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3.3.3 Final Evaluation of Alternatives

A. Summary of Alternatives including Cost and Schedule

Multiple construction alternatives for a grade 9-12 high school with enrollment of 2,395 students were developed, including a base code upgrade option, two renovation and addition options, one phased in-place option at the existing building location, and three entirely new construction alternatives. The alternatives explore opportunities and constraints of building on the existing Lexington High School site and the surrounding athletic fields.The following sections provide a description of each construction alternative advanced through PSR. All project costs identified below list the School Building Educational Program plus the Central Office (CO) and the various Field House Alternates (FH) (refer to Section 3.3.3F for more info):

A cost estimate, provided by AM Fogarty is included in the Appendix to this report.

	B. Renovation & Addition		C. New Construction – On Fields			D. New Construction – Phased in Place
Alternative	B.1 Quad	B.4 Figure Eight	C.1d Branch	C.2b Braid	C.5b Bloom	D.2 Weave
Project Cost School + Add/Reno FH	$690,000,000	$692,000,000	$637,000,000	$636,000,000	$639,000,000	$711,000,000
Project Cost School + Add/Reno FH + Central Office	$713,000,000	$715,000,000	$660,000,000	$659,000,000	$662,000,000	$734,000,000
Construction Duration	6 Years	6.25 Years	4.5 Years	4.5 Years	4.5 Years	6.5 Years
# of Phases	4 + 1	5 + 1	1 + 1	1 + 1	1 + 1	4 + 1
Building Location	Existing Footprint	Existing Footprint	Fields	Fields	Fields	Existing Footprint
Modular Max Required	32	42	0	0	0	48
						

	B.1 *Quad*	B.4 *Figure Eight*	C.1d *Branch*	C.2b *Braid*	C.5b *Bloom*	D.2 *Weave*
New High School	$649 Million	$651 Million	$596 Million	$595 Million	$598 Million	$670 Million
New High School + CO	$672 Million	$674 Million	$619 Million	$618 Million	$621 Million	$694 Million
New High School + Renovated FH + CO	$699 Million	$701 Million	$646 Million	$645 Million	$648 Million	$720 Million
New High School + Add/Reno FH + CO	**$713 Million**	**$715 Million**	**$660 Million**	**$659 Million**	**$662 Million**	**$734 Million**
New High School + Small New FH + CO	$710 Million	$712 Million	$657 Million	$656 Million	$659 Million	$731 Million
New High School + Medium New FH + CO	$732 Million	$734 Million	$679 Million	$678 Million	$681 Million	$754 Million
New High School + Large New FH + CO	$743 Million	$745 Million	$690 Million	$689 Million	$692 Million	$764 Million

Pricing in this table is based on PM&C Cost estimate. All pricing throughout these reports are based on the average costs between PM&C and AM Fogarty estimates.

Preliminary Design Pricing Table

= Formula do not edit

Option (Description)	Total Gross Square Feet	Square Feet of Renovated Space ($*/SF)	Square Feet of New Construction ($*/SF)	Site, Building Takedown, Haz Mat Etc. ($*)	Estimated Total Construction** ($*)	Estimated Total Project Costs ($)
		School and Add/Reno Field House Only				
Option 1 (Code Upgrade Option)	352,000 sf	352,000 sf $ 610.00 $/sf	- sf $ - $/sf	$ 15,607,240	$ 230,327,240 $ 654.34 $/sf	$ 311,000,000
Option 2 (Addition Renovation Option B.1-Quad)	440,816 sf	86,570 sf $ 883.91 $/sf	354,246 sf $ 1,000.33 $/sf	$ 62,230,012	$ 493,113,002 $ 1,118.64 $/sf	$ 649,000,000
Option 3 (Addition Renovation Option B.4-Figure 8)	440,816 sf	140,980 sf $ 959.86 $/sf	299,836 sf $ 992.79 $/sf	$ 59,279,810	$ 492,275,055 $ 1,116.74 $/sf	$ 649,000,000
Option 4 (New Construction Option C.1d Branch)	440,816 sf	- sf $ - $/sf	440,816 sf $ 926.86 $/sf	$ 65,264,572	$ 473,839,290 $ 1,074.91 $/sf	$ 598,000,000
Option 4 (New Construction Option C.2b Braid)	440,816 sf	- sf $ - $/sf	440,816 sf $ 911.16 $/sf	$ 66,525,553	$ 468,179,460 $ 1,062.07 $/sf	$ 598,000,000
Option 5 (New Construction Option C.5b Bloom)	440,816 sf	- sf $ - $/sf	440,816 sf $ 931.88 $/sf	$ 64,831,737	$ 475,619,351 $ 1,078.95 $/sf	$ 598,000,000
Option 6 (New Construction Phased In Place D.2 Weave)	440,816 sf	- sf $ - $/sf	440,816 sf $ 996.01 $/sf	$ 64,798,722	$ 503,855,866 $ 1,143.01 $/sf	$ 670,710,700
Costs Added to all Options Above						
Field House Add/Reno Option 3	48,000 sf	34,400 sf $ 633.57 $/sf	13,600 sf $ 776.60 $/sf	$ 1,247,591	$ 33,604,013	
Breakout Costs not Added to the above options						
Central Office	20,700 sf	- sf $ - $/sf	20,700 sf $ 880.76 $/sf	$ 1,580,001	$ 19,811,733	

* Marked Up Construction Costs

** Does not include Construction Contingency

*** **District's Preferred Schematic**

Lexington High School Project

Preferred Schematic Report - Relative cost summary

12/13/2024

DRAFT

General Note:

The costs for the various PSR Options indicated below are **intended to be an analysis of the relative costs between options and NOT a prediction of the actual final cost of any individual optio**n. Major variables such as geotechnical, site grading, wetland determination, structural system and final MEP systems have yet to be designed and **costs will vary significantly from the benchmark cost estimating included as part of this PDP cost analysis. The costs outlined in this report should not be represented as the FINAL construction budget and have a +/- 10% degree of accuracy.**

Table A - Massing Study Alternates

			Construction Costs Only											
Scope Option	**Scope Description**	**GSF**	**PM&C Estimate ($)**	**A.M. Fogarty Estimate ($)**	**Average between 2 cost estimators**	**Structured Parking**	**Total Construction**	**Soft cost (20% C, 22% B&D)**	**Owner Contingency 5%**	**Modulars**	**Total Project Cost**	Project cost $psf	**Notes**	**Duration (Months)**
Option B.1 "Quad"	Add/Reno - Phased in place, retaining buildings G&J structure	440,816	$ 493,113,002	$ 508,457,930	$ 501,000,000	$ 1,137	**$ 501,001,137**	$ 110,220,250	$ 25,050,057	$ 12,800,000	**$ 649,000,000**	$ 1,472	6 Year duration, requires 32 modulars	72
Option B.4 "Figure Eight"	Add/Reno - 4 story. Phased in place retaining buildings C&D	440,816	$ 492,275,055	$ 505,214,287	$ 499,000,000	$ 1,132	**$ 499,001,132**	$ 109,780,249	$ 24,950,057	$ 16,800,000	**$ 651,000,000**	$ 1,477	6.25 year duration, requires 42 modulars	76
Option C.1d "Branch"	New Construction - . 4 Story. On fields, 2 phases, reduced wetlands impact	440,816	$ 473,839,290	$ 480,112,421	$ 477,000,000	$ -	**$ 477,000,000**	$ 95,400,000	$ 23,850,000		**$ 596,000,000**	$ 1,352	4 year duration	52
Option C.2b "Braid"	New Construction - 4story. On fields, 2 phases	440,816	$ 468,179,460	$ 484,017,020	$ 476,000,000	$ -	**$ 476,000,000**	$ 95,200,000	$ 23,800,000		**$ 595,000,000**	$ 1,350	4 year duration	52
Option C.5b "Bloom"	New Construction - . 4 story. On fields, 2 phases, reduced wetlands impact	440,816	$ 475,619,351	$ 479,480,566	$ 478,000,000	$ -	**$ 478,000,000**	$ 95,600,000	$ 23,900,000		**$ 598,000,000**	$ 1,357	4 year duration	52
Option D.2 "Weave"	New Construction - 4 story. On existing building footprint, multiple phases, reduced wetland and Article 97 impacts.	440,816	$ 503,855,866	$ 521,450,374	$ 513,000,000	$ -	**$ 513,000,000**	$ 112,860,000	$ 25,650,000	$ 19,200,000	**$ 670,710,000**	$ 1,522	6.5 year duration, requires 48 modulars	78
				$ 3			**$ 1,084**		$ 54					
	New Construction options average (C.1d, C.2b, C.5b)	440816			$ 477,000,000			$ 95,400,000	$ 23,850,000		**$ 596,333,333**			
				Construction Cost $psf	**$ 1,082**					**Project Cost $psf**	**$ 1,353**			
	Add/Reno options average (B.1 & B.4)	440816			$ 500,000,000			$ 95,400,000	$ 11,925,027		**$ 650,000,000**			
				Construction Cost $psf	**$ 1,134**					**Project Cost $psf**	**$ 1,475**			
	Weave (D.2)	440816			$ 513,000,000			$ 112,860,000	$ 25,650,000		**$ 670,710,000**			
				Construction Cost $psf	**$ 1,164**					**Project Cost $psf**	**$ 1,522**			

Table B - Breakout Options

Scope Option	Scope Description	GSF	Construction Costs Only: PM&C Estimate ($)	Construction Costs Only: A.M. Fogarty Estimate ($)	Construction Costs Only: Average	Soft cost (20%)	Owner Contingency (5%)	Total Project Cost	Project cost $psf
New Field House Option 1	A stand-alone project, all separate utilities and MEP, Starts 1-year into school construction, separate bid, Separate CM. 4 Lane 146m Track	36,000	$ 30,761,771	$ 29,665,692	**$ 30,213,732**	**$ 6,042,746**	**$ 1,510,687**	**$ 38,000,000**	$ 1,056
New Field House Option 2	A stand-alone project, all separate utilities and MEP, Starts 1-year into school construction, separate bid, Separate CM. 4 Lane 200m track	60,000	$ 48,596,066	$ 46,872,083	**$ 47,734,075**	**$ 9,546,815**	**$ 2,386,704**	**$ 60,000,000**	$ 1,000
New Field House Option 3	A stand-alone project, all separate utilities and MEP, Starts 1-year into school construction, separate bid, Separate CM. 6 Lane 200m Track	72,000	$ 56,804,589	$ 56,014,528	**$ 56,409,559**	**$ 11,281,912**	**$ 2,820,478**	**$ 71,000,000**	$ 986
Add/Reno Field House	4 Lane 200m Track	48,000	$ 33,604,589	$ 32,540,753	**$ 33,072,671**	**$ 6,614,534**	**$ 1,653,634**	**$ 41,000,000**	$ 854
New Pool	A stand-alone project, all separate utilities and MEP, Starts 1-year into school construction, separate bid, Separate CM	16,400	$ 21,162,784	$ 17,172,858	**$ 19,167,821**	**$ 3,833,564**	**$ 958,391**	**$ 24,000,000**	$ 1,463
Renovate field house 5-10yr	4 Lane 146m Track	34,000	$ 1,968,552	$ 2,008,250	**$ 1,988,401**	**$ 397,680**	**$ 99,420**	**$ 2,000,000**	$ 59
Renovated Field House	With the school construction	34,000	$ 21,918,092	$ 21,811,305	**$ 21,864,699**	**$ 4,372,940**	**$ 1,093,235**	**$ 27,000,000**	$ 794
Central Office	Within the High School proper - Include 60 additional on-grade parking spaces	20,700	$ 19,811,723	$ 17,426,965	**$ 18,619,344**	**$ 3,723,869**	**$ 930,967**	**$ 23,000,000**	$ 1,111
Mass Timber Option - Scope A	The entire structure: At Gymnasium - 3-ply CLT with wood trusses clear span at 10' o.c. | At Cafeteria and Media Center - 5-ply CLT with Glu-lam beams at 10' o.c. and wood columns | At remaining Building - 5-ply CLT on all classroom floors with 2-hours rating & 2" concrete topping on acoustic mat & Glulam beams at 15' o.c. & Wood columns at 15'x 30' grid spacing | Lateral system for all Mass Timber options to be steel braced frames	440,816	$ 12,227,320	$ 26,884,351	**$ 19,555,836**	**$ 3,911,167**	**$ 977,792**	**$ 24,000,000**	$ 54
Mass Timber Option - Scope B	Hybrid System: Same as Scope A but with steel columns	440,816	$ 9,107,000	$ 20,812,111	**$ 14,959,556**	**$ 2,991,911**	**$ 747,978**	**$ 19,000,000**	$ 43
Mass Timber Option - Scope C	At Gym, Cafeteria and Media Center only, as described in Scope A	44,000	$ 2,212,000	$ 1,055,600	**$ 1,633,800**	**$ 326,760**	**$ 81,690**	**$ 2,000,000**	$ 45
HVAC Alternate	Deduct to change from GSHP to ASHP	440,816	$ (16,058,560)	$ (16,015,476)	**$ (16,037,018)**	**$ (3,207,404)**	**$ (801,851)**	**$ (20,000,000)**	$ (45)

Table C.1 - Overall Project Pricing (Branch C1D)

Scope Description	GSF	Total Project Cost	Proj $psf
C.1D Branch new construction	440,816	$ 596,000,000	$ 1,352
C.1D Branch new construction + Central Office	461,516	$ 619,000,000	$ 1,341
C.1D Branch new construction + Central Office + Renovated FH	495,516	$ 646,000,000	$ 1,304
C.1D Branch new construction + Central Office + Addition/Renovated FH	509,516	$ 660,000,000	$ 1,295
C.1D Branch new construction + Central Office + New (SMALL) FH	497,516	$ 657,000,000	$ 1,321
C.1D Branch new construction + Central Office + New (LARGE) FH	533,516	$ 690,000,000	$ 1,293

Table C.2 - Overall Project Pricing (Braid C2B)

Scope Description	GSF	Total Project Cost	Proj $psf
C.2B Braid new construction	440,816	$ 595,000,000	$ 1,350
C.2B Braid new construction + Central Office	461,516	$ 618,000,000	$ 1,339
C.2B Braid new construction + Central Office + Renovated FH	495,516	$ 645,000,000	$ 1,302
C.2B Braid new construction + Central Office + Addition/Renovated FH	509,516	$ 659,000,000	$ 1,293
C.2B Braid new construction + Central Office + New (SMALL) FH	497,516	$ 656,000,000	$ 1,319
C.2B Braid addition renovation + Central Office + New (LARGE) FH	533,516	$ 689,000,000	$ 1,291

Table C.3 - Overall Project Pricing (Bloom C5B)

Scope Description	GSF	Total Project Cost	Proj $psf
New High School	440,816	$ 598,000,000	$ 1,357
New High School + Add/Reno Field House	488,816	$ 639,000,000	$ 1,307
New High School+ Central Office + Addition/Renovated FH	509,516	$ 662,000,000	$ 1,299
New High School + Central Office	461,516	$ 621,000,000	$ 1,346
New High School + Central Office + Renovated FH	495,516	$ 648,000,000	$ 1,308
New High School + Central Office + New (SMALL) FH	497,516	$ 659,000,000	$ 1,325
New High School + Central Office + New (LARGE) FH	533,516	$ 692,000,000	$ 1,297

Table C.4 - Overall Project Pricing (Quad B.1)

Scope Description	GSF	Total Project Cost	Proj $psf
B.1 Quad addition renovation	440,816	$ 649,000,000	$ 1,472
B.1 Quad addition renovation + Central Office	461,516	$ 672,000,000	$ 1,456
B.1 Quad addition renovation + Central Office + Renovated FH	495,516	$ 699,000,000	$ 1,411
B.1 Quad addition renovation + Central Office + Addition/Renovated FH	509,516	$ 713,000,000	$ 1,399
B.1 Quad addition renovation + Central Office + New (SMALL) FH	497,516	$ 710,000,000	$ 1,427
B.1 Quad addition renovation + Central Office + New (LARGE) FH	533,516	$ 743,000,000	$ 1,393

Table C.5 - Overall Project Pricing (Figure Eight B.4)

Scope Description	GSF	Total Project Cost	Proj $psf
B.4 Figure Eight addition renovation	440,816	$ 651,000,000	$ 1,477
B.4 Figure Eight addition renovation + Central Office	461,516	$ 674,000,000	$ 1,460
B.4 Figure Eight addition renovation + Central Office + Renovated FH	495,516	$ 701,000,000	$ 1,415
B.4 Figure Eight addition renovation + Central Office + Addition/Renovated FH	509,516	$ 715,000,000	$ 1,403
B.4 Figure Eight addition renovation + Central Office + New (SMALL) FH	497,516	$ 712,000,000	$ 1,431
B.4 Figure Eight addition renovation + Central Office + New (LARGE) FH	533,516	$ 745,000,000	$ 1,396

Table C.6 - Overall Project Pricing (Weave D2)

Scope Description	GSF	Total Project Cost	Proj $psf
D.2 Weave addition renovation	440,816	$ 670,710,000	$ 1,522
D.2 Weave addition renovation + Central Office	461,516	$ 693,710,000	$ 1,503
D.2 Weave addition renovation + Central Office + Renovated FH	495,516	$ 720,710,000	$ 1,454
D.2 Weave addition renovation + Central Office + Addition/Renovated FH	543,516	$ 734,710,000	$ 1,352
D.2 Weave addition renovation + Central Office + New (SMALL) FH	497,516	$ 731,710,000	$ 1,471
D.2 Weave addition renovation + Central Office + New (LARGE) FH	533,516	$ 764,710,000	$ 1,433

Table C.7 - Side by side

	Branch C1D	Braid C2B	Bloom C5B	Quad B1	Figure 8 B4	Weave D2
New High School	$ 596,000,000	$ 595,000,000	$ 598,000,000	$ 649,000,000	$ 651,000,000	$ 670,710,000
New High School + Central Office	$ 619,000,000	$ 618,000,000	$ 621,000,000	$ 672,000,000	$ 674,000,000	$ 693,710,000
New High School + Central Office + Renovated FH	$ 646,000,000	$ 645,000,000	$ 648,000,000	$ 699,000,000	$ 701,000,000	$ 720,710,000
New High School+ Central Office + Addition/Renovated FH	**$ 660,000,000**	**$ 659,000,000**	**$ 662,000,000**	**$ 713,000,000**	**$ 715,000,000**	**$ 734,710,000**
New High School + Central Office + New (SMALL) FH	$ 657,000,000	$ 656,000,000	$ 659,000,000	$ 710,000,000	$ 712,000,000	$ 731,710,000
New High School + Central Office + New (LARGE) FH	$ 690,000,000	$ 689,000,000	$ 692,000,000	$ 743,000,000	$ 745,000,000	$ 764,710,000

B. Alternative A: Code Upgrade (No New Build)

1. Construction Alternative A

Design Approach

Code Upgrade and Repair

The base repair and code upgrade alternative with no modification of existing spaces or their function meets neither the educational program nor the projected growth in student population. The existing two-story high school is approximately 352,000 square feet, including 320,720 gross square feet of base educational program and 31,280 gross square feet of existing Field House building. Upgrades would take approximately 4 years to complete over multiple phases.

The Code Upgrade and Repair Alternative will include compliance with the Lexington Integrated Design Policy, a Net Zero Energy school building with an energy target EUI of 25 kBtu/SF/yr. or 30% better than ASHRAE 90.1-2019 whichever is lower, LEEDv4 for Schools Gold Certification with a goal for Platinum, and embodied carbon reduction strategies such as low carbon concrete and materials such as structural wood components.

