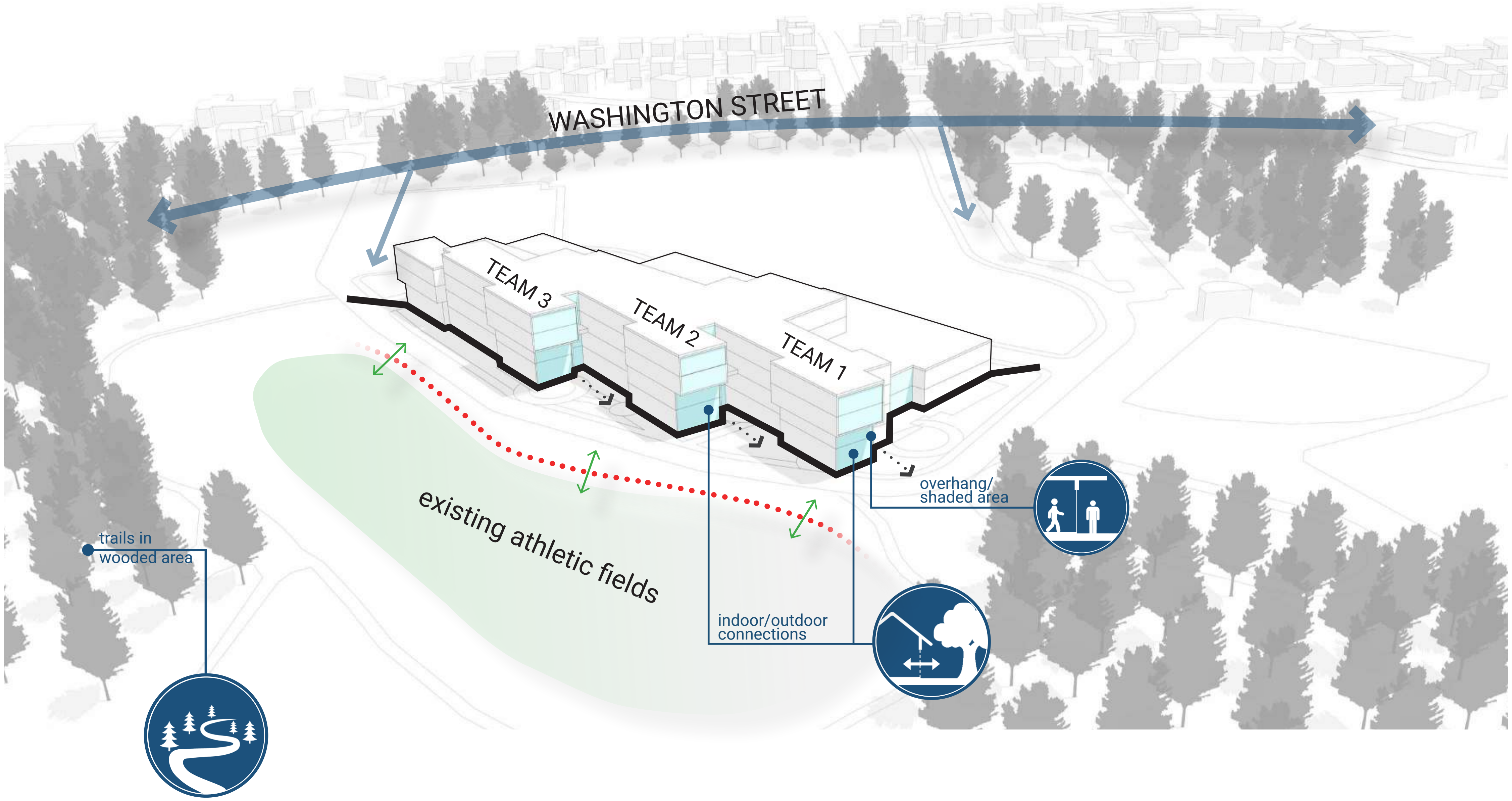
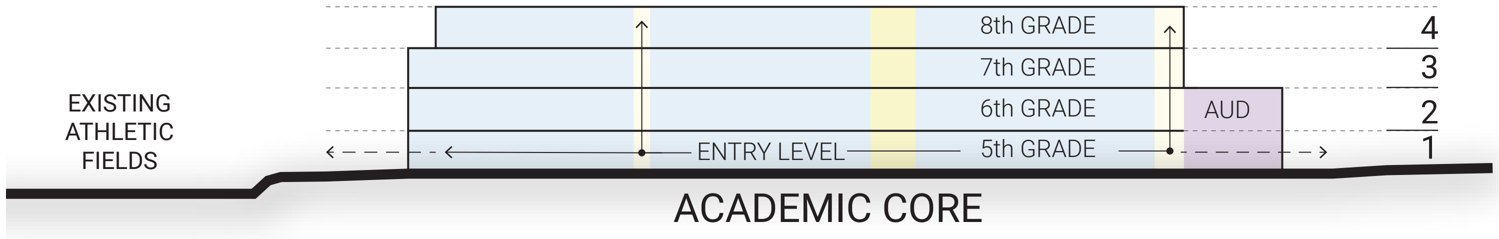
ACADEMIC CORE

INDOOR / OUTDOOR ACCESS & CONNECTIONS





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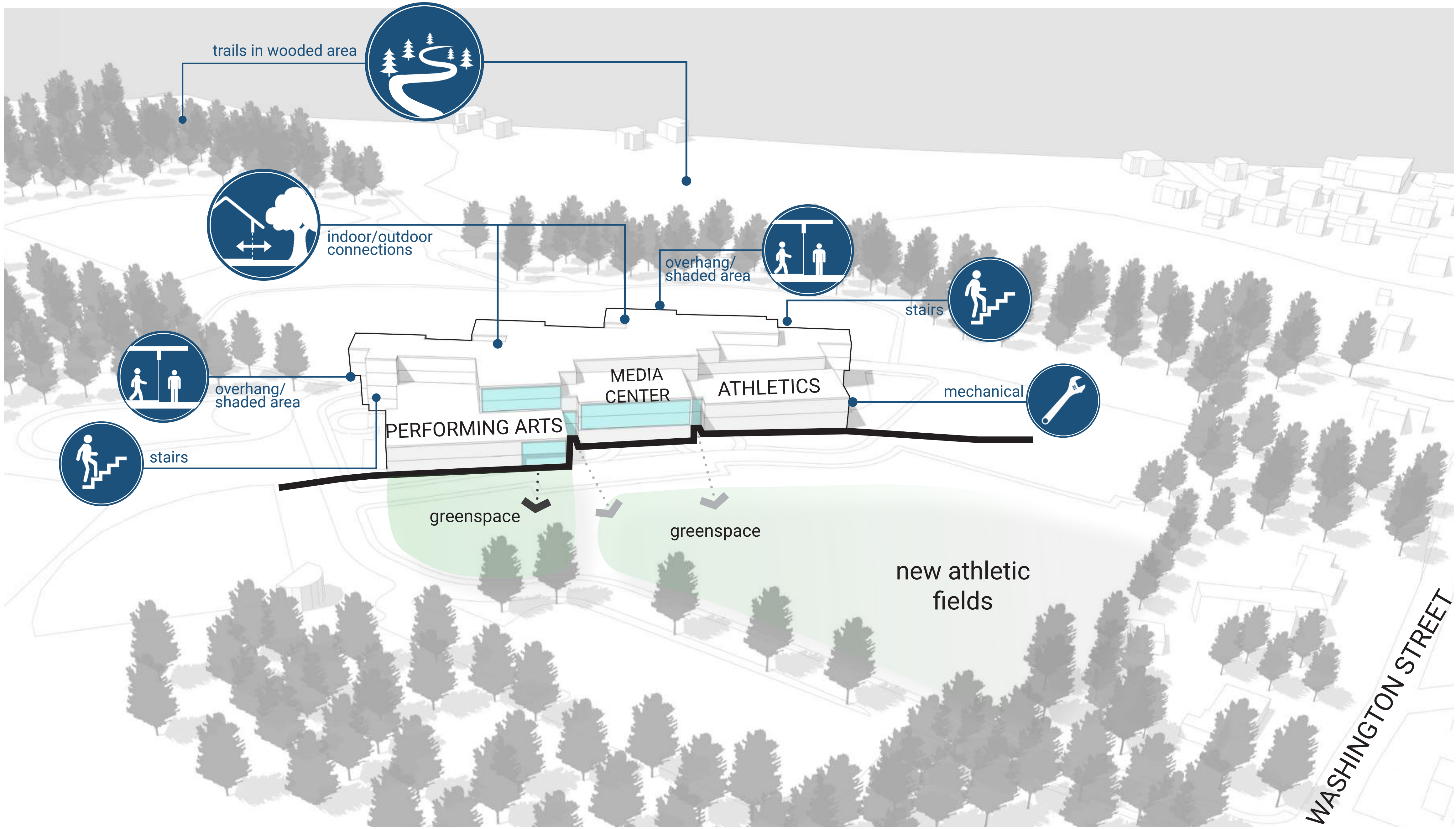
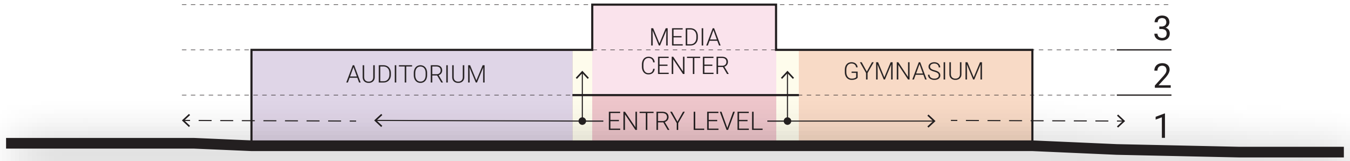
PUBLIC SPACES