Description

The code upgrade and repair alternative require an assessment of the impact and cost of addressing the following deficiencies, without a major building project:

- Life safety code compliance
- Accessibility code limitations
- Stretch Energy code compliance
- Physical plant deterioration
- Hazardous materials
- Capacity constraints

Accessibility Code Limitations

In general, the following items will be addressed in this alternative:

- Lower than required guardrails and handrails for ramps and stairs, without proper extensions
- Insufficient push/pull clearances at some doors
- Lack of ADA Door operators at all entry doors
- Inaccessible seating locations in the theater and lecture hall
- Non-compliant drinking fountains
- Non-compliant toilet fixtures, lavatories and sinks
- Insufficient grab bars at some toilet rooms and showers
- Exposed piping below sinks (neither apron nor pipe protection)
- Lack of 5’-0” clear turning circle at some toilet rooms
- Non-accessible lavatory and sink faucets
- Non-compliant height at some urinals

Energy Code Compliance

The Town of Lexington has adopted the Massachusetts Stretch Energy Code's Specialized Opt-In Code. The Code Upgrade option would require compliance with the Stretch Energy Code (Standard), as the Specialized Code does not apply to existing buildings. Enclosure Upgrades, MEP Systems upgrades will be required to comply with the Stretch Energy Code. Building Enclosure upgrades will include mitigation of thermal bridges.

Life Safety Code Compliance

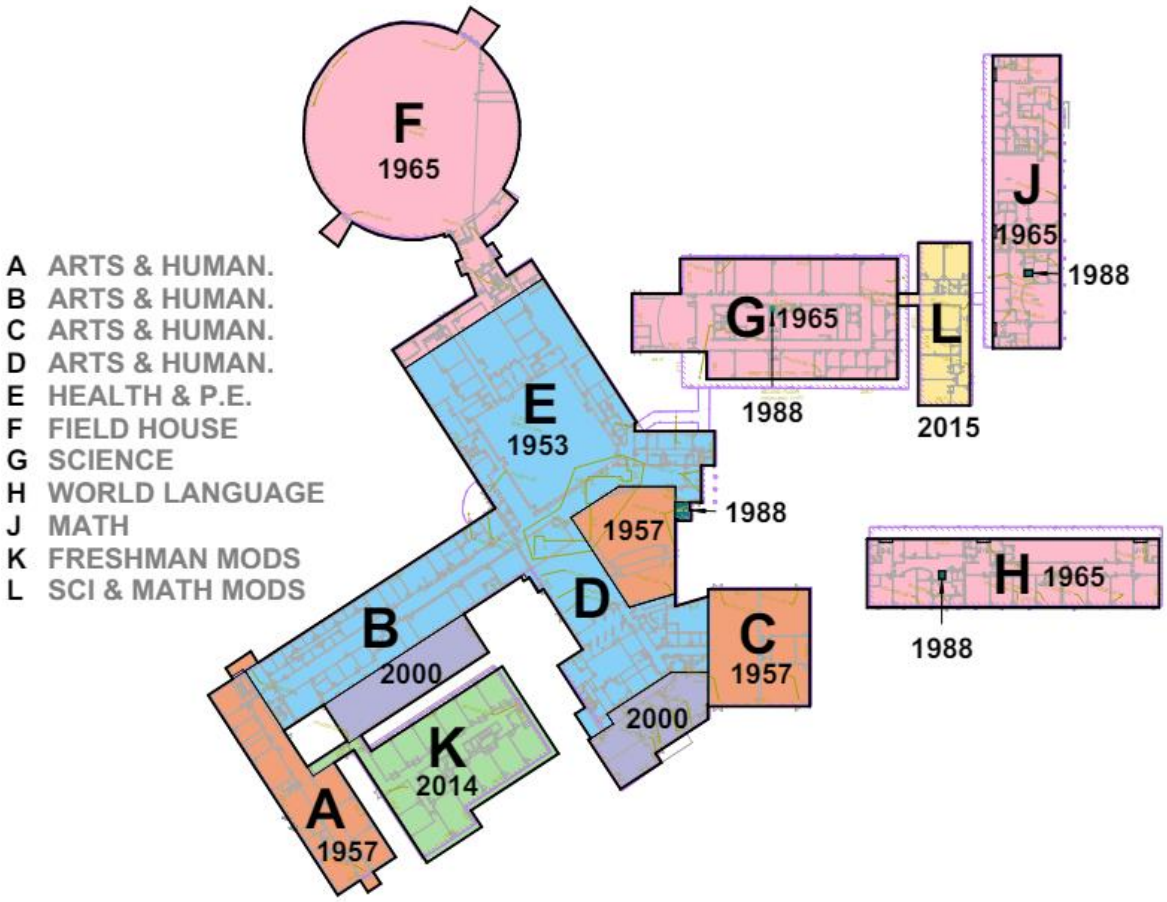
Stair guardrails do not meet minimum opening size requirements, nor require heights, nor provide adequate edge protection in many locations. Infill panels and vertical extensions will be provided at all stair guardrails to make them code compliant, and handrails will be added as required to meet code.

Site

Site work in this option is focused on meeting current accessibility codes. An accessible walkway or ramp with a compliant landing size at main entry doors is required. Existing non-compliant walkways, ramps, guardrails and handrails would be replaced. Accessible routes from the accessible parking spaces to the main entrance would also be provided.

Architectural

On the exterior of the building, localized repointing and general cleaning of exterior masonry brick and exposed cast in place concrete will occur. Replacement of all exterior windows will be required with energy efficient units. Replacement of all exterior HM doors.



Complete replacement of the roofing, providing a high-albedo membrane roof with energy code-compliant thickness of insulation. Complete replacement of exterior wood soffits with energy-code compliant thickness of insulation. Exterior wall assemblies are likely to be replaced to allow for significant additional insulation and to mitigate the excessive thermal bridging conditions across the buildings. Air infiltration testing would be required.

Any non-code compliant door hardware will be replaced with compliant hardware. Any non-code compliant door clearances will be addressed through the use of powered operators and actuator buttons. All interior glazing that is potentially subject to impact will be replaced with laminated or tempered glass. Interior finishes such as flooring, wall tiles, and acoustic ceiling tiles will be replaced where damaged or deteriorated.

As noted in the Accessibility Code Limitations portion of this section, several spaces located throughout the school incorporate inaccessible seating areas, due to tiers in the lecture hall and inaccessible slopes in the auditorium. Cut-outs will be added in the front row of tiers to create inclusive seating positions down low, and ramps and elevated seating positions will be added in the auditorium.

Added accessibility elements in these spaces will reduce the seating capacity slightly. All finishes in these spaces will be renovated to accommodate this alteration. In general, repairs to or replacement of finishes will occur wherever system upgrades are required.

Capacity Constraints

The design capacity of 2,395 students noted in the MSBA Enrollment Projection, and the corresponding educational space needs cannot be adequately provided by a no-build option. No work related to increasing the capacity of the facility is included in the scope of this option.

Program Delivery Impediments

An educational facility that was built over the course of many years, from 1953 to 2015, the existing Lexington High School exhibits many features that no longer meet the pedagogical requirements of a modern high school. Many classrooms are significantly undersized, students are required to go outside to get from building to building, and many modifications over the decades have resulted in duplicate or disconnected spaces and extended travel distances with challenging control and security issues.

School Requirements

Lexington High School delivers a robust curriculum which is dependent on the size, quality and quantity of the general classrooms. However, these classrooms are on average undersized, with an average size of 699 SF, which compares poorly with the accepted norm of 825 to 950 sf for high school use.

Science is taught in 22 small labs at an average size of 1,069 SF with fixed benches that limit flexibility, with ten prep rooms, which are also undersized.

There is a separate gymnasium and field house space in the building. Both spaces are currently being fully utilized, but the gym is undersized, and the field house is insufficient in size to accommodate indoor track competitions.

Other deficiencies are outlined in the Space Summary found in Section 3.1.4D of this report.

Schedule Overview

Alternative A.1 would be implemented through multiple phases and intense summer phases over forty-eight (48) months.

Cost Overview

The estimated construction cost is:

$232,000,000

The estimated project cost is:

$310,000,000

Construction Alternative A Pros & Cons

The Pros and Cons are summarized as follows:

Pros

- Lower costs when compared to other options which enhance the educational value of the building.
- Higher potential reimbursement percentage than new construction options
- Athletic field resources remain largely unchanged

Cons

- The completed construction would not accommodate the future curriculum envisioned in the educational program
- Significantly lower impact on energy conservation and operating costs than that of other options
- Does nothing to address overcrowding, and would incur space reduction impacts due to code upgrades to existing infrastructure
- Many duplicate and poorly utilized spaces remain
- Separated buildings will be maintained, forcing students to move outside between buildings and perpetuating security concerns associated with this condition
- Isolated and inefficient corridors remain difficult to negotiate and are disorienting
- Multiple-year disruption due to phased construction.
- A significant percentage of work would likely occur off-hours and that constraint would further extend the construction schedule.
- Added cost and inconvenience due to modular classrooms
- The floor-to-floor height of existing classroom wings does not easily accommodate duct distribution from DOAS units in lieu of existing unit ventilators.

System Narratives

Structural

Existing foundations, floor and roof framing remain. It is anticipated that the required structural work will be minor, and the seismic upgrade requirement will not be triggered per IEBC. For a voluntary upgrade to the current code, a new lateral system would need to be introduced as there is none defined in the existing drawings. This can include steel braced frames or infill concrete/CMU shear walls, both of which would require new footings. Furthermore, each of the CMU walls will need to be attached to their respective floor and roof diaphragms, which is further complicated by the presence of clerestory windows in the interior partitions. New steel framing for floor and roof openings is required at any new MEP shafts.

HVAC

The existing HVAC systems will be replaced with new, all-electric systems to comply with the current Massachusetts Stretch Energy Code, as adopted by the Town of Lexington. A specific system approach is represented below, but alternative space heating and cooling approaches will be assessed to determine the preferred system.

Phased construction will require on-going operation of portions of the existing HVAC systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure proper indoor air quality of existing spaces while construction occurs in nearby areas of the site (e.g., added filtration at outdoor air intakes or extending existing outdoor air intakes to be clear of construction zones).

The new heating and cooling systems will be based on a ground source geothermal system utilizing vertical boreholes. The preliminary system requirement is estimated as a geothermal field that includes 350 boreholes at 800 ft, each. Based on the findings of the test borehole, where there was a fault at the 190 ft depth, the boreholes should be assumed to require 6” casing down to a depth of 220 ft. The geothermal loop will be 30% propylene glycol with distribution from a system of variable volume pumps in a mechanical room. Plate and frame heat exchangers will separate the ground source glycol loop from the interior water loop and associated pumping system, which will support mechanical heating and cooling systems. Space heating and cooling will utilize above-ceiling heat pumps for classrooms and support spaces. Larger spaces will be supported by AHUs with water source heat pumps.

A mechanical equipment room will be required to support the geothermal system. The existing main boiler room (Wing D) can accommodate the required equipment for the geothermal system. Provide a temporary steam boiler (approximate size of 200HP – 6,700 MBH) to support phased installation of the geothermal system for one (1) heating season.

Ventilation will be provided with rooftop DOAS units, configured with water source heat pumps for conditioning of outdoor air to the classrooms and support spaces. VAV terminal units will manage ventilation to individual rooms based on CO2 control.

Specialty systems will be included for ventilation of Science Labs, Kitchens, Kilns and other such installations.

A new DDC building management system will provide control and monitoring of the HVAC systems and monitoring of selected Plumbing and Electrical equipment and metering.

Alternate System: In lieu of a geothermal system, provide an air source heat pump (ASHP) system based on grade-mounted air source heat pumps (air-to-water) with 4-pipe distribution (HWS/R and CHWS/R) piped to the mechanical equipment room.

Each outdoor loop (30% glycol HW and CHW) will be piped to a pair of dedicated pumps and plate-and-frame heat exchanger: one pair of pumps and heat exchanger for HW and another set for CHW). A separate pair of HW pumps and CHW pumps will provide distribution to the building fan coil loads from their respective heat exchangers. Rooftop Units and DOAS Units will be provided as packaged heat pump units (not supported by 4-pipe ASHP system).

Plumbing

The plumbing systems in general appear to be in adequate working condition, however all plumbing systems are either at or beyond the end of their useful life expectancy. The major piping systems from visual inspection appear in fair to poor condition. In general, plumbing fixtures were replaced during renovations, but some conditions do not fully meet current ADA/MAAB requirements.

Water piping in general appears to be in fair to poor condition. Due to the pipe age, there is a strong probability that the water service includes lead-containing solder. Lead free options for valves and fittings were limited at the time of construction. The domestic water system would require replacement throughout to meet current lead-free requirements.

Fixtures in general do not conform to current water saving standards (LEED). Fixtures to be replaced with low flow fixtures to meet the sustainability requirements. Kitchen equipment will also need to be replaced with low flow equipment in accordance with LEED requirements.

In order to meet the current Massachusetts Energy Code, including the Specialized Stretch Energy Code adopted by the Town of Lexington, the existing gas fired equipment will be removed and replaced with electric equipment.

The existing HVAC systems will be replaced with new, all-electric systems.

The natural gas systems will be removed in their entirety. This includes gas to mechanical units, domestic water heaters, kitchen equipment, and science/lab classrooms. The natural gas piping within the laboratories will be demolished. Electric hot plates would be required within the laboratory spaces. Gas fired kitchen equipment will be replaced with electric equipment.

The gas fired water heaters will be replaced with electric water heaters. Final configuration/coordination would be required during design. The installation would not be as simple as a one for one replacement. The systems would need to be redesigned.

All non-ADA fixtures that are required to be ADA compliant shall be replaced with ADA compliant fixtures and pre-formed pipe insulations. Repair or replace all drinking fountains that are not operational. Replace non-accessible drinking fountains with ADA compliant fixtures where required to be accessible. Provide bottle fillers where possible.

Overflow (secondary) drains or scuppers will be installed in parapets on the roof and where required by 780 CMR.

Replace existing emergency eyewashes with new eyewashes and provide new emergency showers. Eyewashes and showers shall be located and installed in accordance with 248 CMR and ANSI.

Observations of underground sanitary, vent, and storm piping is not possible. Testing, flushing, and possibly video inspection is required to determine the life expectantly left in the underground piping. Underground piping will be replaced unless proven to be fully functional.

Fire Protection

The building is provided with automatic sprinklers throughout with the following exceptions: The field house (building F) and connecting entrance corridor is not protected by sprinklers. Previous additions and renovations did not provide sprinklers within these areas. In addition, the smaller modular building (2015 Building L) drawings do not show sprinklers. Based on the square footage, sprinklers may not have been required.

Sprinkler protection for the field house needs to be evaluated. Massachusetts General Law Section 26G requires sprinkler protection in additions/renovations that are greater than 7,500 square feet. Final coordination and acceptance will be by the Lexington Fire Department and building code official.

There are four (4) 8" fire water service entrances to the buildings that will remain during the code upgrade. Currently, the system does not include a fire pump. It is assumed that a fire pump is not required for the code upgrade. Final confirmation requires a hydrant flow test to confirm the water supply has not decreased through the years.

Quick response sprinklers will be replaced where they have been in operation for more than 20 years in accordance with NFPA requirements. If representative testing is performed and the sprinklers are proved to be fully functional, the sprinklers can be left in place.

To accommodate the HVAC, Plumbing, and Electrical modifications included in the code upgrades, fire protection work includes modifying the existing sprinkler and standpipe systems. In areas where ceilings are removed, upright sprinklers shall be provided for temporary protection. Upon ceiling installation, new sprinklers will be installed in the center of tiles.

Some valves and sprinklers appear antiquated and are near the end of their life expectancy. Also, availability of parts will be difficult for any major maintenance to the system. This option includes recommendation to replace sprinkler control valves, double check valves, and fire department valves to ensure longer life of the system.

Elevator machine rooms and hoistways will not be protected with automatic sprinklers in accordance with 780 CMR.

Electrical

Utility Interconnection

The existing utility service will be upgraded to accommodate the new program, which includes an all-electric HVAC system, electric vehicle (EV) charging stations in a minimum of 4% of the total new off-street parking spaces (per zoning bylaws), provisions for future installation of EV charging stations for a minimum of 50% of the total new off-street parking spaces (per zoning bylaws), code required provisions for photovoltaic arrays, and battery energy storage systems (BESS). The electrical infrastructure to interconnect these systems will require additional coordination with utility, however early assumptions can include:

- Utility reclosure cabinet.
- CT / Metering cabinet (upstream of entire campus electrical interconnections)
- 15,000 Volt switchgear (owned by the school, operated by utility)
- Provisions for four (4) transformers (owned and operated by the school)
- Provisions for solar system interconnect switchboard for the photovoltaic panels and battery storage units.

All this equipment will be located on site, pad-mounted with underground conduit pathways. A screen wall to visually separate the electrical gear from street views will be required per zoning bylaws.

Power Distribution System

The existing electrical service will be replaced. The existing 2400-Amp, 277/480 volt 3-phase 4 wire electrical service provides a power density of approximately 6 watts/sf, which is estimated to be significantly undersized for an all-electric code required program.

The new distribution system will consist of two (2) 4000 Amp, 277/480V 3-phase 4 wire switchboards with new underground secondary service conductors extended to pad-mounted transformers on site. Coordination with utility will be required, however at this time it is expected that two (2) transformers will be required for the demand of the high school.

The existing electrical distribution system, including the existing 2400A main switchboard, downstream distribution panelboards, and most branch panelboards were replaced approximately 24 years ago, and appear to be in good working condition. It is recommended to maintain as much of the existing distribution system as possible in the renovation area.

Modifications to the existing electrical distribution may include additional panelboards, replacing panelboards and feeders with higher ampere ratings to handle increased loads, and replacing existing main overcurrent protections to include arc energy reduction methods and ground fault protection per latest electrical code requirements.

Phased construction will require on-going operation of portions of the existing electrical systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure existing areas remain fully operational while construction occurs.

Lighting loads, the elevator, large mechanical equipment, and large kitchen electrical loads will be connected to 277/480V panelboards, and all other loads will be connected to 120/208V panelboards.

Life Safety/Emergency System

The existing 600-kW 277/480 volt 3-phase, 4 wire diesel fueled emergency generator and generator distribution system is approximately 24 years old and will require modifications to the system to be brought up to code.

A docking station for a temporary roll-up generator shall be installed to allow the life safety distribution system to remain active during routine maintenance or generator failure, as well as new control wiring and pathways to comply with latest signal and wiring integrity codes. This will require excavating, replacing, and re-working the existing underground conduit between the generator and the service entrance equipment.

The system is likely also undersized for the code compliant program. A second generator will likely be required to energize the various loads. It is estimated that the following items will be connected to the generator system:

- Egress emergency lighting.
- Fire alarm system.
- IT Rooms (power and A/C) including network, door access, intrusion detection, CCTV, PA, telephones.
- Heating system as required to freeze protect the building.
- Elevators.
- Resiliency Level:
    - Level 3 for the majority of building.
    - Level 2, not including food prep requirement, applied to select areas of the building, such as the Fieldhouse/Gym (plan for attaching portable generator for cooking.

Lighting & Lighting Control

Replace all existing interior light fixtures with new, highly efficient LED light fixtures fitted with dimmable drivers.

Replace all exterior light fixtures with new, highly efficient LED light fixtures fitted with dimmable drivers and full cut-off optics.

Replace the existing lighting control system with a new, fully networked lighting control system compliant with the latest energy code. The lighting control system shall include the capability of communicating and controlling ON/OFF 120V power to receptacles in classrooms, offices, corridors, and other spaces required by the energy code.

Fire Alarm

The existing fire alarm system is a fully addressable voice evacuation system consisting of four (4) node panels throughout the campus. The system head end is approximately 24 years old, and appears to be in working order.

All existing initiation and notification devices, however, such as smoke detectors and speaker strobes should be replaced.

The system communicates to the Fire Department via an antenna mounted on the roof, and an auto dialer, which is compliant with latest building codes.

A bi-directional antenna (BDA) system shall be installed to comply with the latest building code. The BDA system will have capabilities to boost fire department and police department radio communications within the building.

Phased construction will require on-going operation of portions of the existing fire alarm systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure existing areas remain fully operational while construction occurs.

Lightning Protection System

The existing school does not have a lightning protection system. A lightning protection system is not required by code, although is recommended by NFPA Standards. A system can be installed if desired by the town.

Telecommunications

The existing telecommunications copper and fiber optic cable infrastructure will be replaced to support data and voice transmission. CAT6A cable will be installed to the end points, with (12) strand OM4 multi-mode and (6) strand OS2 single-mode fiber optic cabling between the MDF and the IDFs. Existing network infrastructure electronics spaces in classrooms and storage spaces will be replaced with secure and climate-controlled rooms to better protect and maintain network electronic equipment. The MDF and IDFs will be replaced with new equipment cabinets, patch panels and overhead cable management components. The MDF and IDFs will be replaced with new rooms fitted with new cooling systems, lighting, and generator backed power.

The existing Public Address and Master Clock Systems will be replaced. Classrooms and other learning spaces will be equipped with two-way talkback speakers. Corridors and larger spaces will be equipped with one-way speakers. Clocks will be synchronized and powered via low-voltage wiring. The Public Address and Master Clock systems will be interfaced at the head end.

Classroom technology infrastructure will be upgraded to provide new data and voice communications with a potential wireless access point location in the ceiling. Audiovisual cabling will be installed to allow projection of content from the instructor's computer to the wall-mounted interactive flat panel monitor.

Speech reinforcement systems will be installed in instructional spaces to provide even distribution of instructor and student speech throughout the space, as well as being interfaced to the interactive flat panel monitor to perform the audio functions for audiovisual presentations in the space.

Current wireless access points will be purchased at the time of occupancy.

Security

After careful consideration and in alignment with best practices and the recommendations outlined in Executive Order 548, which established a Cross-Secretariat Task Force on School Safety and Security, it has been determined that the existing security system will require a comprehensive replacement. While there are no explicit code requirements mandating such action, adhering to the directives and insights provided by the Task Force is paramount in ensuring the utmost safety and security measures are in place within our institution.

The school's security infrastructure is designed with multiple layers, incorporating both active and passive security measures. These layers encompass various aspects such as perimeter security, surveillance cameras deployed both indoors and outdoors, controlled, and secure entry points, access control mechanisms at key interior doors, intrusion detection systems featuring multiple zones, intercommunication systems, the ability to initiate lockdowns for classroom wings, and the capability for individual classroom lockdowns.

Acoustics

New building utility equipment will incorporate sound attenuating measures, as necessary, for compliance with the community noise emissions summarized in the Town of Lexington General Bylaws, Chapter 80: Noise Control. These requirements are consistent with the noise emission requirements established in the Massachusetts Division of Air Quality Control (DAQC) Policy 90-001.

Additionally, new HVAC equipment and system components will be designed for compliance with the LEED Minimum Acoustics Performance prerequisite for HVAC background noise levels in core learning spaces.

Hazardous Materials

As expected for a building of this age, there are significant hazardous materials present, despite prior abatement activities that have occurred over the years. For a detailed report on the materials to be abated, see Section 3.1.4N of the PDP Report.

C. Alternatives B: Addition & Renovation

1. Construction Alternative B.1 (Quad)

Design Approach

Multi-Phased Addition/Renovation on Existing Footprint

As a minimal approach to renovation that utilizes the more appropriate structural bay dimensions of Building G (Science) for new classrooms, while inserting Central Office program into the undersized bays of Building J (Math), the scheme includes 86,570 gross square feet of gut renovations and phased demolition of 265,430 gross square feet of Buildings A, B, C, D, E, H, K and L. This alternative offsets some of its carbon footprint by retaining existing concrete structures, but results in a longer overall project duration at higher cost than single-phase construction approaches. New construction additions totaling 375,279 gross square feet occur in 4 phases over 6 years within the general footprint of the existing school.

Alternative B.1 preserves many of the physical features of the existing school, including its setback from Worthen Road, it's axial relationship to the historic Muzzey Street corridor connecting to downtown, albeit with a more massive, 4-story stacking of program toward the Waltham Street side of the site.

Opportunities for connections to the site are constrained, however a fully contained courtyard provides secure access to the outdoors and preserves a sense of "the Quad" as the civic heart of the school.

Description

The Renovations and Additions to Existing Buildings Alternative will include compliance with the Lexington Integrated Design Policy, a Net Zero Energy school building with an energy target EUI of 25 kBtu/SF/yr. or 30% better than ASHRAE 90.1-2019 whichever is lower, LEEDv4 for Schools Gold Certification with a goal for Platinum, and embodied carbon reduction strategies such as low carbon concrete and materials such as structural wood components.

Life Safety Code Compliance

All existing spaces and systems to remain will be reorganized, upgraded and/or constructed new to meet current life safety codes and standards. New addition portions of the building would be constructed in full compliance with current life safety codes and standards.

Accessibility Code Compliance

All existing spaces, systems, fixtures and equipment to remain will be renovated, reorganized and/or constructed new to meet current accessibility codes and standards. New additional portions of the building would be constructed in full compliance with current accessibility codes and standards.

Energy Code Compliance

The Town of Lexington has adopted the Massachusetts Stretch Energy Code's Specialized Code. The Renovations or Additions to Existing Buildings Alternative would require compliance with the Specialized Stretch Energy Code, based on the major renovation/addition scope of work.

Site

Site work within this addition/renovation alternative will include the redevelopment of all vehicular and pedestrian circulation systems.

To maximize safety, buses, vans, cars and delivery vehicles will all maintain separate circulation and arrival and dismissal locations to the extent feasible. These improvements will provide safe multi-modal access to the school site, clarify vehicular circulation, and mitigate combined, poorly functioning vehicular movement. New pedestrian circulation routes will create dedicated, safe, and accessible access to the school.

New outdoor spaces, including entrance plazas, outdoor learning environments, outdoor courtyards, and connections to wetland resource areas will be developed to support the education goals. The entrance plazas will serve as a transition from the vehicular activities of arrival, dismissal, and parking to the educational environment of the building. All pedestrian circulation systems and outdoor gathering areas will meet ADA and MAAB accessibility requirements.

The planting design will consist of new canopy, understory, and ground plane vegetation that will be introduced around the perimeter of the building and throughout the developed site to complement the architecture of the building; develop and frame outdoor rooms, and add shade, scale, color, texture and four-season interest / educational opportunities to the site. All disturbed existing mature tree canopy will be replaced on the site with native tree species.

B.1 Quad - Site Plan

Hardscape materials and site amenities will be selected based on ease of maintenance, durability, and sense of permanence.

The parking program for the project is confirmed to be 500 spaces and will be provided at-grade. The on-site development will include 470 parking spaces to serve the school, as well as incorporating signage to reserve street parking along Worthen Road for the remaining 30 vehicles.

The new parking areas will incorporate ADA and MAAB compliant accessibility from accessible parking and loading zones to all accessible building entrances. PV canopies over the on-site parking spaces are proposed, see Electrical for more information.

Multiple existing natural turf fields will be disrupted as a result of this alternative. All disturbed fields will be reconstructed in place on the property.

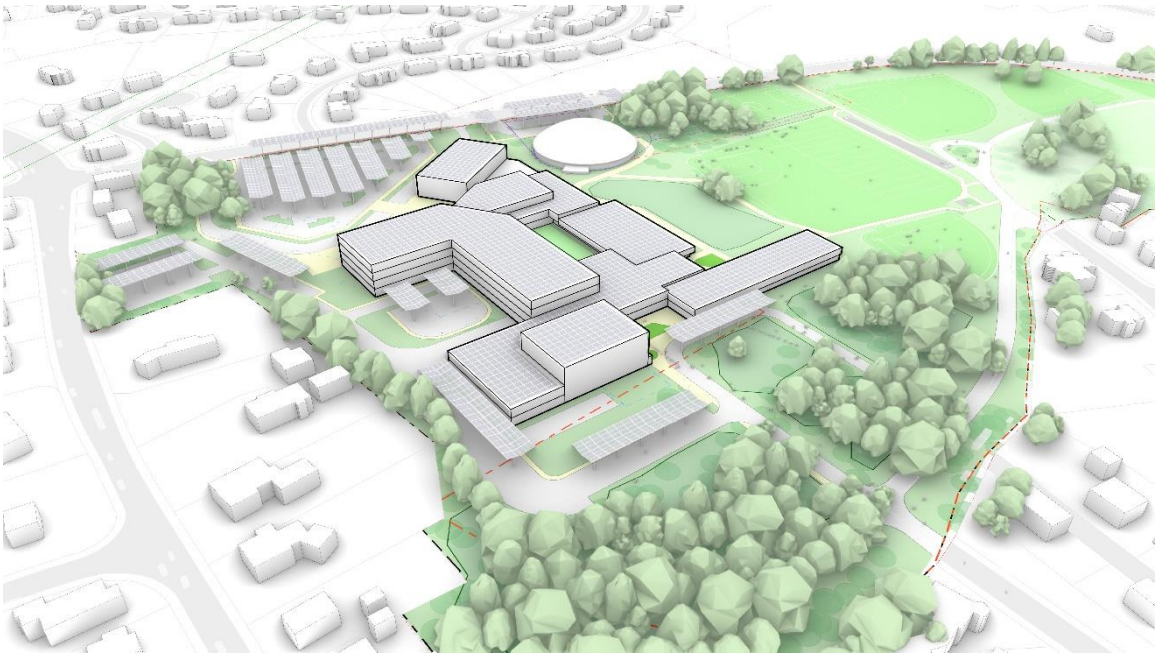
This option includes that the following fields will be impacted and therefor reconstructed:

- C3 Junior Varsity Baseball Diamond
- C5 Crumb Football Field
- C6 Worthen Practice Field
- C8 Multi Use Cricket

Minimizing field disturbance time frames will be a focus of this design option and construction phasing.

The Center Track and Field, Center Playground, Gallagher Tennis Courts, Skate Park, Town Pool, and Farias Basketball Courts will not be impacted by these options and are all outside the Limit of Work.

All new underground utilities will serve the school and the redeveloped site. On-site water distribution will be provided from the existing municipal mains in Waltham Street and Worthen Road. Dedicated fire protection and domestic services to the building will be from the new on-site distribution system, along with new hydrants throughout the site.



B.1 Quad Aerial View

Sanitary waste will discharge via gravity to existing municipal services in the streets. Kitchen waste will be discharged via exterior grease traps sized per Title 5. The design team met with the town to discuss capacity and any other existing issues of utilities in the surrounding roadways on 4/15/2024 and there have been no capacity or other issues noted. Because the design enrollment is insignificantly increased over existing conditions, it is not anticipated that there would be capacity issues because the sources are being maintained.

A new stormwater management system will be incorporated to comply with town and state standards to improve runoff quality and mitigate runoff quantity. Best Management Practices (BMPs) that will be included are catch basins, underground infiltration systems, and hydrodynamic separators.

Due to relatively high groundwater conditions, the project will require perimeter drains at the building, adjacent to and beneath new pavement areas, and beneath play fields.

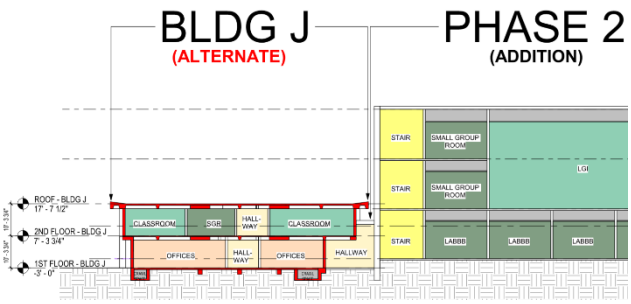
A geothermal wellfield, approximately 3.2 acres, will be required to support the heating and cooling systems, see HVAC for more information.

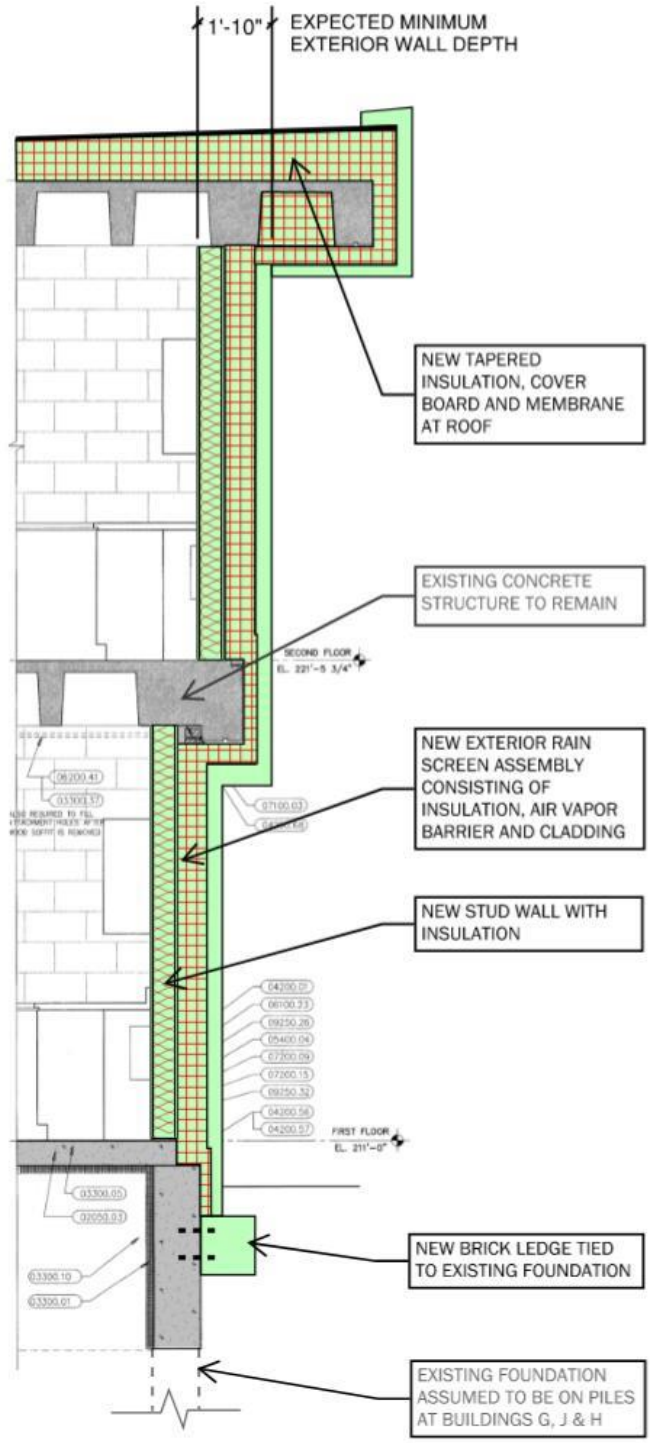
Refer to the attached site plan and utility diagrams for this alternative.

Architectural

All exterior envelope assemblies within the areas of new construction will be designed to meet the robust thermal requirements of the Stretch Energy Specialized Code. Exterior assemblies in renovated areas of the building will be carefully demolished and replaced with new to also meet current code requirements (refer to Building G wall section at right for typical exterior wall renovation scope). Interior assemblies and materials will be selected to provide the necessary level of durability for the expected 50-75 year life span of the school.

Several constraints present themselves with the existing structures of Buildings G & J remaining, both in terms of plan as noted in Capacity Constraints section below, and in section. For example, the low floor-to-floor height and existing 3'-0" drop in elevation for Building J results in the inability for its second level to connect to the new building (refer to section at right).

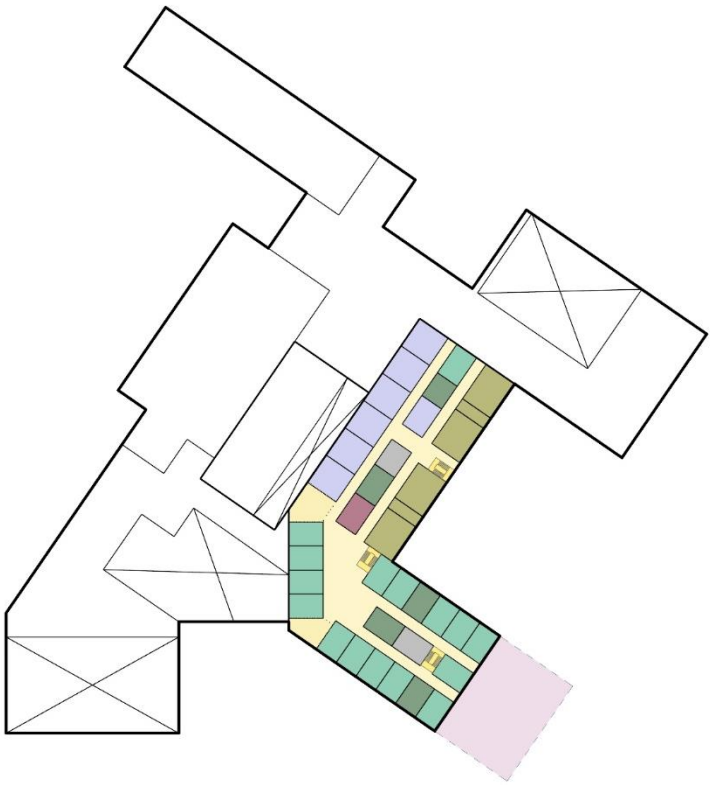




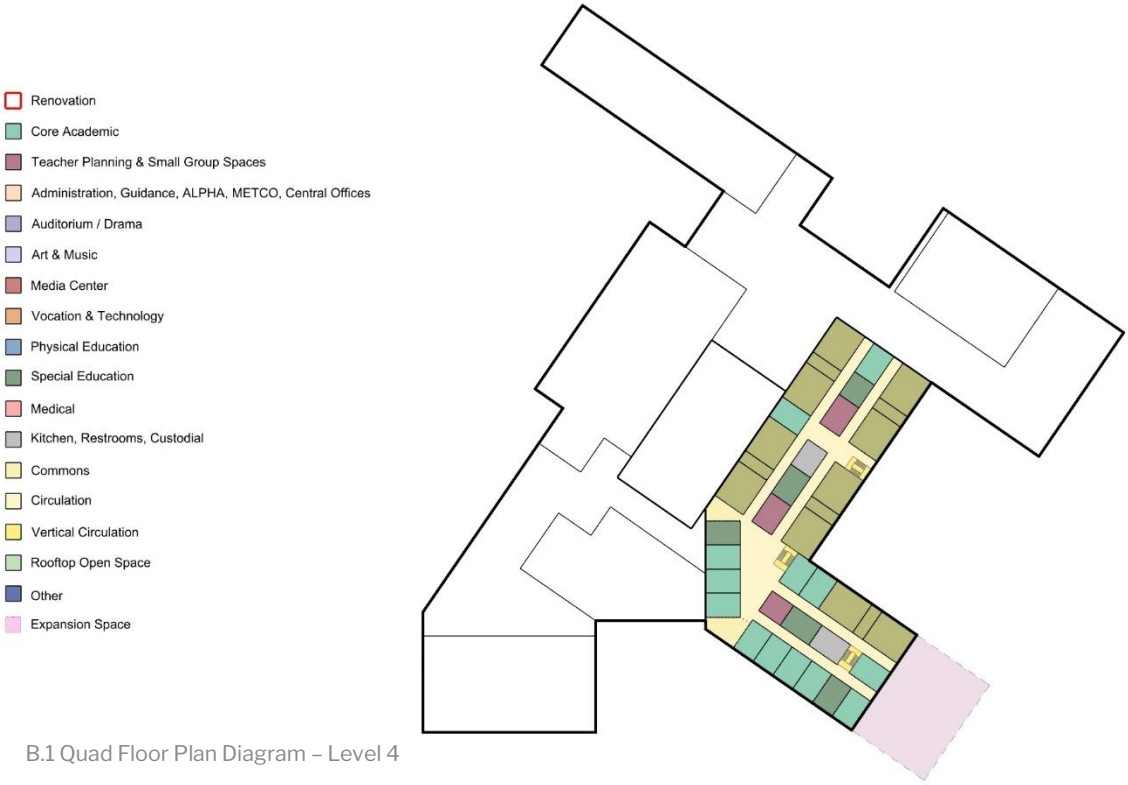
Building J Section (above)
Renovation Scope: Building G Example (right)

B.1 Quad Floor Plan Diagram – Level 1

B.1 Quad Floor Plan Diagram – Level 2



B.1 Quad Floor Plan Diagram – Level 3



B.1 Quad Floor Plan Diagram – Level 4

Capacity Constraints

The design capacity of 2,395 students noted in the MSBA Enrollment Projection, and the corresponding educational space needs will be provided by the additions and renovations of these alternatives.