INDOOR / OUTDOOR

ACCESS & CONNECTIONS





PUBLIC SPACES

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CONSIDERING
NET ZERO & SUSTAi3NABLE DESIGN
August 9, 2021
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Regulations & MISSION

In March 2021, the Governor of Massachusetts signed the **"Climate Legislation to Reduce Greenhouse Gas Emissions"** committing the state to Net Zero emissions by 2050. It establishes:

- Increased protections for environmental justice
- Interim goals for emissions reductions
- Voluntary energy efficient building codes
- Procurement of 2,400 megawatts of wind energy by 2027 for the state

Nearly **40%** of all CO_2 pollution comes from power plants burning fossil fuels

1 Eliminate Fossil Fuels

Fossil fuels are non-renewable resources; there is a finite amount that will **eventually deplete**. The burning of fossil fuels increases a building or site's **carbon footprint**, a source of climate change.

2 Reduce Demand

Reducing demand is another way of practicing **sustainability**, or meeting the needs of the present without compromising the needs of the future. Maintain **ecological balance** by only using as much energy as required.

3 Produce Electricity On-Site

Producing electricty on site is more attainable today than ever before, in terms of both **technology** and **cost**. Schools with this capability are great **resources** for communities and the municipality at large.

Additionally, the Massachusetts (BBRS), **Board of Building Regulations & Standards,** is required to update its building code every <u>**3**</u> years to be consistent with the most recent version of the (IECC), **International Energy Conservation Code**

Ai3 architects

committed to **Sustainability** using passive design strategies

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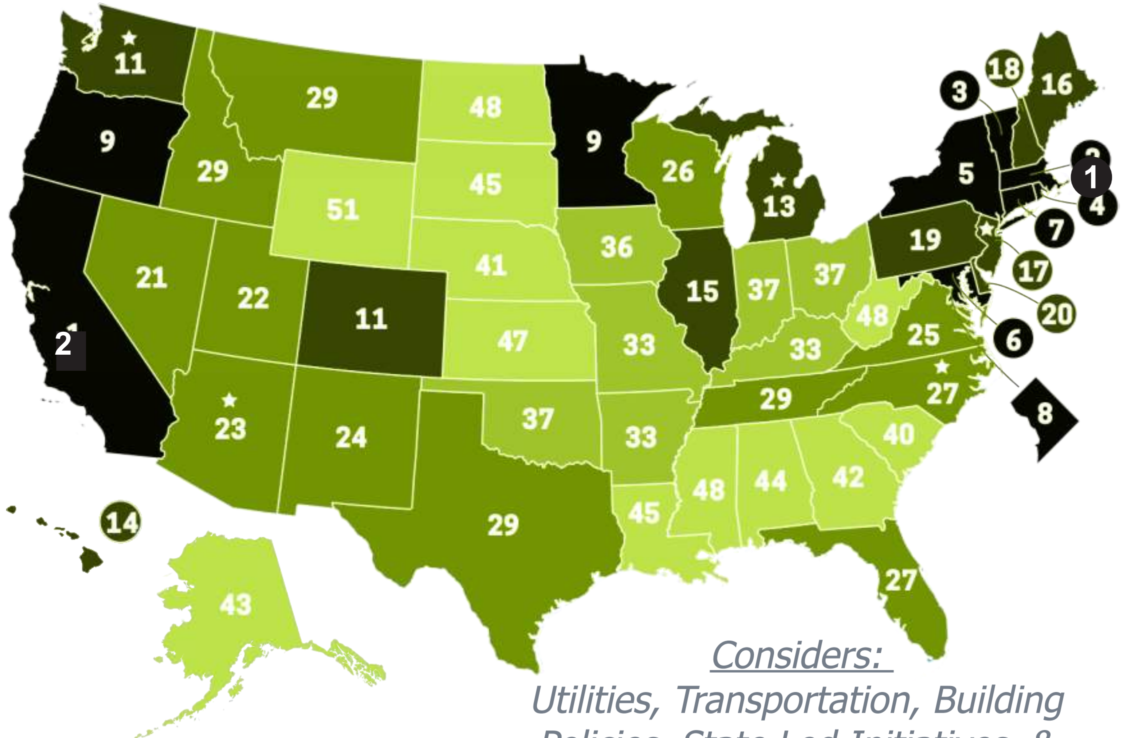
STATUS

MASSACHUSETTS
2010-2019 Most Energy Efficient State

American Council for an Energy-Efficient Economy (ACEEE)



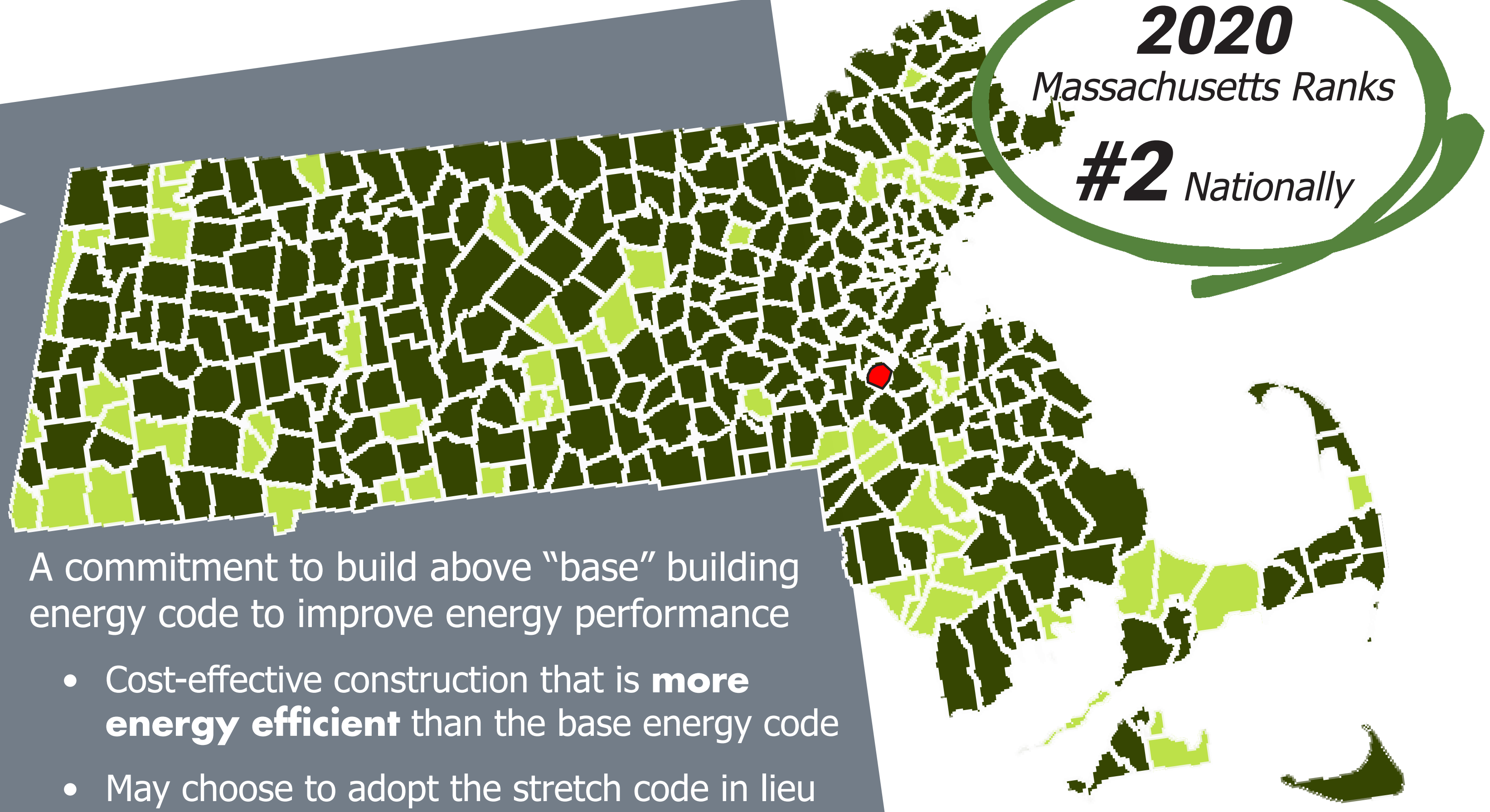
Considers:
Utilities, Transportation, Building Policies, State Led Initiatives, & Appliance Standards per state