Program Delivery Impediments

The pedagogical requirements of a modern high school will be provided for by the renovations and additions of these alternatives, however adjacencies and positioning of some community-based functions have limited ability to be optimized in comparison with new construction alternatives.

School Requirements

All elements of Lexington High School's robust curriculum are accommodated in spaces that meet current standards by these renovations and additions. Existing low ceiling heights will remain in renovated sections of the building due to structural constraints. Lack of space above ceilings will place many constraints on HVAC system design in those same areas, potentially affecting classroom layout and design in renovation areas.

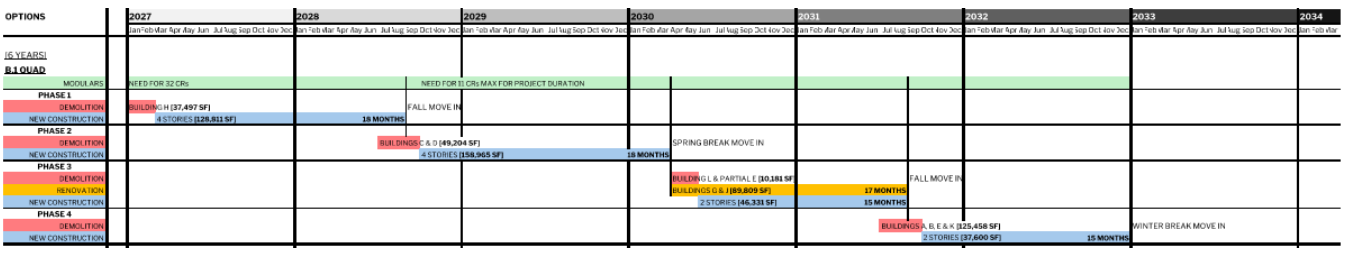
Schedule & Phasing Overview

Alternative B.1 would be implemented over seventy-two (72) months in four (4) phases . Portions of the building would come online over the course of six years of construction and students would rotate into those renovated portions while other areas of the buildings come offline.

As noted in the estimated construction schedule below, these multiple move-ins reside within very short windows of opportunity, which puts tremendous pressure on the schedule and greatly reduces the tolerance for construction delays.

There will be a need for temporary accommodations for many functions including classrooms & assembly spaces during this time (refer to the phasing impact diagrams for more detail). The costs for modular classrooms have been included as the alternative requires. Larger functions such as the Media Center will likely need to occur in other Town buildings.

Temporary conditions during construction will also be required and will at minimum change at the start of each new phase of construction. Mitigation of dead end corridors, temporary life safety systems, maintenance of egress, altered vehicle circulation and site access, noise & vibration, air quality control, and usable square footage reductions due to construction needs, such as laydown space and safety buffers, all add to the complexity of the B.1 alternative.



Estimated Construction Schedule for B.1

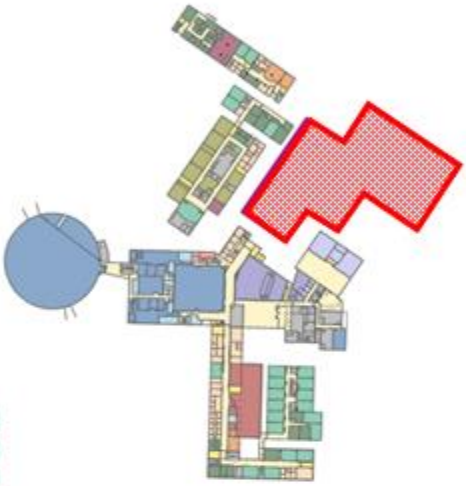
B.1 Quad Phasing Impacts

72 Months Total

Construction Zone

Phase 1

18 Months
32 Modulars



Phase 2

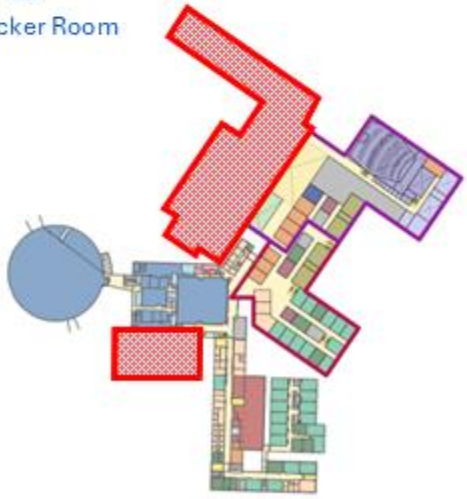
18 Months
11 Modulars

- No Multi-Purpose/Dance Studio
- Multiple service spaces for A, B, E & K lost
- Reduced Commons capacity

Phase 3

17 Months
11 Modulars

- No Multi-Purpose/Dance Studio
- No Lecture Hall
- No Boys' Locker Room



Phase 4

15 Months
11 Modulars

- No Multi-Purpose/Dance Studio
- No Nurse's Suite
- No Locker Rooms
- No Team Rooms
- No Fitness Center
- No Media Center

Cost Overview

The estimated construction cost is:

B.1: $501,000,000

The estimated project cost[1] is:

B.1: $649,000,000

Alternative B.1 Pros & Cons

The Pros and Cons are summarized as follows:

Pros

- Maintains general location of the current school
- Preserves the concrete structures of existing Buildings G and J
- May mitigate Article 97 impacts

Cons

- Existing structural bays in Building J are undersized for appropriately sized classrooms
- New wall enclosures would require extensive rework and additions to existing foundations – not economical.
- Existing structural frame not able to accommodate additional floor levels – limits efficient planning on available site
- Existing floor-to-floor heights will result in low headroom in classrooms due to HVAC renovations
- Multiple-year disruption due to phased construction
- Added cost and inconvenience due to modular classrooms
- Redundant temporary building services will need to be installed to maintain operations within remaining portions of existing building during phased construction
- Existing upper floor levels and all of Building J will not align with new addition floor levels

[1] All pricing is based on Gross Square Foot (GSF) of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium

System Narratives

Structural

The Lexington High School's campus consists of several existing buildings that are adjacent to each other but structurally separate with expansion joints, as well as several stand-alone buildings. The proposed renovations include partial demolition of some of these buildings, preservation of other buildings or portions of buildings which will include gut renovations, and new additions adjacent to the renovated portions. All of these options include a phased approach to demolition and construction. Any demolition of structurally separate buildings can occur without affecting the other buildings. Demolition of a portion of an existing building will require an analysis to verify if the remaining portion has a stable gravity and lateral system. Assume a temporary shoring system is required for the end of any partially demolished buildings. Any basements or subgrade structures should be infilled and compacted with structural fill.

It can be assumed that any proposed renovation will trigger a seismic upgrade for the existing buildings. This can be in the form of new concrete or CMU shear walls, or new steel braced frames. Any new structural elements that support new or increased gravity and/or lateral loads will likely need to be supported on new foundations, which include drilled mini-piles due to the poor soils and low headroom clearances. Any additions that are taller than the existing roofs will impart snow drift on the existing roofs and will likely need to be reinforced. New mechanical units on the roof will require steel dunnage. New floor openings for building services will require steel. Assume 1 PSF steel tonnage for new steel bracing over all existing floors to remain. Provide new foundations at new lateral elements. Provide steel reinforcement at 15% of the existing roofs and 10% of the floor. Assume all unreinforced masonry walls will be seismically attached to the floor diaphragms with new steel clips.

In each phase, the buildings need to be structurally stable without relying on future construction. There are inherent inefficiencies that should be included as an increased cost of construction. For the purposes of estimating, assume a 5% increase in steel and concrete costs.

Existing foundations are to remain at Buildings G & J. Additions shall receive new spread footings on rigid inclusions.

Assume a 30'x30' column grid.

- Three-story additions shall have 9'x9'x2' with 6 PSF of rebar
- Four-story additions shall have 10'x10'x2' with 6 PSF rebar

Existing floor and roof construction to remain in Buildings G & J. Scope to match option A. Provide an expansion joint between existing structure and addition. The addition shall be designed for all loads mandated by the current Massachusetts Building Code at the time of permitting.

Additions to the existing building shall be as described in the New Building Construction Alternative C1.d Branch. Any future expansion will be horizontal only and will be separated from the proposed building with an expansion joint. No cost premium is associated.

HVAC

The existing HVAC systems in the renovated buildings will be replaced and the new additions will be provided with new, all-electric systems to comply with the current Massachusetts Energy Code, including the Specialized Stretch Energy Code adopted by the Town of Lexington.

A specific system approach is represented below, but alternative space heating and cooling approaches will be assessed to determine the preferred system.

Phased construction will require on-going operation of portions of the existing HVAC systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure proper indoor air quality of existing spaces while construction occurs in nearby areas of the site (e.g., added filtration at outdoor air intakes or extending existing outdoor air intakes to be clear of construction zones).

The heating and cooling systems will be based on a ground source geothermal system utilizing vertical boreholes. The preliminary system requirement is estimated as a geothermal field that includes 350 boreholes at 800 ft, each. Based on the findings of the test borehole, where there was a fault at the 190 ft depth, the boreholes should be assumed to require 6" casing down to a depth of 220 ft. The geothermal loop will be 30% propylene glycol with distribution from a system of variable volume pumps in a mechanical room. Plate and frame heat exchangers will separate the ground source loop from the interior water loop and associated pumping system, which will support mechanical heating and cooling systems. Space heating and cooling will utilize above-ceiling heat pumps for classrooms and support spaces. Larger spaces will be supported by AHUs with water source heat pumps.

Ventilation will be provided with rooftop DOAS units, configured with water source heat pumps for conditioning of outdoor air to the classrooms and support spaces. VAV terminal units will manage ventilation to individual rooms based on CO2 control.

Specialty systems will be included for ventilation of Science Labs, Kitchens, Kilns and other such installations.

A new DDC building management system will provide control and monitoring of the HVAC systems and monitoring of selected Plumbing and Electrical equipment and metering.

Alternate System: In lieu of a geothermal system, provide an air source heat pump (ASHP) system based on grade-mounted air source heat pumps (air-to-water) with 4-pipe distribution (HWS/R and CHWS/R) piped to the mechanical equipment room. Each outdoor loop (30% glycol HW and CHW) will be piped to a pair of dedicated pumps and plate-and-frame heat exchanger: one pair of pumps and heat exchanger for HW and another set for CHW). A separate pair of HW pumps and CHW pumps will provide distribution to the building fan coil loads from their respective heat exchangers. Rooftop Units and DOAS Units will be provided as packaged heat pump units (not supported by 4-pipe ASHP system).

Plumbing

The existing plumbing systems in the renovated buildings will be replaced throughout the building and the new additions will be provided with new plumbing systems. During the phased construction options, the existing systems will remain operational while the renovation/ addition systems are installed.

Refer to descriptions below for new work associated with this option.

B.1 'Quad' Phasing

Phased construction will require on-going operation of the plumbing systems that are currently feeding the existing buildings. Storm and sanitary connections shall be maintained during construction where possible. Provide temporary measures where required.

Phase 1 will include a new 6-inch water service and domestic hot water plant. This system will be extended to back-feed other portions of the building.

Part G also has a water service/water heaters that need to be maintained. The service does fall under the addition and a temporary water service will be required to keep G and J active.

During phase 2, a temporary service is required to keep the portions of the building fed from D active during construction.

For Both Add/Reno Alternates:

New domestic cold and hot water systems will be provided throughout the facility. A domestic water booster is not anticipated; however, a hydrant flow test is required to confirm. The entire system will be replaced including reduced pressure backflow preventers pipe insulation, pipe labels with flow arrows and valve tags. Electric storage type domestic water heaters will be provided.

Sanitary, waste and vent systems will be provided throughout the facility and will connect by gravity to the new exterior site sewer system. Where lower level/basement fixtures cannot be drained by gravity, duplex waste ejectors will be provided. Vent locations will be coordinated with PV panel locations and PV ready locations.

A kitchen waste system will be provided and will connect to a new exterior grease trap in the site by gravity. Point-of-use grease traps will be provided to receive the waste discharge at the triple pot sink, dishwasher, tilting kettle and other grease producing kitchen equipment and floor drains. The kitchen waste main will run to an exterior grease interceptor.

Vent piping will be installed from the exterior grease trap back into the building and to the roof independently.

Tepid water emergency wash systems will be provided throughout all lab areas, pH adjustment room, Nurse's room and boiler room. Equipment will include new ADA compliant emergency shower/eyewash stations. All emergency shower and eyewash units will include a thermostatic mixing valve set for 60 deg. F, fed from the domestic potable hot and cold-water distribution systems. Hot water will be recirculated to within 15 ft. of each mixing valve.

New storm drainage systems will be provided throughout the facility including primary and secondary roof drainage systems for each roof area. Primary storm drainage systems will connect to the exterior site storm drainage system by gravity. Overflow (secondary) drains or scuppers shall be installed. And discharge independently to 18" above finished exterior grade. A new underslab and foundation drainage system will be provided. The discharge from the underslab drainage system will exit the building independently from the primary storm drainage systems and connect to exterior storm drainage manholes with backwater valves.

Storm drainage piping from each level of roof area will be provided with backwater valves for each level.

Due to the electrification requirements, natural gas is not anticipated. The kitchen equipment will be electric. Hot plates will be utilized within the lab classrooms. Two new acid waste chip tanks will be provided. One for each science wing. Laboratory waste piping shall be polypropylene with fused joints. Lab waste Venting will combine and vent through the roof independently from the sanitary vent system. Each drain from chip tanks will drain independently from the building by gravity and connect to the site sewer system 10 feet outside the foundation wall.

New plumbing fixtures will be provided throughout the facility. ADA compliant fixtures will be provided throughout in locations and quantities in accordance with MAAB requirements.

Low flow fixtures meeting the requirements of 248 CMR will be provided throughout. 1.28 gal/flush water closets will be provided. Urinals will utilize 0.125 gal/flush valves. Lavatories will utilize 0.35 gpm sensor operated faucets. Sinks will utilize 1.5 gpm flow restrictors and showers will utilize 1.5 gpm flow shower heads. Fixtures to be hard wired and hands free.

Fire Protection

The scope of the renovation and addition option is to replace the existing sprinkler system throughout and extend the new system to feed existing systems (that will be replaced). The systems are to remain active to the extent possible during phased construction.

The existing building does not have a fire pump. However the proposed options have more floors (elevation) than the existing structures. It is assumed that the renovation/addition will require a fire pump. The layout of the addition (height, number of stories) and hydrant flow test is required to confirm.

B.1 'Quad' Phasing

Building D (also serves A/B/C/D/and E) and Buildings G, H, and J have their own individual services. Phase 1 construction is located over the existing service to Building G. This line needs to be relocated between the buildings, so it does not fall under the footprint of the addition. Provide a new 8-inch fire service and fire service room (double check valve, fire pump, wet alarm valve) in Phase 1.

During phase 2, the new system will be extended to refeed the existing sprinkler systems. A temporary service is required to keep buildings A B C, D, E and K active.

During Phases 3 and 4, the systems will be fed from the phase 1 fire service room.

For Both Add/Reno Alternates:

As indicated above, it is important to note that the phased construction will require on-going operation of portions of the existing automatic sprinkler system. The new system(s) will be as outlined below:

The existing sprinkler systems are to be replaced with new piping systems and valves/components. The new system will include new double check valve assemblies, wet alarm check valves, floor control valve assemblies, sprinklers, flow switches, tamper and pressure switches and all associated piping. The system will be hydraulically calculated in accordance with NFPA requirements. Sprinkler mains will be equipped with control valves, inspector test stations, and flow switches. Sprinkler spacing will comply with NFPA-13 requirements. Separate sprinkler zones will be provided for each floor and each wing.

New standpipes meeting the requirements of 780 CMR and NFPA 14 will be installed. A standpipe isolation valve will be provided at each standpipe feed. Each standpipe will meet the requirements of a Class 1 standpipe system in accordance with 780 CMR and NFPA 14 requirements. Each will be provided with 2 ½-inch fire department valves with 1 ½-inch reducers and caps. The standpipes will be interconnected at the ceiling of the first floor.

New fire department connections and electric bells shall be provided in the quantities and locations as required per the local fire department. The new fire department connection will be arranged to serve all sprinklers and standpipes within the building.

The fire department connection threads will match Fire Department requirements. Where required due to travel distances and local fire department requirements, intermediate standpipes will be provided in additional locations.

Sprinklers for areas with ceilings will be factory painted gloss white, concealed type.

Mechanical rooms and other unfinished areas are to be provided with brass finish, exposed sprinklers. Sprinklers that are subject to damage will be provided with sprinkler guards. Sprinklers subject to higher temperatures will be intermediate or high temperature sprinklers in accordance with NFPA 13 requirements. Sprinklers for areas subject to freezing, including loading dock areas, shall be dry type.

Elevator machine rooms and hoistways will not be protected with automatic sprinklers in accordance with 780 CMR.

A roof manifold will be provided at each roof level with a two story or greater height.

Electrical

Utility Interconnection

The existing electrical service for the building is currently fed underground from Waltham Street.

Based on preliminary estimates of the building's total connected load, it is anticipated that utility will require a dual-source service (DSS) to accommodate the electrical demand. This will likely involve providing two services from Eversource. While specifics and interconnection equipment will be coordinated with utility in later design phases, the current plan proposes the following equipment for interconnection.

- 15k-Volt switchgear, main-tie-main configuration for dual source service.
- Utility reclosure cabinet.
- CT / Metering cabinet (upstream of entire campus electrical interconnections)
- Provisions for four (4) transformers (owned and operated by the school)
- Solar interconnect switchboard for the photovoltaic panels and battery storage units.

All electrical utility equipment will be pad-mounted on site, with underground conduit pathways.

A screen wall will be installed to visually separate the electrical gear from street views, in accordance with zoning bylaws.

Phased in Place Approach

The core building electrical service must remain operational until the new service is constructed and ready for transfer. This will be accomplished by maintaining the existing service transformer, pad-mounted generator, and service entrance equipment in Building D during Phase 1 of construction.

During phase 1, construct new main electrical rooms and emergency electrical rooms in the newly constructed wings. Utility equipment and a new outdoor generator will also be installed on-site to power the new electrical rooms. Once this is complete, Phase 2 will begin, allowing for the decommissioning of the current electrical service, the demolition of existing equipment, and the installation of the new systems.

Renewable Energy System

Based on a target EUI of 25, early estimates suggest the size of the total solar system shall be 3.5 Megawatts, along with 2-Megawatt/4-Megawatt-hour battery energy storage systems (BESS).