- Ranks 1-10
- Ranks 11-20
- Ranks 21-30
- Ranks 31-40
- Ranks 41-50
- Rising States

2020
Norwood adopts the MA Stretch Energy Code
Effective 7/1/19

Current MA Stretch Energy Code Adoption by Community

2020
Massachusetts Ranks
#2 *Nationally*



A commitment to build above "base" building energy code to improve energy performance

- Cost-effective construction that is **more energy efficient** than the base energy code
- May choose to adopt the stretch code in lieu of the base building energy code

- Adopted the MA Stretch Code (79%)
- Unadopted the MA Stretch Code (21%)

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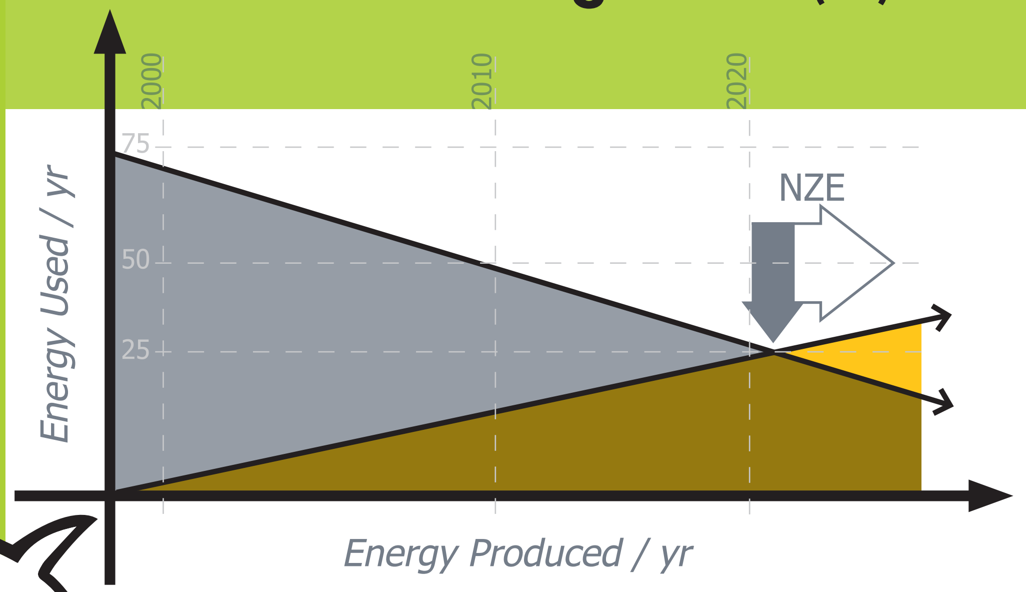
EUI

ENERGY USE INTENSITY *noun*

A measurement of a building's **energy efficiency** calculated as:

$$\text{EUI} = \frac{\text{Annual ENERGY USED (kBtu)*}}{\text{Building AREA (SF)}}$$



25: Typical target EUI to achieve NZE

Energy produced equal to what is needed makes the building Net Zero Energy (NZE)

NZE

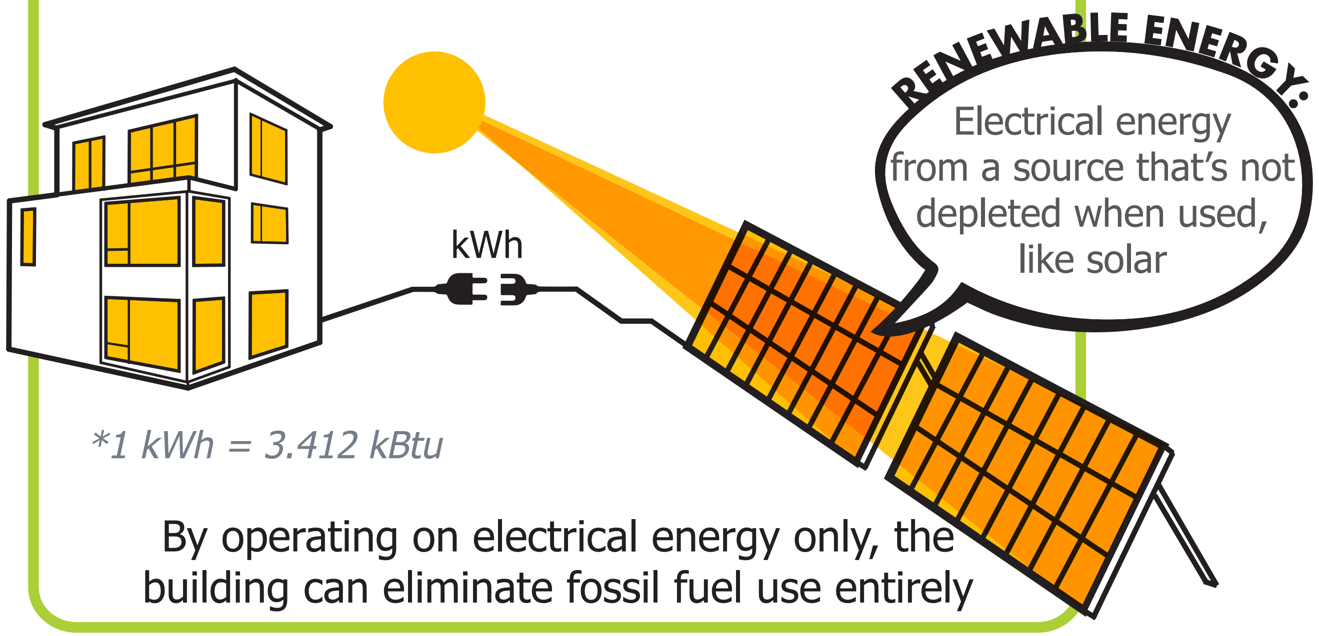
NET ZERO ENERGY *noun*

The total amount of **energy used** by the building on an annual basis is less than or equal to the amount of renewable **energy produced** on site

ENERGY USED ON SITE (kWh)*

less than $\leq$ *or equal to*

ENERGY PRODUCED ON SITE (kWh)



**1 kWh = 3.412 kBtu*

By operating on electrical energy only, the building can eliminate fossil fuel use entirely

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PRECEDENTS

Watertown, Massachusetts

Cunniff Elementary School

- Size: 82,355 sf
- Population: 385 students (K, 1-5)
- Year completed: 2021
- Net Zero Energy Building

PRECEDENTS

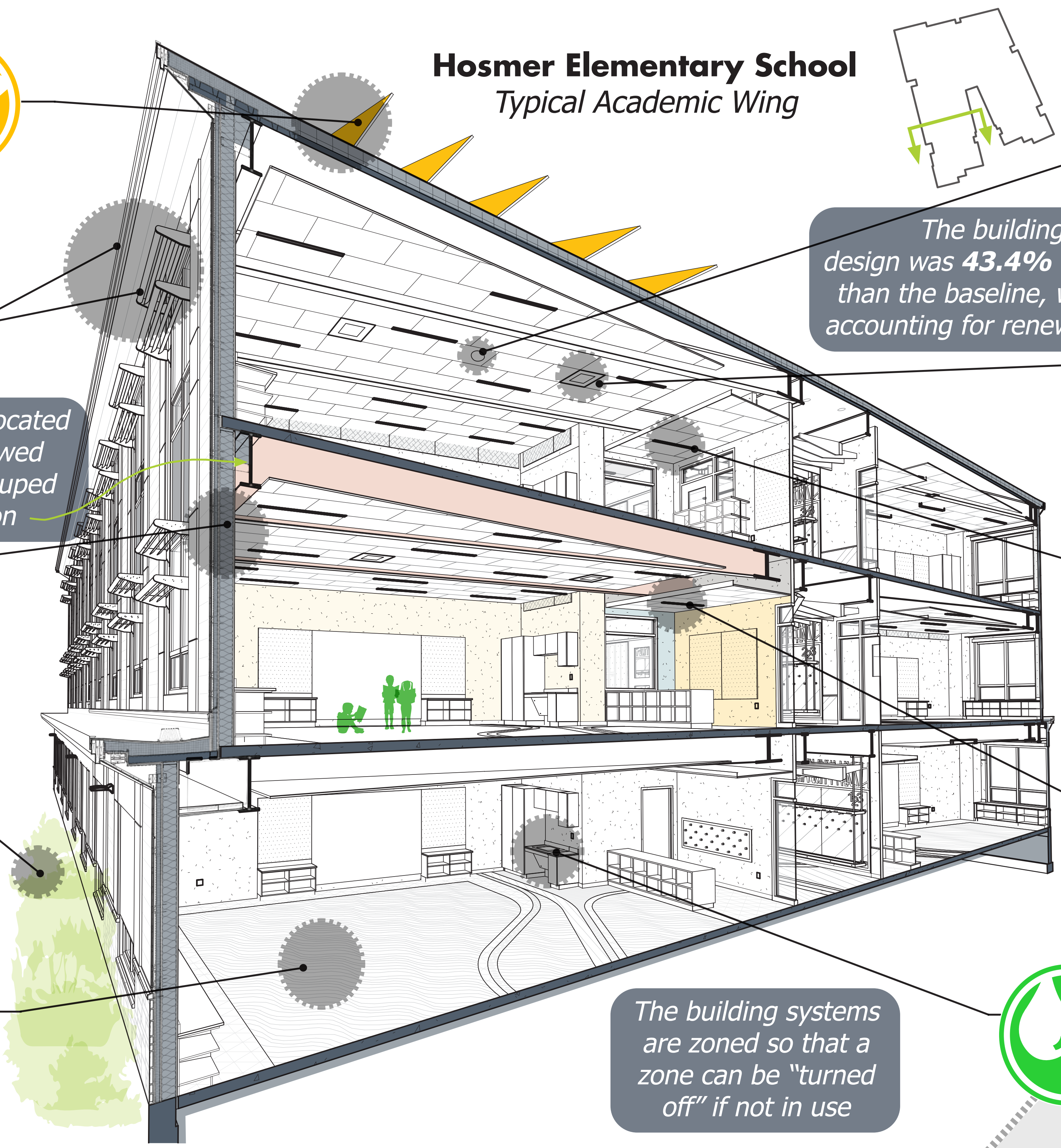
Watertown, Massachusetts

Hosmer Elementary School

- Size: 142,500 sf
- Population: 790 (PS, PK, K, 1-5)
- Year completed: 2022
- Net Zero Energy Building

Hosmer Elementary School

Typical Academic Wing



Renewable Energy Production:

Photovoltaic arrays on the roof and site generate enough energy for operation

Passive Solar Control:

Building oriented for best daylighting with sunshades and overhangs for control

Enhanced Envelope:

Continuous rigid insulation from slab to roof with batt insul. also within walls

Native Landscaping:

Reduces heat island effect and requires less watering

Natural & Recycled Materials:

Such as aluminum composite metal panels, natural wood & stone, and linoleum flooring

CO_2 Occupancy Control:

Signals to the rooftop units to modulate outside air dampers for fresh ventilation in the space

Air-Source Heat Pumps:

(2) four-way VRF casettes per classroom provide the heat/air conditioning required

High-Efficiency LED Lighting:

The school's lighting power density (LPD) is 0.424 W/sf; that's nearly half of the typical baseline, 0.783 W/sf

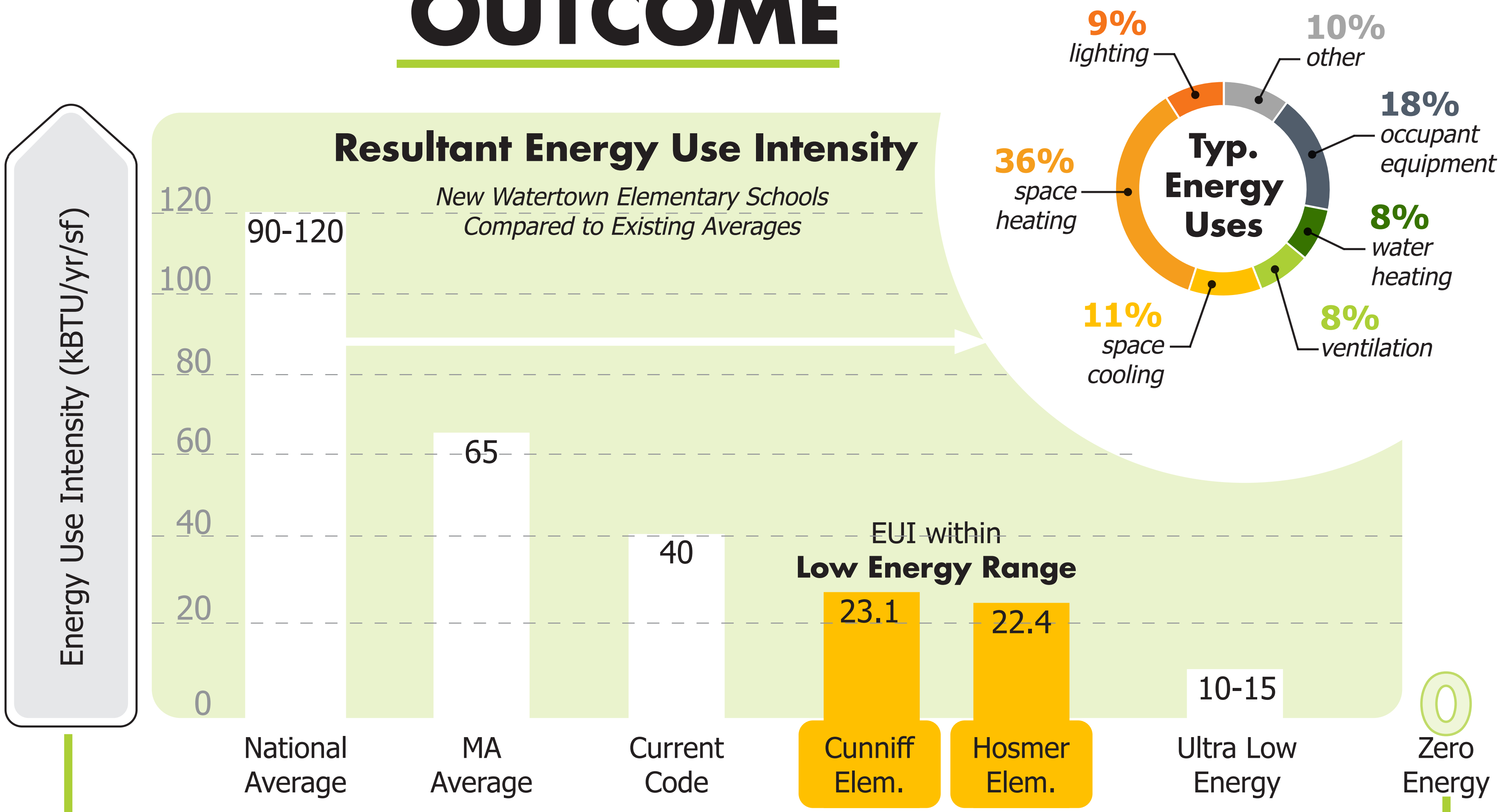
Occupancy Sensing:

Turns lights on/off automatically depending on if the room is occupied; prevents wasted electricity when the lights are left on

Low-Flow Water Fixtures:

All toilets, urinals, sinks, lavatories, and drinking fountains are WaterSense, using the lowest allowable flow for water conservation

OUTCOME



	Building Energy Data	Cunniff (NZE)	Hosmer (NZE)
A	TOTAL SITE ENERGY USE PER YEAR (in kWh)	558,280 kWh	936,871 kWh
B	TOTAL SITE ENERGY PRODUCED (in kWh)	560,000 kWh	937,700 kWh
C	TOTAL SITE ENERGY USE PER YEAR (in kBtu/yr)	1,904,851 kBtu/yr	3,196,604 kBtu/yr
D	BUILDING AREA (in SF)	82,355 SF	142,445 SF
E	ENERGY USE INTENSITY (C÷D)	23.1 kBtu/yr/SF	22.4 kBtu/yr/SF