Various configurations of PV installations will be considered, including the following options. Refer to the LHS PSR Alt Data Sheet for square footage takeoffs of each option and configuration:

- Canopies covering 50% of the total roof area, including both high and low roof installations.
- Parking canopies with solar arrays.
- Transparent glazing arrays for walkways and exterior shading awnings.
- Vertical solar array installations such as wall mounted, or roof equipment mounted configurations.

One pad-mounted transformer is dedicated to the photovoltaic (PV) system, energizing a 5000 Amp 277/480 V solar switchboard for utility interconnection.

The PV system and battery storage are anticipated to be designed as AC-coupled, allowing for the independent operation of the solar system and battery storage without disrupting school programs.

Power Distribution System

The existing electrical service will be replaced. The new distribution system will consist of two (2) 4000 Amp, 277/480V 3-phase 4 wire switchboards, service rated, with new underground secondary service conductors extended to pad-mounted transformers.

The existing electrical distribution system, including the existing 2400A main switchboard, downstream distribution panelboards, and most branch panelboards were replaced approximately 24 years ago, and appear to be in good working condition. It is recommended to maintain as much of the existing distribution system as possible in the renovation area. Modifications to the existing electrical distribution may include additional panelboards, replacing panelboards and feeders with higher ampere ratings to handle increased loads, and replacing existing main overcurrent protections to include arc energy reduction methods and ground fault protection per latest electrical code requirements.

Phased construction will require on-going operation of portions of the existing electrical systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure existing areas remain fully operational while construction occurs.

A system of new separate-use panelboards for lighting, mechanical and general power will be installed in dedicated electrical rooms throughout the building to service equipment, lighting and branch circuit loads.

An Energy sub-metering system will be provided to monitor all separate-use panelboard systems and individual energy loads that represent 10% or more of the total annual consumption of the building. Sub-meters will be connected to the new building DDC system. All metering installations must be commissioned by a third-party reviewer and DOER certified.

Life Safety/Emergency System

The existing 600-kW 277/480 volt 3-phase, 4 wire diesel fueled emergency generator and generator distribution system is approximately 24 years old and will require modifications to the system to be brought up to code. A docking station for a temporary roll-up generator shall be installed to allow the life safety distribution system to remain active during routine maintenance or generator failure, as well as new control wiring and pathways to comply with latest signal and wiring integrity codes. This will require excavating, replacing, and re-working the existing underground conduit between the generator and the service entrance equipment.

The system is likely also undersized for the code compliant program. A second generator will likely be required to energize the various loads. It is estimated that the following items will be connected to the generator system:

- Egress emergency lighting.
- Fire alarm system.
- IT Rooms (power and A/C) including network, door access, intrusion detection, CCTV, PA, telephones.
- Heating system as required to freeze protect the building.
- Elevators.
- Resiliency Level:
    - Level 3 for the majority of building.
    - Level 2, not including food prep requirement, applied to select areas of the building, such as the Fieldhouse/Gym (plan for attaching portable generator for cooking.

Lighting & Lighting Control

Replace all existing interior light fixtures with new, high efficiency LED light fixtures fitted with dimmable drivers.

Replace all exterior light fixtures with new, high-efficient LED light fixtures fitted with dimmable drivers and full cut-off optics.

Replace the existing lighting control system with a new, fully networked lighting control system compliant with the latest energy code. The lighting control system shall include the capability of communicating and controlling ON/OFF 120V power to receptacles in classrooms, offices, corridors, and other spaces required by the energy code.

Fire Alarm

The existing fire alarm system is a fully addressable voice evacuation system consisting of four (4) node panels throughout the campus. The system head end is approximately 24 years old, and appears to be in working order.

New node panels will be provided as required to provide complete coverage to new construction areas. A network backbone will be extended from the new node panels to communicate with the existing.

All existing initiation and notification devices, such as smoke detectors and speaker strobes should be replaced.

The system communicates to the Fire Department via an antenna mounted on the roof, and an auto dialer, which is compliant with latest building codes.

A bi-directional antenna (BDA) system shall be installed to comply with the latest building code. The BDA system will have capabilities to boost fire department and police department radio communications within the building.

Phased construction will require on-going operation of portions of the existing fire alarm systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure existing areas remain fully operational while construction occurs.

Lightning Protection System

The existing school does not have a lightning protection system. A lightning protection system is not required by code, although is recommended by NFPA Standards. A system can be installed if desired by the town.

Telecommunications

The existing telecommunications copper and fiber optic cable infrastructure will be replaced to support data and voice transmission. CAT6A cable will be installed to the end points, with (12) strand OM4 multi-mode and (6) strand OS2 single-mode fiber optic cabling between the MDF and the IDFs. Existing network infrastructure electronics spaces in classrooms and storage spaces will be replaced with secure and climate-controlled rooms to better protect and maintain network electronic equipment. The MDF and IDFs will be replaced with new equipment cabinets, patch panels and overhead cable management components. The MDF and IDFs will be replaced with new rooms fitted with new cooling systems, lighting, and generator backed power.

The existing Public Address and Master Clock Systems will be replaced. Classrooms and other learning spaces will be equipped with two-way talkback speakers. Corridors and larger spaces will be equipped with one-way speakers. Clocks will be synchronized and powered via low-voltage wiring. The Public Address and Master Clock systems will be interfaced at the head end.

Classroom technology infrastructure will be upgraded to provide new data and voice communications with a potential wireless access point location in the ceiling.

Audiovisual cabling will be installed to allow projection of content from the instructor's computer to the wall-mounted interactive flat panel monitor.

Speech reinforcement systems will be installed in instructional spaces to provide even distribution of instructor and student speech throughout the space, as well as being interfaced to the interactive flat panel monitor to perform the audio functions for audiovisual presentations in the space.

Current wireless access points will be purchased at the time of occupancy.

Security

After careful consideration and in alignment with best practices and the recommendations outlined in Executive Order 548, which established a Cross-Secretariat Task Force on School Safety and Security, it has been determined that the existing security system will require a comprehensive replacement. While there are no explicit code requirements mandating such action, adhering to the directives and insights provided by the Task Force is paramount in ensuring the utmost safety and security measures are in place within our institution.

The school's security infrastructure is designed with multiple layers, incorporating both active and passive security measures.

These layers encompass various aspects such as perimeter security, surveillance cameras deployed both indoors and outdoors, controlled and secure entry points, access control mechanisms at key interior doors, intrusion detection systems featuring multiple zones, intercommunication systems, the ability to initiate lockdowns for classroom wings, and the capability for individual classroom lockdowns.

Audio / Visual

New audiovisual systems will be provided for the Auditorium (including backstage support spaces), music classrooms (including the Band, Chorus, and General Music Classroom), the Fitness area (including the Gymnasium, Fitness Room, Multipurpose Room, and Dance Studio), Cafeteria, Large Group Instruction room, and the Lecture Hall. Where applicable, the systems will be provided with high-resolution video displays/projection, sound systems for speech reinforcement and audio playback, ADA-compliant assistive listening, and integrated AV controls. In addition, broadcast recording equipment will be provided for use by the students in the TV Production Room.

Acoustics

New building utility equipment will incorporate sound attenuating measures, as necessary, for compliance with the community noise emissions summarized in the Town of Lexington General Bylaws, Chapter 80: Noise Control. These requirements are consistent with the noise emission requirements established in the Massachusetts Division of Air Quality Control (DAQC) Policy 90-001.

New HVAC equipment and system components and room finishes will be designed for compliance with the LEED Minimum Acoustics Performance prerequisite for HVAC background noise and reverberation time in renovated core learning spaces.

Specialty spaces, such as the auditorium, music classrooms, fitness areas, gymnasia, and large lecture rooms will incorporate room shaping, sizing, finish material strategies, and sound isolating surrounding construction to appropriately suit the acoustic needs of the users.

Hazardous Materials

As expected for a building of this age, there are significant hazardous materials present, despite prior abatement activities that have occurred over the years. For a detailed report on the materials to be abated, see Section 3.1.4N of the PDP Report. Hazardous material abatement is required for both renovated sections of the existing building to remain, as well as portions of the existing building that are to be demolished.

Permitting Requirements

Federal

Environmental Protection Agency

A Construction General Permit would be required for the B.1 alternative due to the area/size of construction activities on the site. It will be filed with the Environmental Protection Agency prior to the start of any construction activities on the site but not less than 14 days before construction begins.

Army Corps of Engineering

Engagement with the Army Corps of Engineering is not required for the B.1 alternative because there are no direct impacts to the wetlands.

State

Article 97 Legislature

Article 97 Legislature is not required for the B.1 alternative because there are no permanent changes to the protected portions of the site. Although temporary impacts to the fields are required to accommodate modular classrooms, temporary parking and circulation, and the geothermal wellfield, they do not require legislative action.

Massachusetts Environmental Protection Act

The review thresholds of Massachusetts Environmental Protection Act are not exceeded for the B.1 alternative. Review thresholds include impacts to land, state-listed species, wetlands, water, wastewater, transportation, energy, air, waste, historical and archaeological resources, and areas of critical environmental concern.

Massachusetts Historic Commission

A Project Notification Form was filed with Massachusetts Historic Commission (MHC) on October 07, 2024.

On December 6, 2025 MHC responded confirming that the existing Lexington High School building is not included within the MHC's Inventory of Historic and Archaeological Assets of the Commonwealth, nor is the building in the State register of Historic Places.

Local

Demolition Permit

A Demolition Permit is required for the B.1 alternative and was filed with the Town of Lexington Building Office on 5/14/2024.

Building Permit

A Building Permit for New Construction will be required for the B.1 alternative by the Town of Lexington Building Office and will be obtained prior to the start of construction.

Zoning Board of Appeals

A Variance for building height is required for the B.1 alternative because the proposed height is approximately 4 stories/64 feet which exceeds the maximum permittable height of 2.5 stories/40 feet in the site's zoning district.

A Variance for driveways is required for the B.1 alternative because the proposed vehicular circulation off Worthen Road exceeds the maximum of 2 drives per street line.

The Requests for Variance will be filed with the Town of Lexington Zoning Board of Appeals during the Design Development phase of the project, and it is anticipated to take approximately two months to obtain.

Conservation Commission

A Notice of Intent is required for the B.1 alternative due to the proposed location of land disturbances within the buffer zones of the wetlands on the project site. It will be filed with the Town of Lexington Conservation Commission during the Design Development phase, and it is anticipated to take approximately four months to complete and receive an Order of Conditions.

N

LEGEND

- sanitary sewer
- underground electric
- water service
- grease trap
- transformer
- infiltration area
- hydrodynamic separators
- geothermal well field

0 200'

Utility Diagram| Quad (B.1)

Lexington High School Feasibility Study / Town of Lexington

smma

LEXINGTON HIGH SCHOOL

2. Construction Alternative B.4 (Figure Eight)

Design Approach

Multi-Phased Addition/Renovation on Existing Footprint

As a more extensive exploration of renovation possibilites, Alternative B.4 includes phased demolition of 211,020 gross square feet of Buildings A, G, H, J, K and L, and gut renovations of 140,980 gross square feet at two-story Buildings B, C, D and E with their existing structures retained and absorbed into new construction. New construction additions totaling 363,193 gross square feet occur in 5 phases over 6.25 years.

The "Figure Eight" concept imagines two new, 3-story academic wings bracketing the core 1950's era buildings to create two courtyards bringing nature and daylight deep into the interior of the school. By utilizing existing wings with greater floor-to-floor dimensions than the circa 1960's buildings, the scheme seeks to minimize vertical discontinuity, however ultimately the third floor wings are unable to be connected across the sprawling building footprint.

Due to site constraints and the need for service roads, parking and PV canopy coverage, this approach leaves few opportunities to improve on the civic gesture of the existing school, relying primarily on its western edge for access to adjacent fields and trails.

Description

This Alternative will include compliance with the Lexington Integrated Design Policy, a Net Zero Energy school building with an energy target EUI of 25 kBtu/SF/yr. or 30% better than ASHRAE 90.1-2019 whichever is lower, LEEDv4 for Schools Gold Certification with a goal for Platinum, and embodied carbon reduction strategies such as low carbon concrete and materials such as structural wood components.

Life Safety Code Compliance

All existing spaces and systems to remain will be reorganized, upgraded and/or constructed new to meet current life safety codes and standards. New addition portions of the building would be constructed in full compliance with current life safety codes and standards.

Accessibility Code Compliance

All existing spaces, systems, fixtures and equipment to remain will be renovated, reorganized and/or constructed new to meet current accessibility codes and standards. New additional portions of the building would be constructed in full compliance with current accessibility codes and standards.

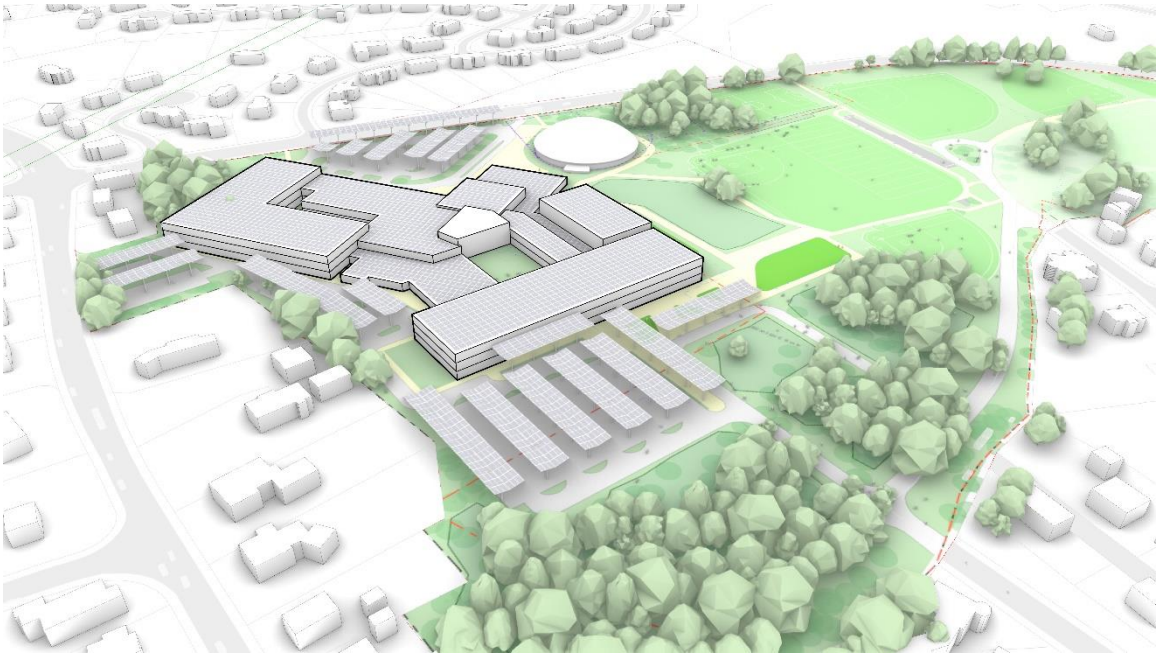
Energy Code Compliance

The Town of Lexington has adopted the Massachusetts Stretch Energy Code's Specialized Code. The Renovations or Additions to Existing Buildings Alternative would require compliance with the Specialized Stretch Energy Code, based on the major renovation/addition scope of work.

Site

Site work within this addition/renovation alternative is consistent with the scope of the B.1 Quad alternative

B.4 Figure Eight Site Plan

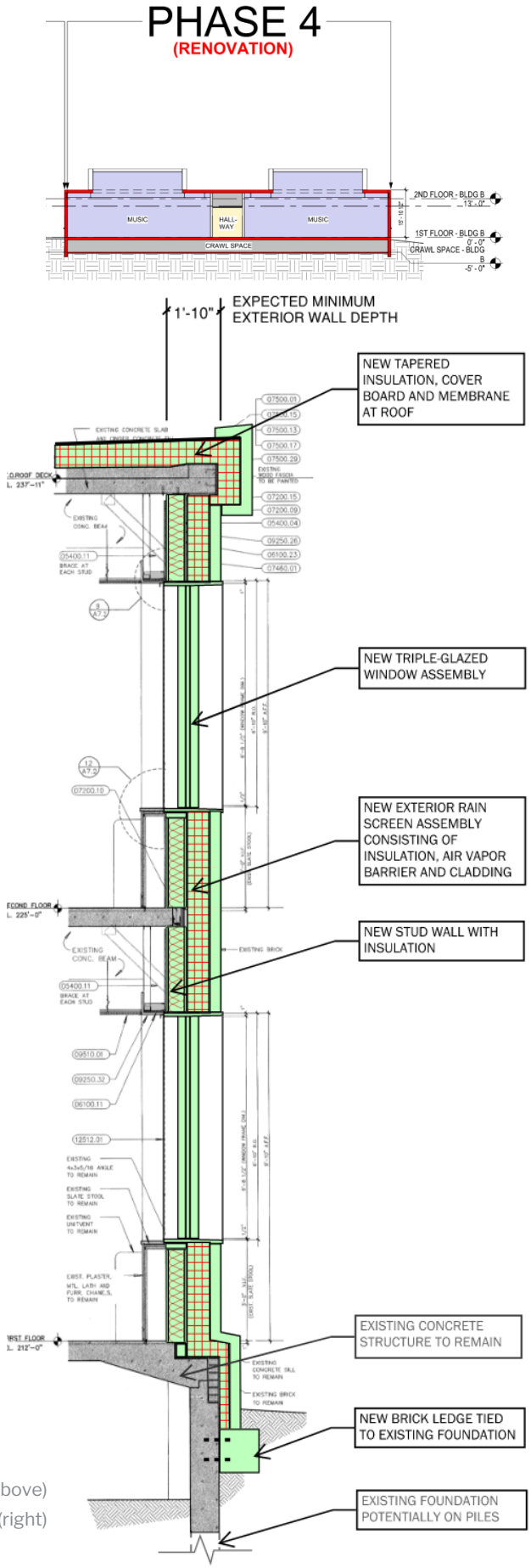


B.4 Figure Eight Aerial View

Architectural

All exterior envelope assemblies within the areas of new construction will be designed to meet the robust thermal requirements of the Stretch Energy Specialized Code. Exterior assemblies in renovated areas of the building will be carefully demolished and replaced with new to also meet current code requirements (refer to Building B wall section at right for typical exterior wall renovation scope). Interior assemblies and materials will be selected to provide the necessary level of durability for the expected 50-75 year life span of the school.

Several constraints present themselves with the existing structures of Buildings B, C, D & E remaining, both in terms of plan as noted in Capacity Constraints section below, and in section. For example, the existing roof height of Building C is too low to house the Band space, and the structure will need to be extended upward several feet (refer to section below).



Building C Section (above)
Renovation Scope: Building B Example (right)

B.4 Figure Eight Floor Plan Diagram – Level 1

B.4 Figure Eight Floor Plan Diagram – Level 2

Capacity Constraints

The design capacity of 2,395 students noted in the MSBA Enrollment Projection, and the corresponding educational space needs will be provided by the additions and renovations of these alternatives.

Program Delivery Impediments

The pedagogical requirements of a modern high school will be provided for by the renovations and additions of these alternatives, however adjacencies and positioning of some community-based functions have limited ability to be optimized in comparison with new construction alternatives.

School Requirements

All elements of Lexington High School's robust curriculum are accommodated in spaces that meet current standards by these renovations and additions. Existing low ceiling heights will remain in renovated sections of the building due to structural constraints. Lack of space above ceilings will place many constraints on HVAC system design in those same areas, potentially affecting classroom layout and design in renovation areas.

Schedule & Phasing Overview

Alternative B.4 would be implemented over seventy-six (76) months in five (5) phases. Portions of the building would come online over the course of six-plus years of construction and students would rotate into those renovated portions while other areas of the buildings come offline.