BENEFITS

Environmental:

- Eliminated use of fossil fuels
- Reduced Carbon Footprint
- Meets needs of the present without compromising needs of the future

Educational:

- Educated in “living laboratories”
- Understanding of environmental stewardship early on
- Engaged occupants/community by using the building as teaching tool

Health:

- Improved well-being by establishing connections to outdoors & daylight
- Improved occupant performance by providing thermal comfort controls
- Lowered absenteeism

Cost:

- Lowered operating costs
- Lowered energy bills
- Maximized utility rebates
- Reduced exposure to the volatility of shifting energy prices

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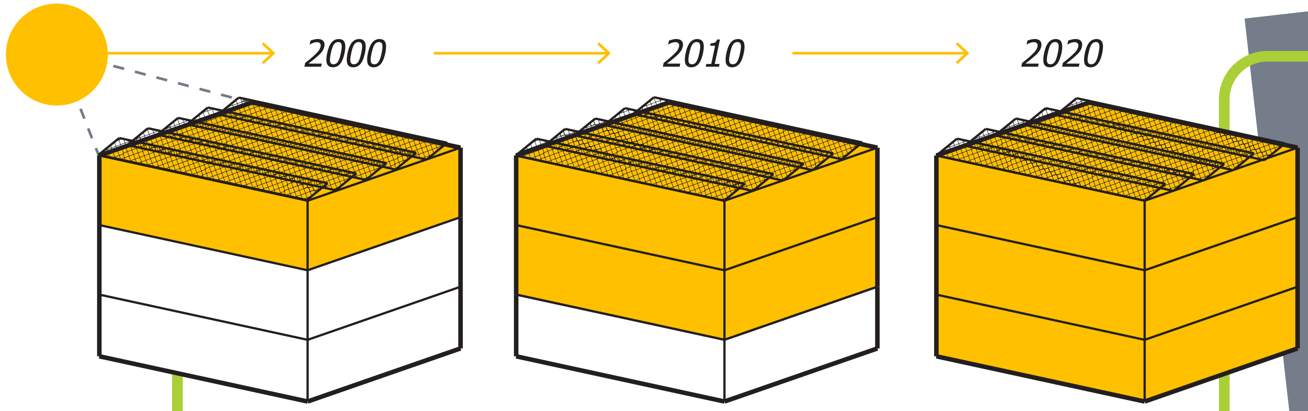
TECHNOLOGY

Evolution of Energy Production

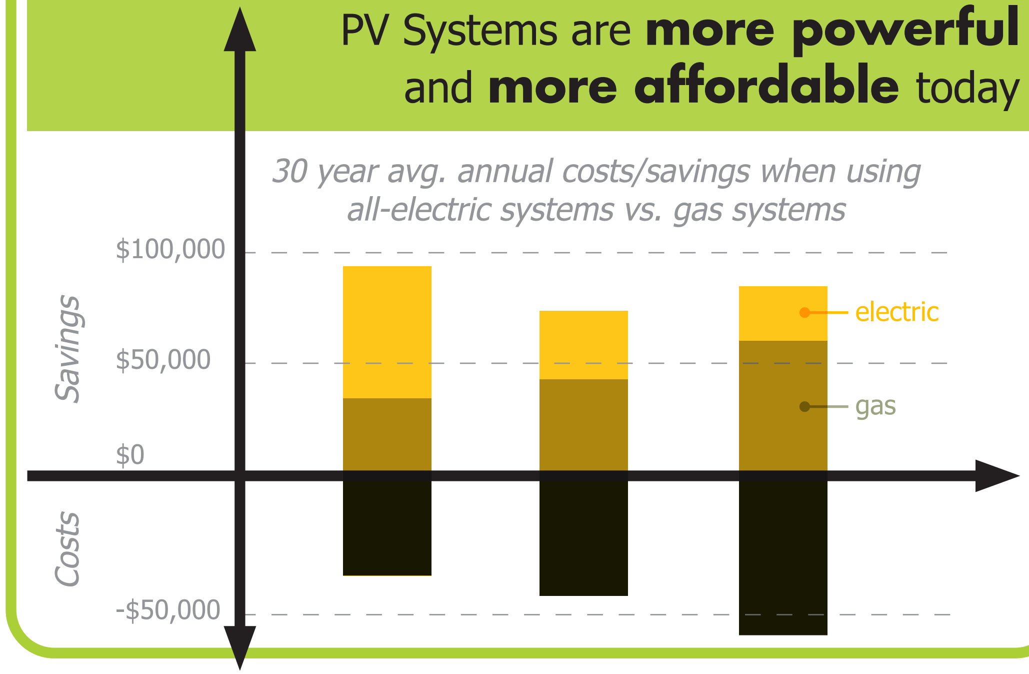
Photovoltaic (PV) efficiency is trending upward

2000 → 2010 → 2020



2000	2010	2020
$12.50/watt	**$7.50/watt**	**$2.50/watt**
200 watts/panel	300 watts/panel	450 watts/panel

PV Systems are **more powerful** and **more affordable** today



Steps to achieve NZE for your building:

1 Select a method of electricity generation using **renewable energy** (practical in MA):

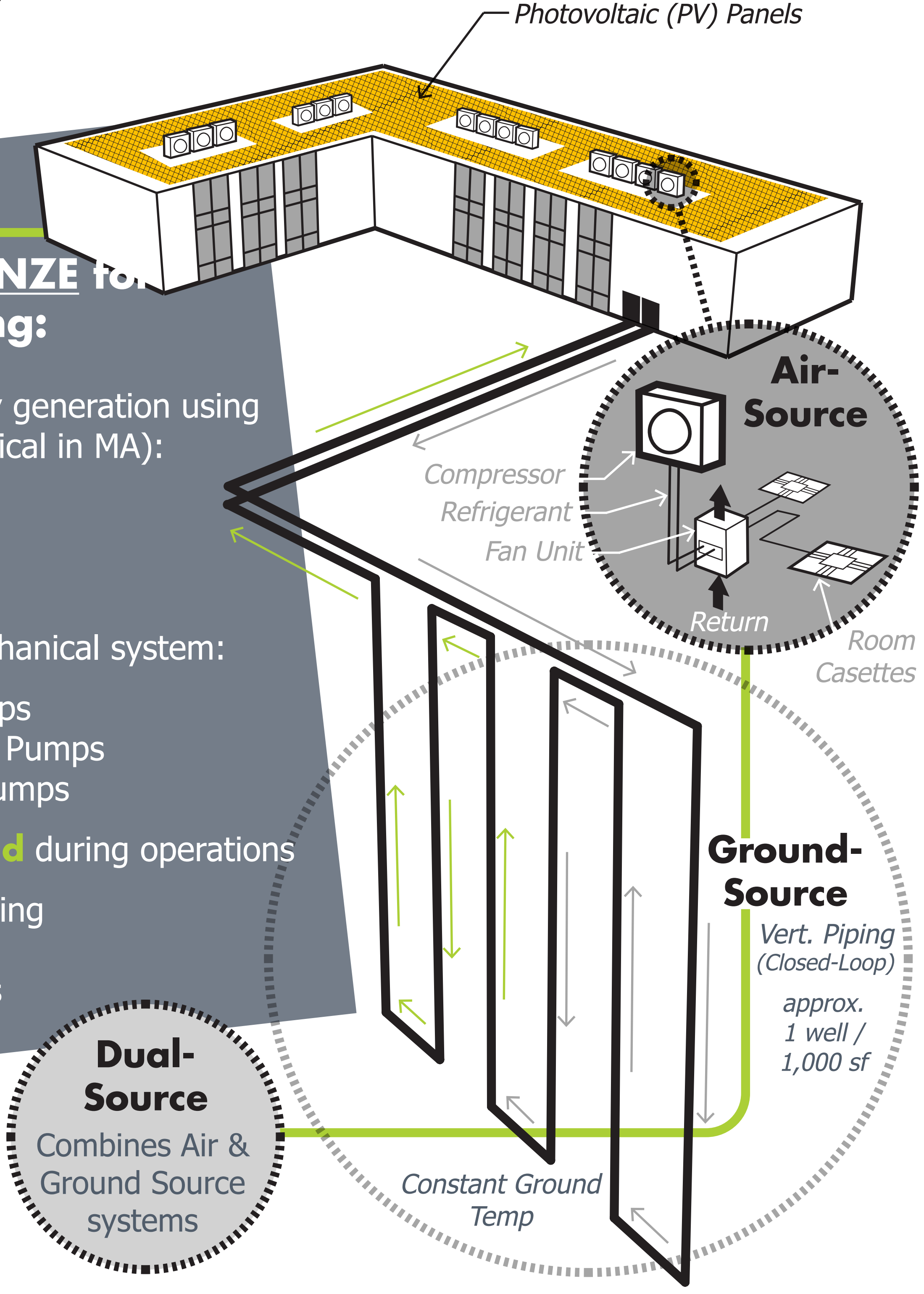
- Solar
- Geothermal
- Wind

2 Select an **all-electric** mechanical system:

- Air-Source Heat Pumps
- Ground-Source Heat Pumps
- Dual-Source Heat Pumps

3 Monitor/**reduce demand** during operations

- Metering & Monitoring
- Occupant Behavior
- Reduce Plug Loads



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ASSI$TANCE

Federal
Assistance Programs:

Solar Investment Tax Credit (ITC):
Tax credit on costs to install a source of renewable energy on your building

U.S. Department of Energy (DOE):
In March 2021, DOE announced new target to cut the cost of solar energy by 60% over next 10 years + funding to improve performance/ deployment of solar energy technologies

State
Assistance Programs:

Designated Green Community Grant Program:
Financial support for local initiatives that improve energy efficiency (ex. replacing streetlights with LED)

123 in MA (48%)

Solar Massachusetts Renewable Target (SMART) Program:
A long-term sustainable solar incentive program to encourage development of solar technology

Sponsored by the utility companies: Eversource, National Grid and Unitil

February 3, 2020
NORWOOD
Designated Green Community
received **$182,080** Green Community Grant

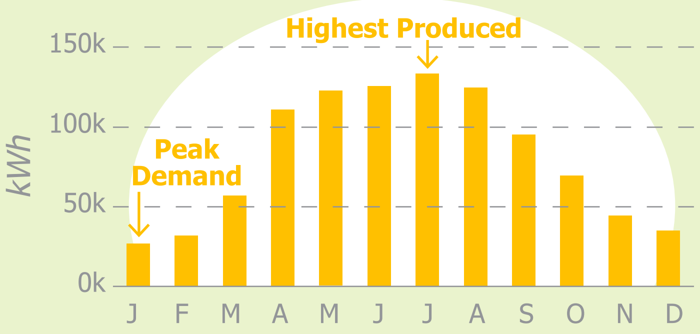
Utility Company
Assistance Programs:

mass save

Mass Save Pathways (2 of 4 apply):

path 1 — Zero Net Energy (ZNE)/ Deep Energy Savings
→ 25 EUI & ZNE or ZNE Ready, **earn $1.25/sf + $1.00/sf**

path 2 — Whole Building Energy Use Intensity (EUI) Reduction
→ Reduce EUI by 25%, **earn $1.25/sf**



Net Metering:
Credit received in months where school produces more electricity than used (summer) & 10% of Peak Demand shed during Demand Response

Renewable Energy:
Revenue for the amount of renewable energy produced on site annually

Performance Lighting:
Revenue for reduction in Lighting Power Density below code

Electric Vehicle Charging:
Revenue for connected charger

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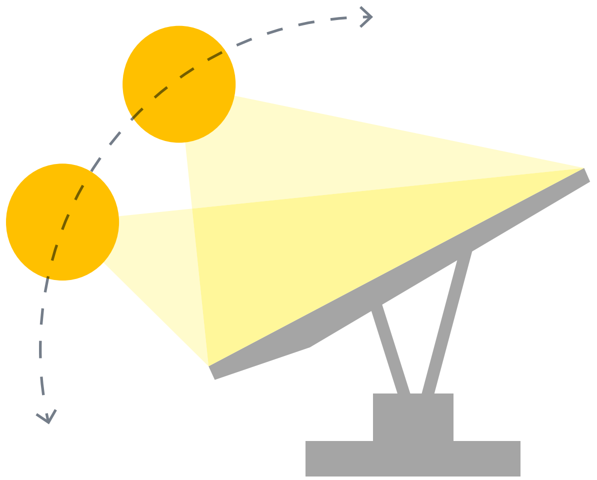
REVENUE



Assistance Program		Building Energy Data	NZE Building
	A	TOTAL SITE ENERGY USE PER YEAR (in kWh)	1,376,400 kWh
	B	TOTAL SITE ENERGY PRODUCED (in kWh)	1,376,400 kWh
	C	TOTAL SITE ENERGY USE PER YEAR (in kBtu/yr)	4,696,277 kBtu/yr
	D	BUILDING AREA (in SF)	187,840 SF
	E	ENERGY USE INTENSITY (C÷D)	25.0 kBtu/yr/SF
SMART Program	F	REVENUE TOTAL ENERGY PRODUCED PER YEAR (B x $0.10*/ kWh) **Assumes Eversource Block 10 rate * 1,376,400 assumes NZE achieved...*	$136,640.00 annual revenue
Eversource Mass Save Path 1 25 EUI	G	REVENUE 25 EUI REDUCTION ($1.25 x D) REVENUE POST OCCUPANCY ($1.00 x D)7840	$422,640.00 one-time incentive
Eversource Net Metering	H	REVENUE NET METERING (applicable if excess energy generated from renewables = $0.1268/kWh)	$0.00 annual revenue
Electricity Cost Offset (avoided cost of Electricity)	I	REVENUE TOTAL ENERGY PRODUCED PER YEAR (A x $0.225/ kWh) *based upon Eversouce data	$309,690.00 annual revenue
Performance Lighting	J	MASS Save Exterior Lighting Incentive ($1.50 or $2.0 or $3.0 /Watts Saved; LPD & Controls)	$4,425.00
Eversource EV Charging	K	REVENUE EV CHARGING (requires separate electrical service for EV stations. Pending funding approval of MA Dept of Public Utilities; 100% reimbursement except for EV Station itself) $3,000 for electrical infrastructure per vehicle assumes 25% of parking spaces, or 80 EV Charging stations	$240,000.00 *one time incentive 25% of Parking Spaces*

FYI
Municipality must own renewables to earn SMART benefits

An alternative to ownership is a Power Purchase Agreement (PPA). Analysis should be done to assess which to employ.

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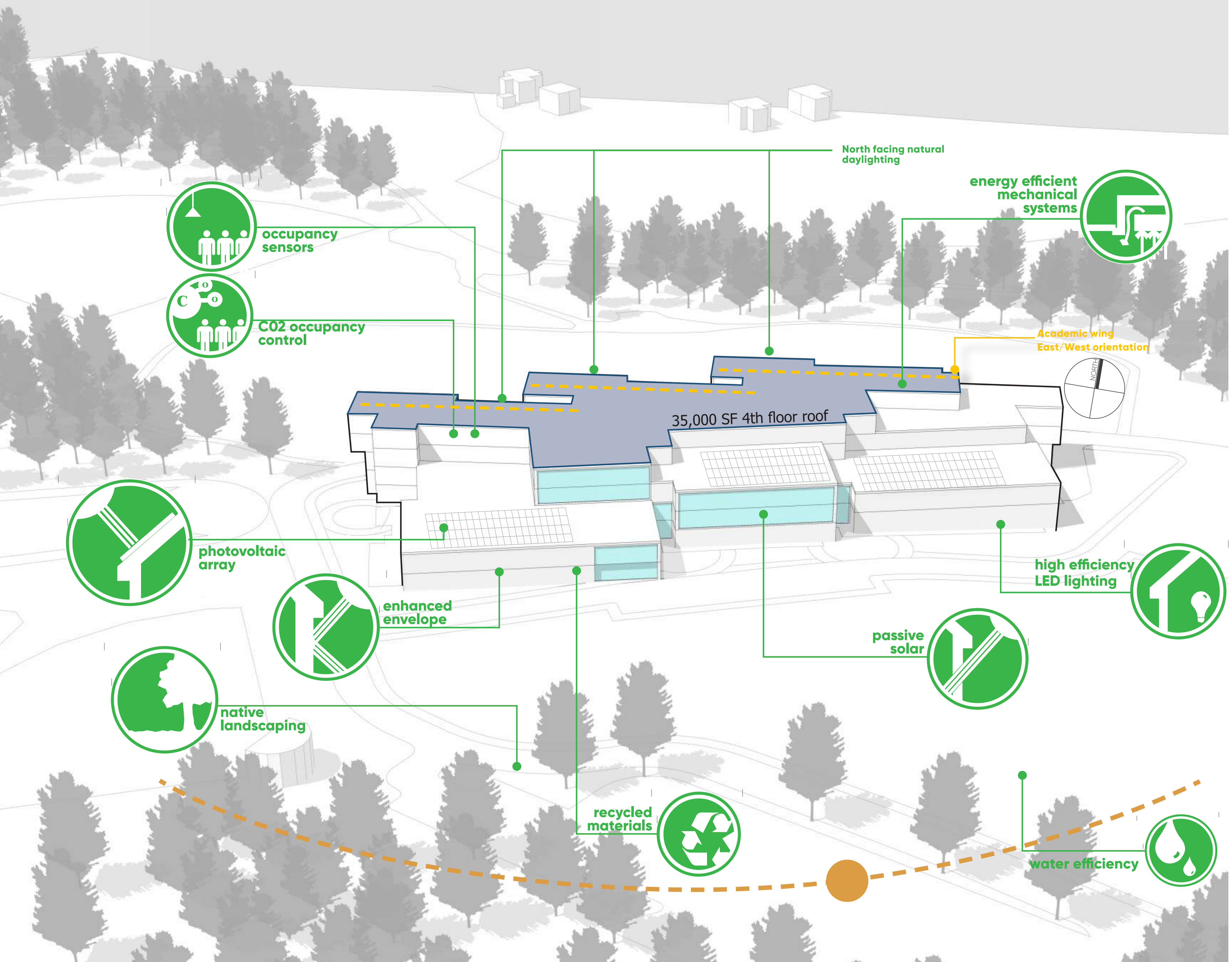