B.4 Figure Eight Floor Plan Diagram – Level 3

As noted in the estimated construction schedule below, these multiple move-ins reside within very short windows of opportunity, which puts tremendous pressure on the schedule and greatly reduces the tolerance for construction delays.

There will be a need for temporary accommodations for many functions including classrooms & assembly spaces during this time (refer to the phasing impact diagrams for more detail). The costs for modular classrooms have been included as the alternative requires. Larger functions such as the Auditorium will need to occur in other Town buildings.

Temporary conditions during construction will also be required and will at minimum change at the start of each new phase of construction.

Mitigation of dead-end corridors, temporary life safety systems, maintenance of egress, altered vehicle circulation and site access, noise & vibration, air quality control, and usable square footage reductions due to construction needs, such as laydown space and safety buffers, all add to the complexity of the B.4 alternative.

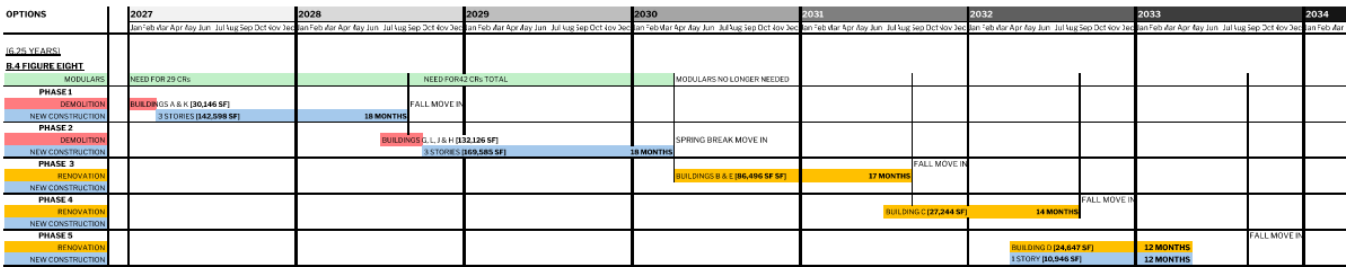
Cost Overview

The estimated construction cost is:

B.4: $499,000,000

The estimated project cost[2] is:

B.4: $651,000,000



Estimated Construction Schedule for B.4

[2] All pricing is based on Gross Square Foot (GSF) of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium

Alternative B.4 Pros & Cons

The Pros and Cons are summarized as follows:

Pros

- Maintains general location of the current school
- Preserves the concrete structures of existing Buildings B, C, D & E
- May mitigate Article 97 impacts

Cons

- Existing structural bays in Building B are undersized for appropriately sized classrooms
- New wall enclosures would require extensive rework and additions to existing foundations – not economical.
- Existing structural frame not able to accommodate additional floor levels – limits efficient planning on available site
- Existing floor-to-floor heights will result in low headroom in classrooms due to HVAC renovations
- Multiple-year disruption due to phased construction
- Added cost and inconvenience due to modular classrooms
- Redundant temporary building services will need to be installed to maintain operations within remaining portions of existing building during phased construction
- Limited to renovating the existing Auditorium and Stage rather than constructing a new, larger space
- Requires the roof of Building C to be raised 5'-0"
- Existing upper floor level will not align with new addition floor levels

For general systems information applicable to both Addition & Renovation Alternates B.1 & B.4, refer to the System Narratives under B.1 Quad. Conditions unique to Alternate B.4 Figure Eight are enumerated below.

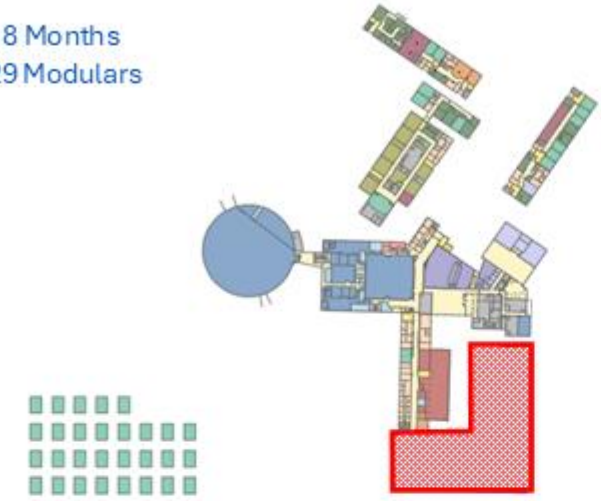
B.4 Figure Eight Phasing Impacts

76 Months Total

Construction Zone

Phase 1

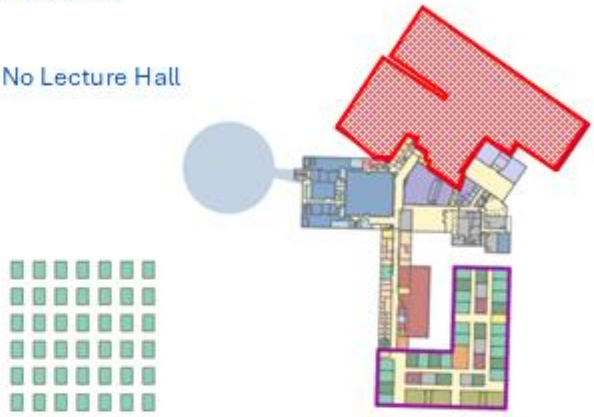
18 Months
29 Modulars



Phase 2

18 Months
42 Modulars

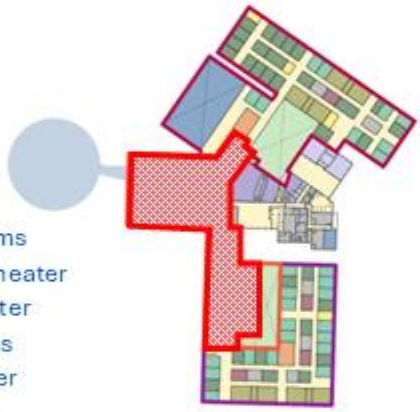
- No Lecture Hall



Phase 3

15 Months
0 Modulars

- No Locker Rooms
- No Black Box Theater
- No Fitness Center
- No Team Rooms
- No Media Center



Phase 4

14 Months
0 Modulars

- No Auditorium
- No Band Room
- No Orchestra Room

Phase 5

12 Months
0 Modulars

- No Commons
- No Kitchen
- No Loading Dock
- No Facilities Spaces

System Narratives

Structural

Existing foundations are to remain at Buildings B, C, D & E. Additions shall receive new spread footings on rigid inclusions.

Assume a 30'x30' column grid.

- Three-story additions shall have 9'x9'x2' with 6 PSF of rebar
- Four-story additions shall have 10'x10'x2' with 6 PSF rebar

The existing floor and roof construction is to remain in Buildings B, C, D & E. Scope to match option A. Provide an expansion joint between existing structure and addition. The addition shall be designed for all loads mandated by the current Massachusetts Building Code at the time of permitting.

Additions shall be as described in the New Building Construction Alternatives.

HVAC

B.4 Figure Eight Phasing

Phase 4 will require temporary heating support for active existing systems for the spaces associated with Phase 5.

Plumbing

B.4 Figure Eight Phasing

Phase 1 will require a temporary water service and water heater to feed the addition.

Phase 2 will also include demolition of the existing services and systems feeding buildings G, H, and J. A new domestic water service and domestic hot water heaters will be located within phase 2 and back-feed existing buildings.

Part D (existing domestic heaters) will be maintained until phase 5.[3]

Fire Protection

B.4 Figure Eight Phasing

Phase 1 construction will include extension of the existing system to feed the addition.

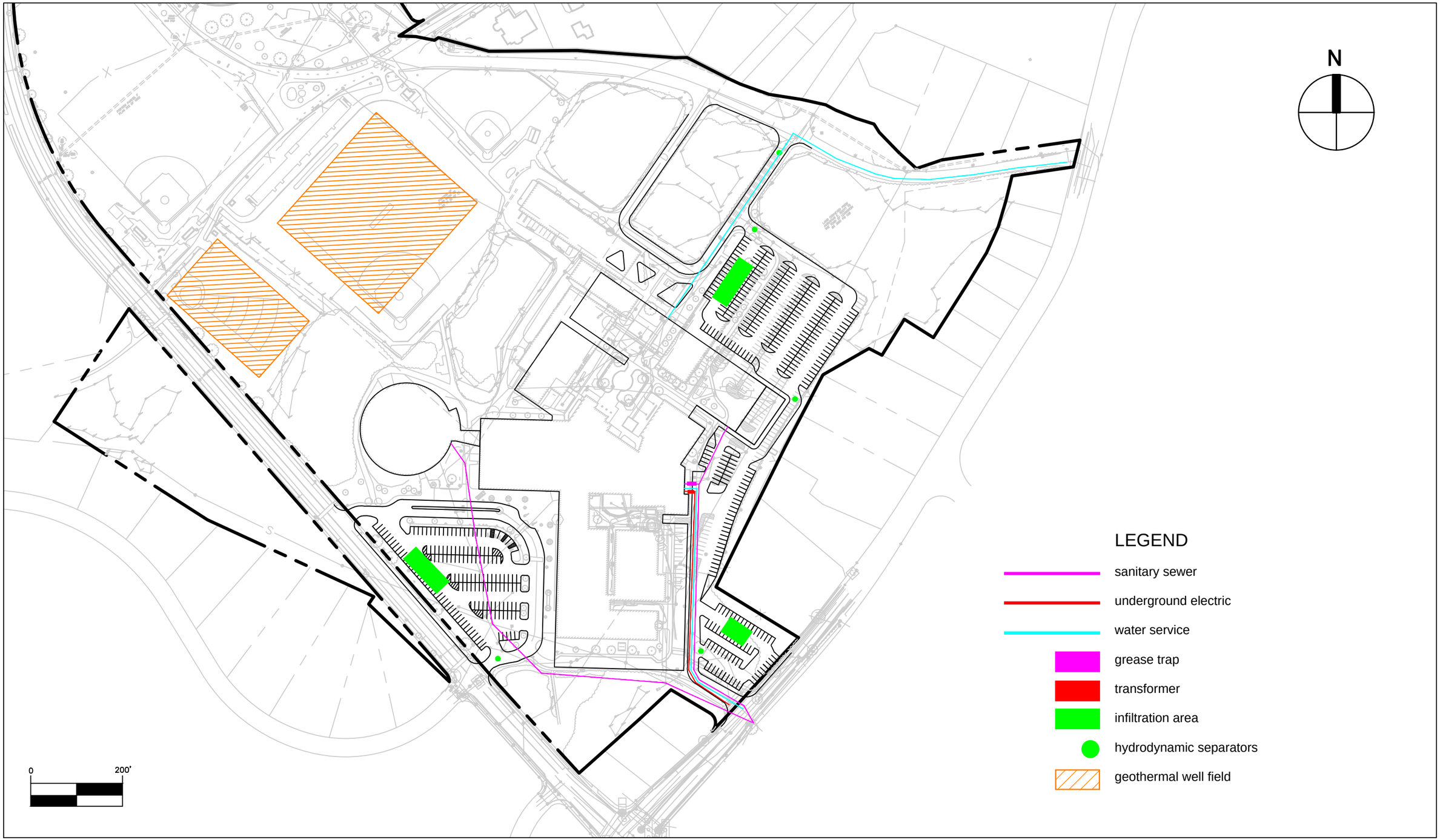
Phase 2 will include a new 8-inch fire service and fire service room (double check valve, fire pump, wet alarm valve). This system will back feed the existing buildings. Phase 2 will also include demolition of the existing services and systems feeding buildings G, H, and J.

During phase 2, the new system will be extended to refeed the existing sprinkler systems. The fire service will remain in part D until phase 5, where the rest of the sprinkler system will be fed from the new service.

Permitting Requirements

Permitting requirements for the B.4 alternative are consistent with the B.1 alternative.

[3] Note: domestic water runs through pipe tunnels/crawl spaces between the buildings. A, B, C, D, E are fed from the part D hot water heaters. Building G has its own water service and feeds J and H through pipe trenches. Coordination of removal of trenches is required as the buildings come offline.



Utility Diagram| Figure Eight (B.4)

Lexington High School Feasibility Study / Town of Lexington

smma

LEXINGTON HIGH SCHOOL

D. Alternatives C & D: New Building Construction and Evaluation of Potential Locations

1. Construction Alternative C.1d (Branch)

Design Approach

Alternative option C.1d Branch includes New Construction on existing athletic fields, enabling the entire new school building to be constructed efficiently in one phase, free of the existing high school footprint, and with minimal impacts to the ongoing functioning of the school. The configuration of the new construction features preferred interdisciplinary programmatic adjacencies within academic environments placed in a four-story linear bar configuration on the north side of the site. This approach provides for an efficient and predictable organization of classrooms and support space along a clear network of corridors.

For school and community use the major public access spaces are primarily within the Performing Arts and Health and Wellness wings, but will possibly include elements such as innovation labs, maker space, and Large Group Instruction, and would be organized with direct connection to a central Commons space, while allowing academic wings to be compartmentalized and secured after hours.

The Media Center is also a primary public use space and together with the Auditorium and Gymnasium can be organized to connect to the cafeteria/commons as a major, bi-level community gathering space. This alternative provides a significant outdoor commons space at Level 3 as a rooftop courtyard akin to “the Quad” space that is the heart of the existing school.

The massing of this alternative allows for inflection at major building access points to the east and south from Worthen Road, however it presents a challenging 4-story frontage along the northern edge facing Clarke Street and the Center Recreation Facility.

This alternative will include compliance with the Lexington Integrated Design Policy, a Net Zero Energy school building with an energy target EUI of 25 kBtu/SF/yr. or 30% better than ASHRAE 90.1-2019 whichever is lower, LEEDv4 for Schools Gold Certification with a goal for Platinum, an embodied carbon reduction strategies such as low carbon concrete and materials such as structural wood components.

New Building in One Phase

Construction of 461,516 gross square feet of new 4-story building in one phase on existing athletic fields, followed by demolition of the existing high school. Total estimated construction duration of 4.5 years.

The primary entry elevation in option C.1d faces east toward the open space at new athletic fields, and a new vehicular circulation system extending south from Muzzey Street/Park Drive and north from Worthen Road.

Life Safety Code Compliance

New construction building alternatives will be designed and constructed in full compliance with current life safety codes and standards.

Accessibility Code Limitations

New construction building alternatives will be designed and constructed in full compliance with current accessibility codes and standards.

Energy Code Compliance

The Town of Lexington has adopted the Massachusetts Stretch Energy Code's Specialized Code. The New Building Construction Alternative would require compliance with the Specialized Stretch Energy Code,

C.1d Branch Site Plan

Site

Site work for C1.d Branch includes the development of all vehicular and pedestrian circulation systems. To maximize safety, buses, vans, cars and delivery vehicles will all maintain separate circulation and arrival and dismissal locations. These improvements will provide safe multi-modal access to the school site, clarify vehicular circulation, and mitigate combined, poorly functioning movement. New pedestrian circulation routes will create dedicated and safe access to the school. Bicycle facilities will be interspersed throughout the site, interconnected with any bicycle routes that are proximate to the site. New outdoor student spaces, including entrance plazas, outdoor learning environments, outdoor courtyards, rooftop courtyards, and connections to resource areas will be developed to support the education plan. The entrance plazas will serve as a transition from the vehicular activities of arrival, dismissal and parking to the educational environment of the building. All pedestrian circulation systems and outdoor gathering areas will meet ADA and MAAB accessibility requirements.

The planting design will consist of new canopy, understory, and ground plane vegetation that will be introduced around the perimeter of the building and throughout the developed site to complement the architecture of the building, develop and frame outdoor rooms, and add shade, scale, color, texture and four-season interest/educational opportunities to the site. All disturbed existing mature tree canopy will be replaced on the site with native tree species.

Hardscape materials and site amenities will be selected based on ease of maintenance, durability, and sense of permanence.

The parking program consists of 500 vehicles and will be provided at-grade throughout the site. The new parking areas will incorporate ADA and MAAB compliant accessibility from accessible parking and loading zones to all accessible building entrances.

PV canopies over the on-site parking spaces are proposed, see the Electrical section for more information.

Multiple existing natural turf fields will be disrupted or relocated as part of this alternative. All disturbed fields will be reconstructed either in place or elsewhere on the Center Recreation Facility property to the same quantity, quality, solar orientation and size of the fields to be disturbed. These options currently anticipate that the following fields will be impacted:

- C1 Varsity Softball Diamond
- C2 Varsity Baseball Diamond
- C3 Junior Varsity Baseball Diamond
- C4 Little League Diamond
- C5 Crumb Football Field
- C6 Worthen Road Practice Field
- C7 Multi Use Rectangle
- C8 Multi Use Cricket

Minimizing field disturbance time frames will be a focus of this design option. When restored, fields C2, C3, C4, C5, C7 and C8 will be part of a comprehensive passive and active recreation “wellness quad” that will support student and community health and wellbeing.

The Center Track and Field, Center Playground, Gallagher Tennis Courts, Skate Park, Town Pool, and Farias Basketball Courts will not be impacted by these options and are all outside the Limit of Work.

Wetland replication will be required to mitigate direct impacts to the isolated and bordering wetlands at a ratio of 2:1 to comply with the town’s Wetland Protection Code.

All new underground utilities will serve the school and the redeveloped site. On-site water distribution will be provided from the existing municipal mains in Waltham Street and Worthen Road.

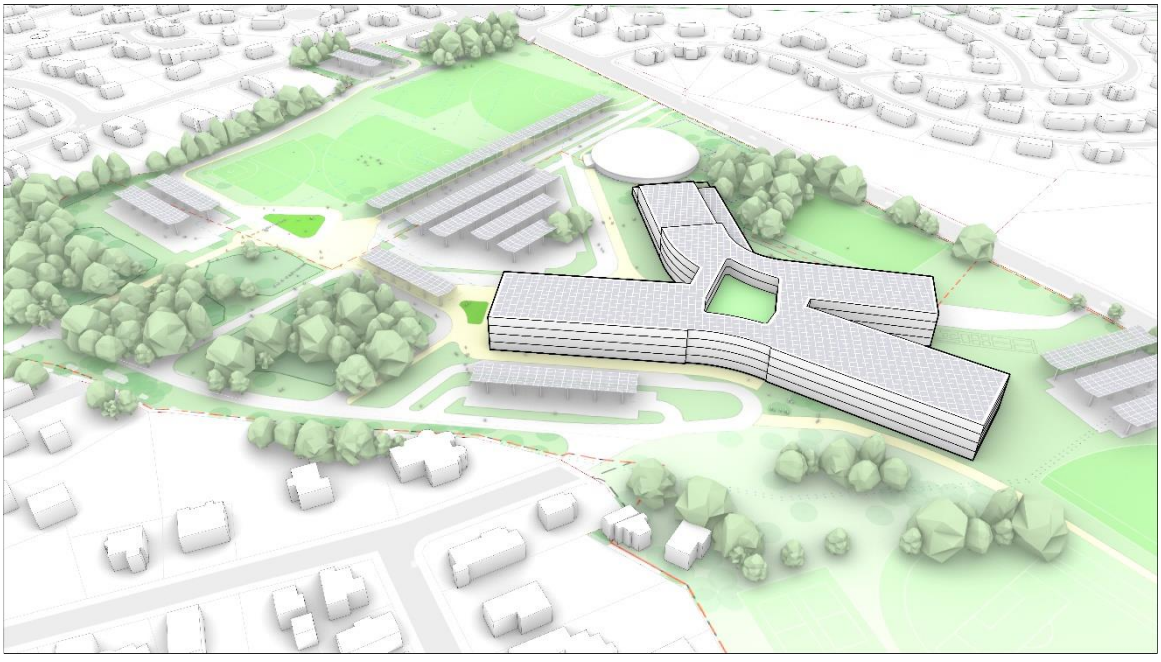
Dedicated fire protection and domestic services to the building will be from the new on-site distribution system, along with new hydrants. Sanitary waste will discharge via gravity to existing municipal services in the streets. Kitchen waste will discharge via exterior grease traps sized per Title 5. The design team has met with the town on 4/15/2024 to discuss capacity and any other existing issues of utilities in the surrounding roadways and there have been no capacity or other issues noted. Because the design enrollment is insignificantly increased over existing conditions, it is not anticipated that there would be capacity issues because the sources are being maintained.