Preferred Solution

Sustainability

Building Stats

- Target **40%** more efficient than energy code
  (Hosmer was 43.4% better than code)
- Stretch code requires 10% better than code

WALL ASSEMBLIES

- Proposed wall performs between **16% - 28%** better than code. (thermal performance)

ROOF ASSEMBLIES

- Roof assembly performs **39%** better than code. (thermal performance)

New Coakley Middle School anticipated annual energy consumption:

1,376,400 kWh

Required PV to offset building use

- Approximately 30,000 sf of panels on the roof

  @ $50/SF = **$2.0 mil purchase price***

- Approximately 30,000 sf of panels over parking spaces

  @ $100/SF = **$3.9 mil purchase price***

  (does not include underground infrastructure)

- Battery Storage system = **$700,000**

  Rough estimate for battery storage

  NOTE:required on systems over 500kW

* does not include electrical & structural engineering, architectural design service, energy modeling, solar consultant fees, utility capacity analysis and impact study.

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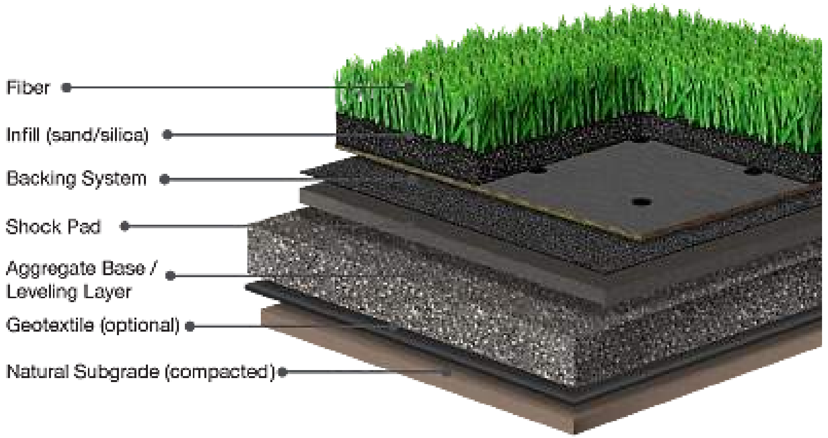
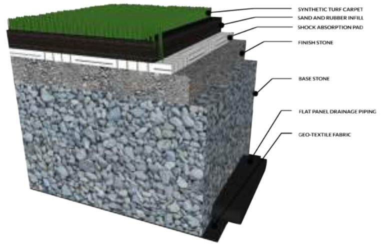
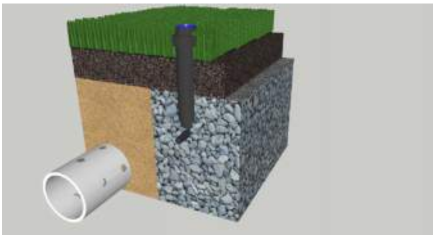
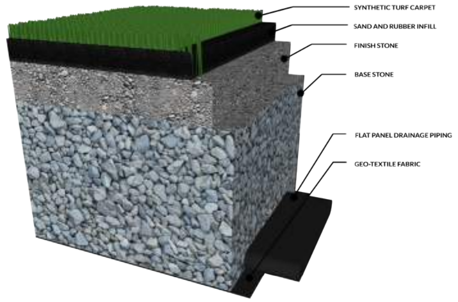
Why Synthetic Turf?

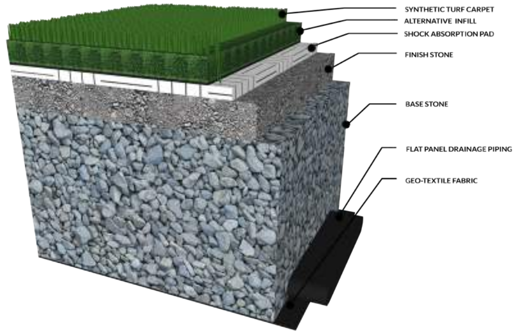
- Playability - 24/7/365
- Consistency
  - Field is usable in all seasons
  - Properly drained, field is usable in all weather conditions
  - Field synthetic turf provides a surface that is true and predictable for all athletes and sports. Specifically true for soccer, field hockey and lacrosse.
  - Consistency of field surface improves overall quality of play.
- Maintenance/Value
- Water Conservation











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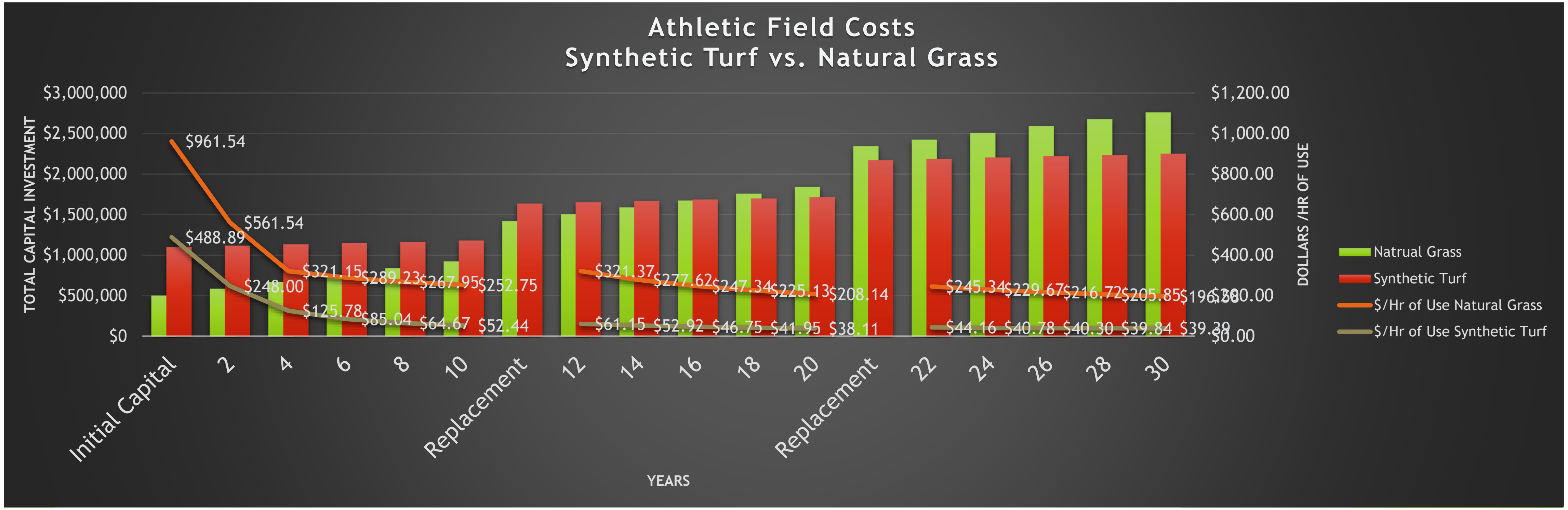
Turf Life Cycle Costs

- **Natural Turf/Grass**
  - Cost to Install $500,000
  - 10 yrs Maintenance $420,000
  - 10 year TOTAL $920,000
  - 10 year Replacement $500,000
  - 10 yrs Maintenance $420,000
  - **20 year TOTAL** **$1,840,000**
- **Synthetic Turf**
  - Cost to Install $1,100,000
  - 10 yrs Maintenance $80,000
  - 10 year TOTAL $1,180,000
  - 10 year Replacement $455,000
  - 10 yrs Maintenance $80,000
  - **20 year TOTAL** **$1,715,000**

higher initial cost

BUT

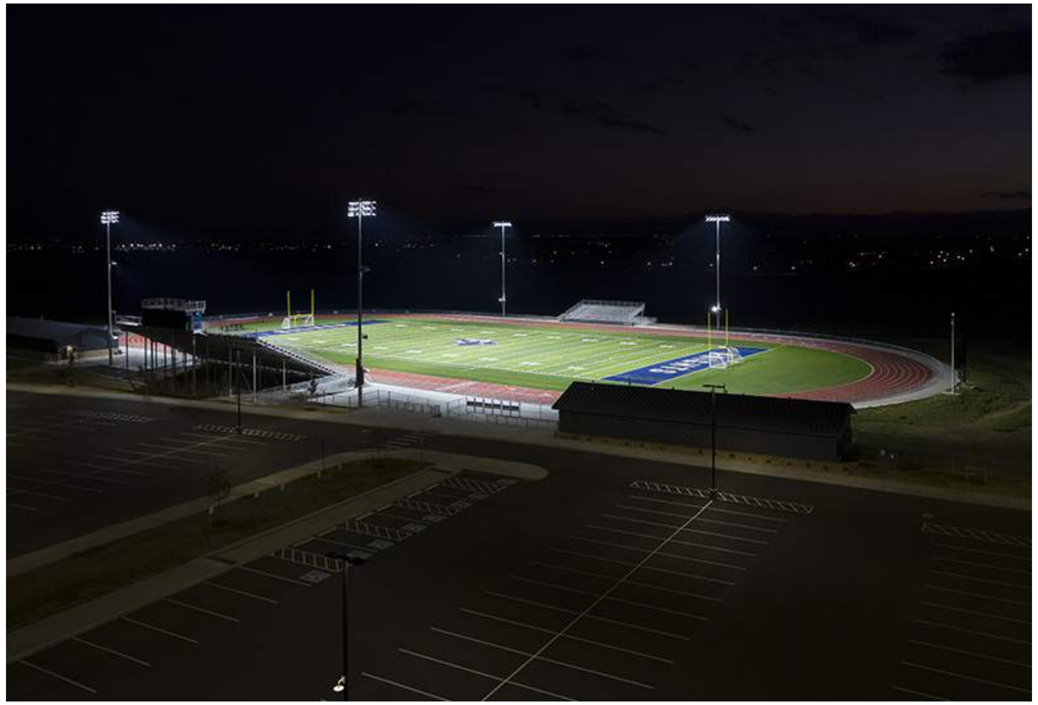
cheaper to maintain

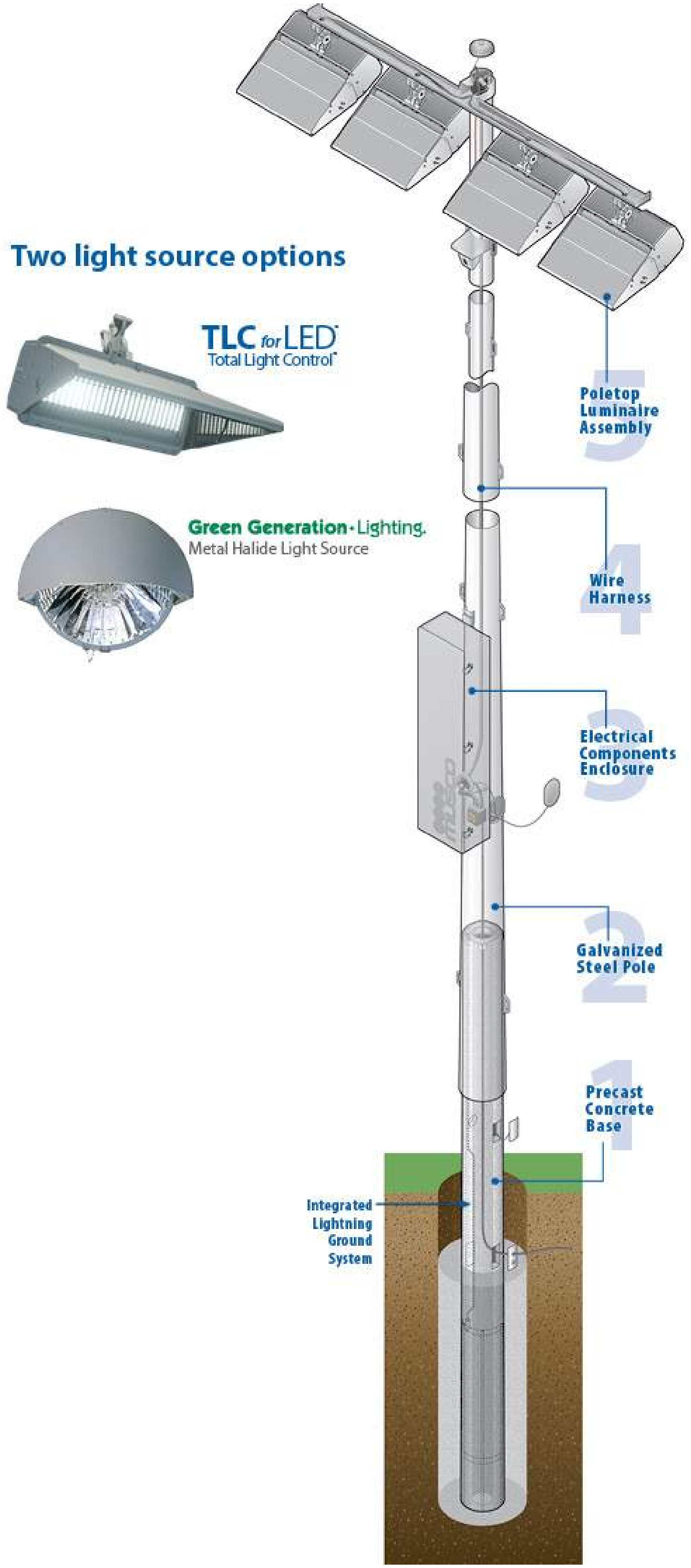


COAKLEY MIDDLE SCHOOL

Sport Lighting

- Photometric Study to determine the foot/candles on the field surface and perimeter of 0.0 light spread
- Number and locations of lights
- Pole height required for lights
- Cut-off fixtures to control light spread
- Site sections and existing tree line to study relationships with abutters





COAKLEY MIDDLE SCHOOL

Preliminary Phasing Plan Process

- Initial plans developed by Ai3 Design team
- Civil Engineers provide additional review for utilities and stromwater management
- Ai3 Construction Administration Team reviews phasing plans
- Compass to review Phasing Plans for constructability
- Working group review including Superintendent, Principal, and Building Committee members
- Phasing Plans to be submitted in the Schematic Design Report

COAKLEY MIDDLE SCHOOL

Phasing Plan Considerations

- Parking needs during construction for staff/faculty/community
- Access to community fields during construction
- Gate closure times
- Secure delivery routes if needed
- Impact to running track for potetial staging area
- Impact to walking track around existing fields during and after construction
- Impact to existing field lighting
- Impact to consession stand during construction
- Location of contractor staging
- Location of contractor trailors/ parking
- Soil stockpile
- De-watering of the site during construction
- Erosion/noise/dust control

Option 3A
New Construction
4-story

- replication of 1 field
- large outdoor playspace
- additional parking
- full perimenter access
- distributed student pick-up & drop-off
- concessions would be demo'd & rebuilt
- new building avoids existing modulars
- bus parking remains on-site

Parent drop-off
Bus drop-off

PARKING
existing: 234
5 - 8: 319

COAKLEY MIDDLE SCHOOL

Estimated Total Project Cost $131.4 million

$6,186,770 ADD for CMr (C.149A)
$950,000 ADD for Synthetic Turf Field
$550,000 ADD for sports field lighting
$6,400,000 ADD for Renewable Energy

Estimated MAXIMUM Total Project Cost $150.0 million

Questions/Discussion

COAKLEY MIDDLE SCHOOL