A new stormwater management system will be incorporated to comply with town and state standards to improve runoff quality and mitigate runoff quantity. Best Management Practices (BMPs) that will be included are catch basins, underground infiltration systems, and hydrodynamic separators.

Due to relatively high groundwater conditions, the project will require perimeter drains at the building, adjacent to and beneath new pavement areas, and beneath play fields.

A geothermal wellfield, approximately 3.2 acres, will be required to support the heating and cooling systems, see HVAC for more information.

Refer to the attached site plan and utility diagrams for this alternative.



C.1d Branch Aerial View

Architectural

All exterior envelope assemblies within the areas of new construction will be designed to meet the robust thermal requirements of the Stretch Energy Specialized Code. Interior assemblies and materials will be selected to provide the necessary level of durability for the expected 50-75 year life span of the school.

Capacity Constraints

The design capacity of 2,395 students noted in the MSBA Enrollment Projection, and the corresponding educational space needs will be provided by the design of the new construction in these alternatives.

Program Delivery Impediments

The pedagogical requirements of a modern comprehensive high school will be provided for within the new construction of these alternatives.

School Requirements

All elements of Lexington High School's robust curriculum are accommodated in spaces that meet current standards by the new construction.

Schedule Overview

Alternatives C1.d, C2.b & C5.b would be implemented over fifty-four (54) months in two phases, with an estimated thirty-six (36) months for new building construction and eighteen (18) months for demolition of the existing building and construction of the new athletic fields.

Cost Overview

The estimated construction cost is:

C.1d $ 477,000,000

The estimated project cost is:

C.1d $ 596,000,000

All pricing is based on GSF of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium

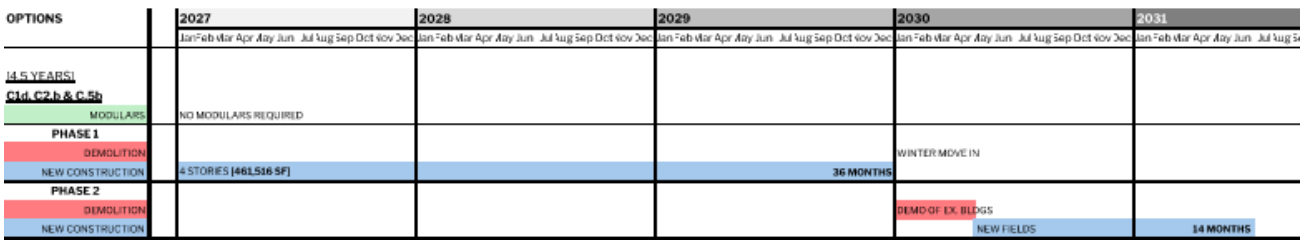
Alternative C1.d Branch Pros and Cons

Pros

- Current Building Remains in Use Throughout Construction, resulting in minimized disruption to ongoing LHS building uses
- Best opportunity for site access and lay-down space for construction
- Single, economical construction phase
- Freedom of educational planning and adjacencies
- No modulars required
- Allows for more parking spaces than schemes B.1, B.4 and D.2

Cons

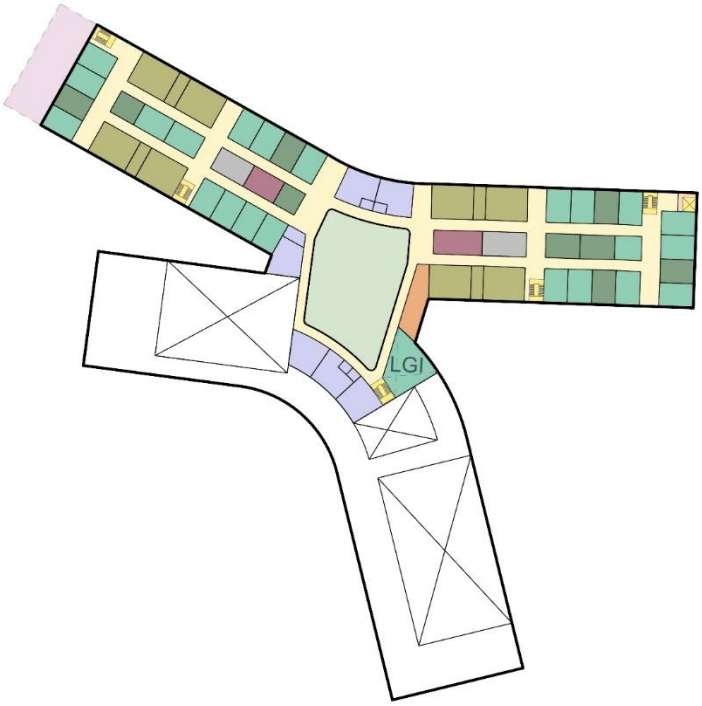
- Athletic fields taken offline during construction.
- Final field locations may be physically separated from Center Rec Complex
- Building massing bisects the site
- Requires Article 97 legislation



Estimated Construction Schedule for C.1d, C.2b & C.5b

C.1d Branch Floor Plan Diagram – Level 1

C.1d Branch Floor Plan Diagram – Level 2



C.1d Branch Floor Plan Diagram – Level 3

C.1d Branch Floor Plan Diagram – Level 4

System Narratives

Structural

Foundation recommendations are based on the Preliminary Geotechnical Report by OTO dated March 22, 2024. The presence of an organic soil layer on the site will require additional site-specific analysis to determine seismic parameters. Footings and slab shall bear on soil improved with reinforced rigid inclusions ground improvement designed for 5 KSF allowable bearing capacity (footings) and 100 PSF live load (slab). A 12" crushed stone layer below the entire building footprint will be provided.

New foundations consist of cast-in-place, reinforced concrete shallow spread footings with cast-in-place, reinforced concrete frost walls, and concrete pilasters at exterior columns.

Assuming a column spacing of 30'x30':

- 3-story buildings: 9'x9'x2' with 6 PSF of rebar
- 4-story buildings: 10'x10'x2' with 6 PSF rebar

A continuous footing 3'-0"x1'-0" with 4 PSF of rebar will be placed along the perimeter of the building. Frost walls will be 3'-6" x 20" with 5 PSF of rebar. Assume 2'x2' pilasters under perimeter columns. New slabs will be 5" concrete slab on grade with 6x6 W2.9x2.9 WWF over 15 mil vapor barrier over 12" of crushed stone. 12" thickened slab with rebar to support non-load bearing CMU wall partitions. Assume a 5' deep reinforced concrete elevator pit with sump pit, and both perimeter and underslab drains. If there are any basement spaces, walls are to be 20" thick with 4 PSF rebar where grade is more than 4 feet above the lowest level.

Structural Steel recycled content shall consist of a minimum of 95% recycled steel. New floors shall be supported by steel columns and composite steel beams supporting of a 3¼" lightweight concrete slab over 3" composite metal deck. Slab to be reinforced with 6x6 W2.1x2.1 WWF. Assume ¾" diameter x 4 ½" headed shear studs per foot of beam length.

Assume steel weight of 13 PSF. Add 10% for connections and 1 PSF for miscellaneous steel such as kickers, bent plates, relieving angles, and girts.

New typical roofs shall be galvanized 3" metal roof deck spanning between wide flange steel beams and girders. Assume steel weight of 11 PSF. Add 10% for connections and 1 PSF for miscellaneous steel such as kickers, bent plates, relieving angles, and girts. Add concrete slab under rooftop mechanical units – increase steel weight to 13 PSF. New Auditorium and Gymnasium Roof: acoustic, galvanized 3" metal roof deck spanning between long span open web steel joists with an estimated weight of 11 PSF. Bridging at quarter points.

The lateral system will be steel braced frames. Due to organic soils, lateral forces will be high and require an additional 1 PSF of steel weight to be assumed for lateral system. Assume 8" reinforced CMU walls in the elevator shafts. Roof to be designed as PV-ready for a ballasted system.

Miscellaneous steel (see 1 PSF allowance above):

- Galvanized brick relieving angles at the second, third, and fourth floors
- Canopy structure
- Gym equipment support
- Theater equipment support in Auditorium
- Mechanical screen enclosures (allowance of 10 PSF on vertical screen area)
- Hung partition support beams

Provide isolation pads or floating slab at vibrating equipment.

Fireproofing of primary frame members for a 2-hour rating (columns, beams, braces). Assume 5% of members receive intumescent paint. Floor slabs do not require additional fireproofing due to the 2-hour rating of the concrete slab. Spray underside of roof deck for a 1-hour rating.

Solar canopies are to bear on 36" diameter x 20'-0" reinforced concrete drilled piers on a 30'x60' grid. The steel weight is to be 8 PSF and steel members are to be hot-dipped galvanized.

Any future expansion will be horizontal only and will be separated from the proposed building with an expansion joint. No cost premium is associated.

Structural Design References

Design will anticipate compliance with 780 CMR 10th edition (MA State Building Code)

Floor Live Loads:

- Classroom
  40 PSF + 15 PSF partition load
- Classrooms with "shops"
  100 PSF
- Library
  150 PSF
- Corridors
  80 PSF
- Stairs/Assembly Spaces
  100 PSF

Dead Loads:

- Structure self-weight + superimposed load from ceiling/finishes/hung MEP
- Future PV as mandated by code

Roof Snow Loads:

- Ground Snow Load (pg.)
  40 PSF
- Minimum Flat Roof Snow Load
  30 PSF
- Exposure Factor Ce
  1.0
- Thermal Factor
  1.0
- Importance Factor
  1.1

Wind loads:

- Basic Wind Speed Vult (Cat III)
  127 MPH
- Exposure
  C

Seismic Loads:

- Risk Category
  III
- Seismic Importance Factor
  1.25
- Ss/S1
  .296/.069
- Site Class
  TBD
- Seismic Design Category
  TBD
- Seismic System
  Steel Systems Not Spec.
- Detailed for Seismic Resistance
- Response Modification Factor
  R=3
- Analysis Procedure
  Equivalent Lateral
- Force Procedure

HVAC

New, all-electric HVAC systems will be provided to comply with the current Massachusetts Energy Code, including the Specialized Stretch Energy Code adopted by the Town of Lexington. A specific system approach is represented below, but alternative space heating and cooling approaches will be assessed to determine the preferred system.

The heating and cooling systems will be based on a ground source geothermal system utilizing vertical boreholes. The preliminary system requirement is estimated as a geothermal field that includes 350 boreholes at 800 ft, each. Based on the findings of the test borehole, where there was a fault at the 190 ft depth, the boreholes should be assumed to require 6" casing down to a depth of 220 ft. The geothermal loop will be 30% propylene glycol with distribution from a system of variable volume pumps in a mechanical room. Plate and frame heat exchangers will separate the ground source loop from the interior water loop and associated pumping system, which will support mechanical heating and cooling systems. Space heating and cooling will utilize above-ceiling heat pumps for classrooms and support spaces. Larger spaces will be supported by AHUs with water source heat pumps.

Ventilation will be provided with rooftop DOAS units, configured with water source heat pumps for conditioning of outdoor air to the classrooms and support spaces. VAV terminal units will manage ventilation to individual rooms based on CO2 control.

Specialty systems will be included for ventilation of Science Labs, Kitchens, Kilns and other such installations.

A new DDC building management system will provide control and monitoring of the HVAC systems and monitoring of selected Plumbing and Electrical equipment and metering.

Alternate System: In lieu of a geothermal system, provide an air source heat pump (ASHP) system based on grade-mounted air source heat pumps (air-to-water) with 4-pipe distribution (HWS/R and CHWS/R) piped to the mechanical equipment room. Each outdoor loop (30% glycol HW and CHW) will be piped to a pair of dedicated pumps and plate-and-frame heat exchanger: one pair of pumps and heat exchanger for HW and another set for CHW). A separate pair of HW pumps and CHW pumps will provide distribution to the building fan coil loads from their respective heat exchangers. Rooftop Units and DOAS Units will be provided as packaged heat pump units (not supported by 4-pipe ASHP system).

Plumbing

New domestic cold and hot water systems will be provided throughout the facility, including a domestic water booster system with VFD drives, reduced pressure backflow preventers, new water meter, pipe insulation, pipe labels with flow arrows and valve tags. Electric storage type domestic water heaters will be provided. In lieu of electric water heaters, provide a domestic water heat pump system with electric backup.

Sanitary, waste and vent systems will be provided throughout the facility and will connect by gravity to the new exterior site sewer system. Where lower level/basement fixtures cannot be drained by gravity, duplex waste ejectors will be provided. Vents will tie together to a common header and vent up through the roof.

Coordination is required to avoid conflicts with the roof mounted PV and future PV locations.

A kitchen waste system will be provided and will connect to a new exterior grease trap in the site by gravity. Point-of-use grease traps will be provided to receive the waste discharge at the triple pot sink, dishwasher, tilting kettle and other grease producing kitchen equipment and floor drains. The kitchen waste main will run to an exterior grease interceptor.

Vent piping will be installed from the exterior grease trap back into the building and to the roof independently.

Tepid water emergency wash systems will be provided throughout all lab areas, pH adjustment room, Nurse's room and boiler room. Equipment will include new ADA compliant emergency shower/eyewash stations. All emergency shower and eyewash units will include a thermostatic mixing valve set for 60 deg. F, fed from the domestic potable hot and cold-water distribution systems.

Hot water will be recirculated to within 15 ft. of each mixing valve.

New storm drainage systems will be provided throughout the facility including primary and secondary roof drainage systems for each roof area. Primary storm drainage systems will connect to the exterior site storm drainage system by gravity. Overflow (secondary) drains or scuppers shall be installed. And discharge independently to 18" above finished exterior grade.

A new underslab foundation drainage system will be provided. The discharge from the underslab drainage system will exit the building independently from the primary storm drainage systems and connect to exterior storm drainage manholes with backwater valves. Storm drainage piping from each level of roof area will be provided with backwater valves for each level.

Due to the electrification requirements, natural gas is not anticipated. Kitchen equipment will be electric. Hot plates will be utilized within the lab classrooms.

Two new acid waste chip tanks will be provided. One for each science wing. Laboratory waste piping shall be polypropylene with fused joints. Lab waste Venting will combine and vent through the roof independently from the sanitary vent system. Each drain from chip tanks will drain independently from the building by gravity and connect to the site sewer system 10 feet outside the foundation wall.

New plumbing fixtures will be provided throughout the facility. ADA compliant fixtures will be provided throughout in locations and quantities in accordance with MAAB requirements. Low flow fixtures meeting the requirements of 248 CMR will be provided throughout. 1.28 gal/flush water closets will be provided. Urinals will utilize 0.125 gal/flush self-sensor type flush valves. Lavatories will include 0.35 gpm flowrate faucets. Sinks will utilize 1.5 gpm flow restrictors and showers will utilize 1.5 gpm flow shower heads. Fixtures to be hands free and hardwired. Battery operation is not permitted.

Fire Protection

A new combination standpipe/sprinkler system will include a new fire pump, jockey pump, fire pump controller, jockey pump controller, double check valve assembly, wet alarm check valves, floor control valve assemblies, sprinklers, flow switches, tamper and pressure switches and all associated piping. The system will be hydraulically calculated in accordance with NFPA requirements. Sprinkler mains will be equipped with control valves, inspector test stations, and flow switches. Sprinkler spacing will comply with NFPA-13 requirements. Separate sprinkler zones will be provided for each floor and each wing.

The current system does not include a fire pump, however, the new building will be three, four, or five levels high, as opposed to two. A hydrant flow test is required to confirm the available water supply. If required, the fire pump will be located in a rated room with direct access to the exterior in accordance with 780 CMR and NFPA 20. An approved double check valve assembly will be provided by the fire service.

New standpipes meeting the requirements of 780 CMR and NFPA 14 will be installed. A standpipe isolation valve will be provided at each standpipe feed. Each standpipe will meet the requirements of a Class 1 standpipe system in accordance with 780 CMR and NFPA 14 requirements.

Each will be provided with 2 ½-inch fire department valves with 1 ½-inch reducers and caps. The standpipes will be interconnected at the ceiling of the first floor. Roof manifolds will be installed for each roof level.

New fire department connections and electric bells shall be provided in the quantities and locations as required per the local fire department. The new fire department connection will be arranged to serve all sprinklers and standpipes within the building. The fire department connection threads will match Fire Department requirements. Where required due to travel distances and local fire department requirements, intermediate standpipes will be provided in additional locations.

Sprinklers for areas with ceilings will be factory painted gloss white, concealed type. Mechanical rooms and other unfinished areas are to be provided with brass finish, exposed sprinklers. Sprinklers that are subject to damage will be provided with sprinkler guards. Sprinklers subject to higher temperatures will be intermediate or high temperature sprinklers in accordance with NFPA 13 requirements. Sprinklers for areas subject to freezing, including loading dock areas, shall be dry type. It is assumed that two dry systems will be required.

Elevator machine rooms and hoistways will not be protected with automatic sprinklers in accordance with 780 CMR. A roof manifold will be provided at each roof level with a two story or greater height.

Electrical

Utility Interconnection

The existing electrical service for the building is currently fed underground from Waltham Street. As part of the new construction options, the design team will coordinate with utility and propose relocating the service entrance to a utility pole on Worthen Road, closer to the new school footprint.

Based on preliminary estimates of the building's total connected load, it is anticipated that utility will require a dual-source service (DSS) to accommodate the electrical demand. This will likely involve providing two services from Eversource. While specifics and interconnection equipment will be coordinated with utility in later design phases, the current plan proposes the following equipment for interconnection.

- 15k-Volt switchgear, main-tie-main configuration for dual source service.
- Utility reclosure cabinet.
- CT / Metering cabinet (upstream of entire campus electrical interconnections)
- Provisions for four (4) transformers (owned and operated by the school)
- Solar interconnect switchboard for the photovoltaic panels and battery storage units.

All electrical utility equipment will be pad-mounted on site, with underground conduit pathways. A screen wall will be installed to visually separate the electrical gear from street views, in accordance with zoning bylaws.

Renewable Energy System

Based on a target EUI of 25, early estimates suggest the size of the total solar system shall be 3.5 Megawatts, along with 2-Megawatt/4-Megawatt-hour battery energy storage systems (BESS). Various configurations of PV installations will be considered, including the following options. Refer to the LHS PSR Alt Data Sheet for square footage takeoffs of each option and configuration:

- Canopies covering 50% of the total roof area, including both high and low roof installations.
- Parking canopies with solar arrays.
- Transparent glazing arrays for walkways and exterior shading awnings.
- Vertical solar array installations such as wall mounted, or roof equipment mounted configurations.

One pad-mounted transformer is dedicated to the photovoltaic (PV) system, energizing a 5000 Amp 277/480 V solar switchboard for utility interconnection. The PV system and battery storage are anticipated to be designed as AC-coupled, allowing for the independent operation of the solar system and battery storage without disrupting school programs.

Power Distribution System

The existing electrical service will be replaced. The new distribution system will consist of two (2) 4000 Amp, 277/480V 3-phase 4 wire switchboards, service rated, with new underground secondary service conductors extended to pad-mounted transformers.

A system of new separate-use panelboards for lighting, mechanical and general power will be installed in dedicated electrical rooms throughout the building to service equipment, lighting and branch circuit loads.

An Energy sub-metering system will be provided to monitor all separate-use panelboard systems and individual energy loads that represent 10% or more of the total annual consumption of the building. Sub-meters will be connected to the new building DDC system. All metering installations must be commissioned by a third-party reviewer and DOER certified.

Life Safety/Emergency System

The existing emergency system will be replaced with a new 277/480 volt 3-phase, 4 wire diesel fueled emergency generator and generator distribution system. Preliminary calculations suggest a generator sized at 1500kW.

It is estimated that the following items will be connected to the generator system:

- Egress emergency lighting.
- Fire alarm system.

- IT Rooms (power and A/C) including network, door access, intrusion detection, CCTV, PA, telephones.
- Heating system as required to freeze protect the building.
- Elevator(s).
- Resiliency Level:
    - Level 3 for the majority of building.
    - Level 2, not including food prep requirement, applied to select areas of the building, such as the Fieldhouse/Gym (plan for attaching portable generator for cooking.

Lighting & Lighting Control

All lighting will be new, high-efficient LED light fixtures.

All lighting will be automatically controlled using a combination of ceiling occupancy sensors in classrooms, offices and smaller spaces and network programmable relays for larger spaces such as corridors and gymnasium. Perimeter spaces will have closed loop light level sensors 12' from window for 2 zone dimming control of primary and secondary daylight zones. Selected fixtures in egress paths will be connected to emergency panels and new exit signs, connected to emergency circuits, will be provided throughout.

The lighting control system shall include the capability of communicating and controlling ON/OFF 120V power to receptacles in classrooms, offices, corridors, and other spaces required by the energy code.

Fire Alarm

The new fire alarm system will consist of an addressable voice evacuation fire alarm control panel, automatic smoke and heat detectors, manual pull stations, audible and visible alarm signals, elevator recall, connections to automatic fire suppression systems, and connection to the Fire Department. The new fire alarm system will report to the Fire Department through a radio master box with a remote 5dB antenna located on the roof, as well as an auto dialer for supervisory and trouble signals.

The fire alarm control panel will be in a dedicated fire command center with an LCD remote annunciator located at the Main entrance where the fire department responds to an alarm condition. Audio speakers and visual high intensity strobes alarm devices will be installed per NFPA-72. The building will be covered by a sprinkler system, and smoke detectors will be provided throughout all corridors, and selective spaces.

Fire suppression systems shall be tied to the fire alarm control panel. Interface & control modules will be provided for elevator recall, air handling unit shut down, gas shut off, door hold release, door hardware bypass and any other systems requiring control under an alarm condition.

A bi-directional antenna (BDA) system shall be installed to comply with latest building code. The BDA system will have capabilities to boost fire department and police department radio communications within the building.

Lightning Protection System

The existing school does not have a lightning protection system. A lightning protection system is not required by code, although is recommended by NFPA Standards. A system can be installed if desired by the town.

Telecommunications

The existing telecommunications copper and fiber optic cable infrastructure will be replaced to support data and voice transmission. CAT6A cable will be installed to the end points, with (12) strand OM4 multi-mode and (6) strand OS2 single-mode fiber optic cabling between the MDF and the IDFs. Existing network infrastructure electronics spaces in classrooms and storage spaces will be replaced with secure and climate-controlled rooms to better protect and maintain network electronic equipment. The MDF and IDFs will be replaced with new equipment cabinets, patch panels and overhead cable management components. The MDF and IDFs will be replaced with new rooms fitted with new cooling systems, lighting, and generator backed power.

The existing Public Address and Master Clock Systems will be replaced. Classrooms and other learning spaces will be equipped with two-way talkback speakers. Corridors and larger spaces will be equipped with one-way speakers. Clocks will be synchronized and powered via low-voltage wiring. The Public Address and Master Clock systems will be interfaced at the head end.

Classroom technology infrastructure will be upgraded to provide new data and voice communications with a potential wireless access point location in the ceiling. Audiovisual cabling will be installed to allow projection of content from the instructor's computer to the wall-mounted interactive flat panel monitor.

Speech reinforcement systems will be installed in instructional spaces to provide even distribution of instructor and student speech throughout the space, as well as being interfaced to the interactive flat panel monitor to perform the audio functions for audiovisual presentations in the space. Current wireless access points will be purchased at the time of occupancy.

Security

The school's security infrastructure is designed with multiple layers, incorporating both active and passive security measures. These layers encompass various aspects such as perimeter security, surveillance cameras deployed both indoors and outdoors, controlled and secure entry points, access control mechanisms at key interior doors, intrusion detection systems featuring multiple zones, intercommunication systems, the ability to initiate lockdowns for classroom wings, and the capability for individual classroom lockdowns.

Access Control (card readers and video intercom stations) will be added to better secure entrances and spaces within the building such as elevators and where sensitive equipment and documents are stored.

Audio / Visual

New audiovisual systems will be provided for the Auditorium (including backstage support spaces), music classrooms (including the Band, Chorus, and General Music Classroom), the Fitness area (including the Gymnasium, Fitness Room, Multipurpose Room, and Dance Studio), Cafeteria, Large Group Instruction room, and the Lecture Hall. Where applicable, the systems will be provided with high-resolution video displays/projection, sound systems for speech reinforcement and audio playback, ADA-compliant assistive listening, and integrated AV controls. In addition, broadcast recording equipment will be provided for use by the students in the TV Production Room.

Acoustics

New building utility equipment will incorporate sound attenuating measures, as necessary, for compliance with the community noise emissions summarized in the Town of Lexington General Bylaws, Chapter 80: Noise Control. These requirements are consistent with the noise emission requirements established in the Massachusetts Division of Air Quality Control (DAQC) Policy 90-001.

New HVAC equipment and system components and room finishes will be designed for compliance with the LEED Minimum Acoustics Performance prerequisite for HVAC background noise and reverberation time in renovated core learning spaces.

Specialty spaces, such as the auditorium, music classrooms, fitness areas, gymnasia, and large lecture rooms will incorporate room shaping, sizing, finish material strategies, and sound isolating surrounding construction to appropriately suit the acoustic needs of the users.

Hazardous Materials

As expected for an existing building of this age, there are significant hazardous materials present, despite prior abatement activities that have occurred over the years. For a detailed report on the materials to be abated, see Section 3.1.4N of the PDP Report. For the new construction alternatives, hazardous material abatement is required for the existing building that will be completely demolished.

Permitting Requirements

Federal

Environmental Protection Agency

A Construction General Permit would be required for the C1.d alternative due to the area/size of construction activities on the site. It will be filed with the Environmental Protection Agency prior to the start of any construction activities on the site but not less than 14 days before construction begins.

Army Corps of Engineering

Engagement with the Army Corps of Engineering is required for the C1.d alternative because of the proposed direct wetlands impacts. It is anticipated that a Pre-Construction Notification will be required because the direct wetland impacts will exceed 5,000sf but not exceed more than one acre. It is anticipated that the Notification process will take approximately 2 months to complete and will begin prior to the conclusion of the Design Development phase.

State

Article 97 Legislation is required for the C1.d alternative because of the permanent impacts to protected open space. It is anticipated that the process, including engagement and kick-off with Public Land Preservation Act, preparation of the Bill including local and state support, Town Meeting Approval of the land swap, and legislative approval/action will take approximately 20 months. The town has initiated the process, and it is anticipated that it will conclude in June of 2026.

Massachusetts Environmental Protection Act

There are two review thresholds of Massachusetts Environmental Protection Act (MEPA) that are exceeded for the C1.d alternative.

The project requires an Article 97 land swap as described above. Section 310 CMR 11.03 (1) (b) 3, alteration of ½ or more acres of any other wetlands, requires an Environmental Notification Form (ENF) and other MEPA review if the sectary so requires.

The project also proposes to fill Wetland 10, an Isolated Land Subject to Flooding that is approximately 34,000 square feet (0.78 acres) and jurisdictional area under the Massachusetts Wetlands Protection Act. Section 310 CMR 11.03 (3) (b), alteration of ½ or more acres of any other wetlands require an ENF and other MEPA review if the sectary so requires.

It should be noted that there are 11 adjacent Environmental Justice (EJ) populations identified by the Executive Office of Energy and Environmental Affairs within a one-mile radius of the project that all meet the minority criteria. Although MEPA regulations require an ENF for the thresholds exceeded, the adjacent EJ populations require both ENF and Environmental Impact Report (EIR) filings.

The team anticipates an Expanded ENF in August of 2025 and a Single EIR in December 2024, and a certificate from the Secretary in January 2026.

Massachusetts Historic Commission

A Project Notification Form was filed with Massachusetts Historic Commission on October 7, 2024.

On December 6, 2025 MHC responded confirming that the existing Lexington High School building is not included within the MHC's Inventory of Historic and Archaeological Assets of the Commonwealth, nor is the building in the State register of Historic Places.

See attached draft schedule for additional details.

Local

Demolition Permit

A Demolition Permit is required for the C1.d alternative and was filed with the Town of Lexington Building Office on 5/14/2024.

Building Permit

A Building Permit for New Construction will be required for the C1.d alternative by the Town of Lexington Building Office and will be obtained prior to the start of construction.

Zoning Board of Appeals

A Variance for building height is required for the C1.d alternative because the proposed height is approximately 4 stories/64 feet which exceeds the maximum permittable height of 2.5 stories/40 feet in the site's zoning district.

A Variance for driveways is required for the C1.d alternative because the proposed vehicular circulation off Worthen Road exceeds the maximum 2 drives per street line.

The Requests for Variance will be filed with the Town of Lexington Zoning Board of Appeals during the Design Development phase of the project, and it is anticipated to take approximately two months to obtain.

Conservation Commission

A Notice of Intent is required for the C1.d alternative due to the proposed location of land disturbances within the buffer zones of the wetlands and the direct wetlands impacts on the project site. It will be filed with the Town of Lexington Conservation Commission during the Design Development phase, and it is anticipated to take approximately four months to complete and receive an Order of Conditions.

Utility Diagram| Branch (C.1d)

Lexington High School Feasibility Study / Town of Lexington

smma

LEXINGTON HIGH SCHOOL

2. Construction Alternative C.2b (Braid)

Design Approach

Alternative option C.2b Braid includes all new construction in one phase on existing athletic fields, enabling the entire new school building to be constructed efficiently, free of the existing high school footprint, and with minimal impacts to the ongoing functioning of the school. The planning concept features a four-story linear bar configuration similar to Alternative C.1d Braid, but located on the west side of the site.

For school and community use the major public access spaces are primarily within the Performing Arts and Health and Wellness wings, but will possibly include elements such as innovation labs, maker space, and Large Group Instruction, and would be organized with direct connection to a central Commons space, while allowing academic wings to be compartmentalized and secured after hours. The Media Center is also a primary public use space and together with the Auditorium and Gymnasium can be organized to connect to the cafeteria/commons as a major, bi-level community gathering space.

The massing concept features a terraced building form that helps scale down the bulk of building while allowing for an array of outdoor learning environments at the scale of individual classrooms rather than a singular large courtyard.

Refer to C1.d Branch for Life Safety Code Compliance, Accessibility Code Limitations, Energy Code Compliance, Site, Architecture, Capacity Constraints, Program Delivery Impediments, School Requirements, Schedule Overview, Pros & Cons, System Narratives & Permitting Requirements.

New Building in One Phase

Construction of 461,516 gross square feet of new 4-story building in one phase on existing athletic fields, followed by demolition of the existing high school. Total estimated construction duration of 4 years.

C.2b features two large exterior spaces enclosed by three walls of the building and a series of terraces that setback at each level above the first floor.

Cost Overview

The estimated construction cost is:

C.2b $ 476,000,000

The estimated project cost is:

C.2b $ 595,000,000

All pricing is based on GSF of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium

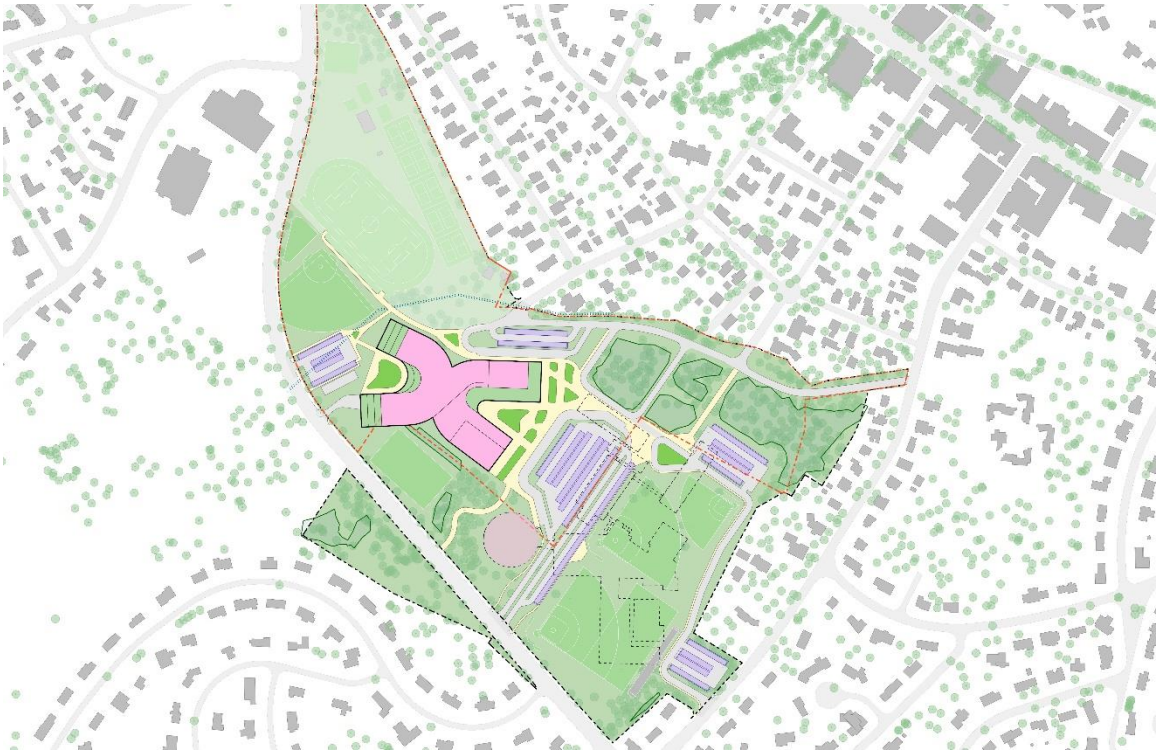
Alternative C.2b Braid Pros and Cons

Pros

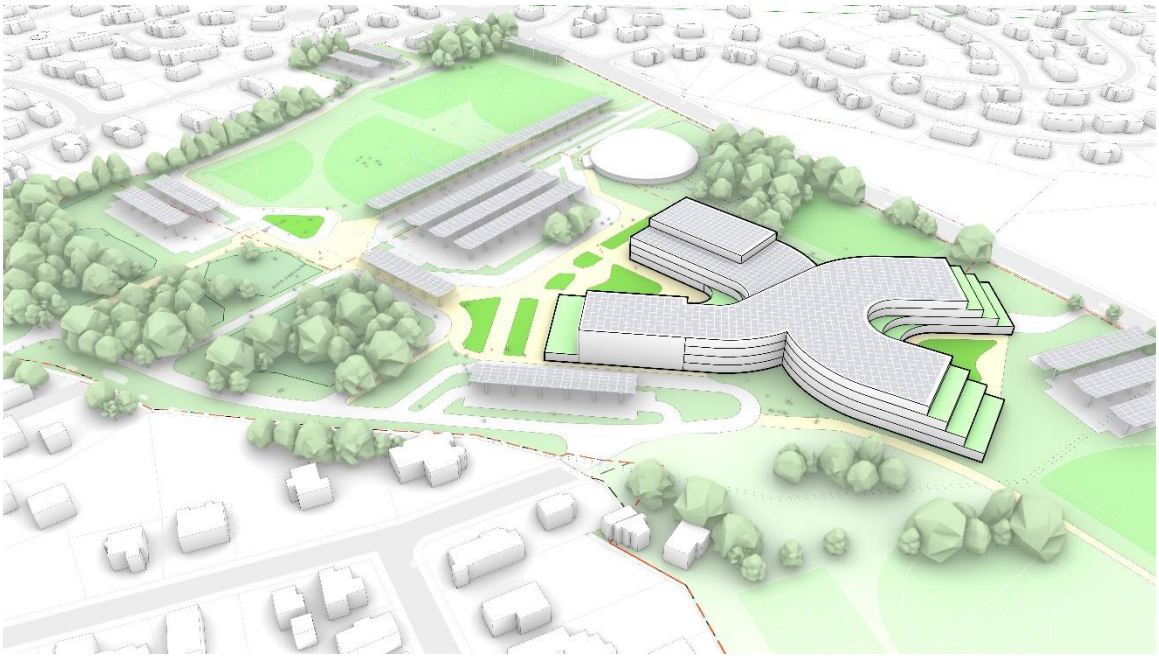
- Current Building Remains in Use Throughout Construction, resulting in minimized disruption to ongoing LHS building uses
- Best opportunity for site access and lay-down space for construction
- Single, economical construction phase
- Freedom of educational planning and adjacencies
- No modulars required
- Allows for more parking spaces than schemes B.1, B.4 and D.2

Cons

- Athletic fields taken offline during construction.
- Final field locations may be physically separated from Center Rec Complex
- Building massing bisects the site
- Requires Article 97 legislation

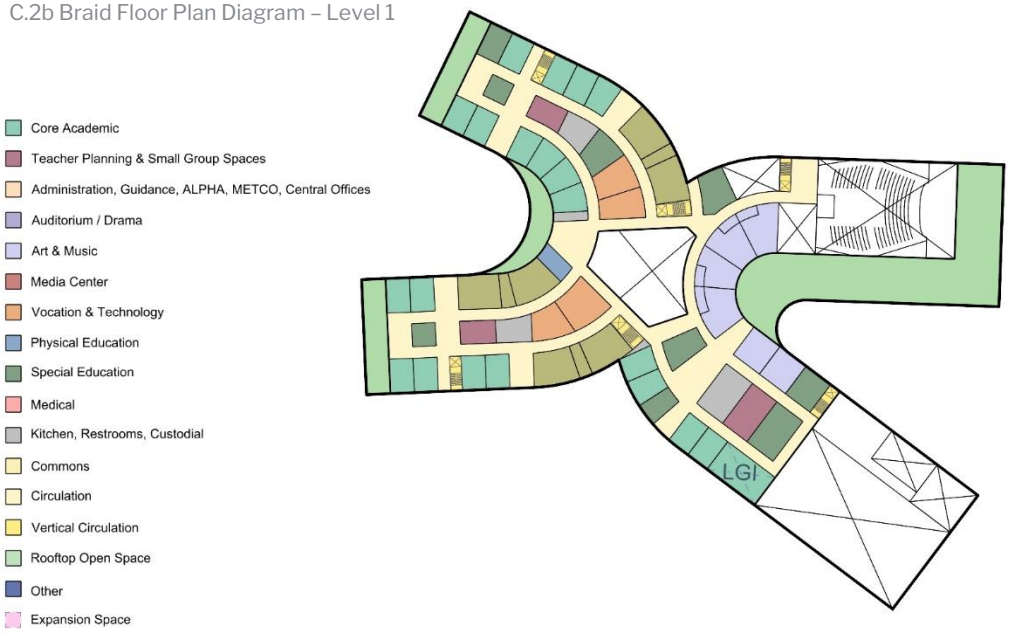


C.2b Braid Site Plan

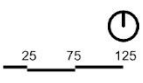


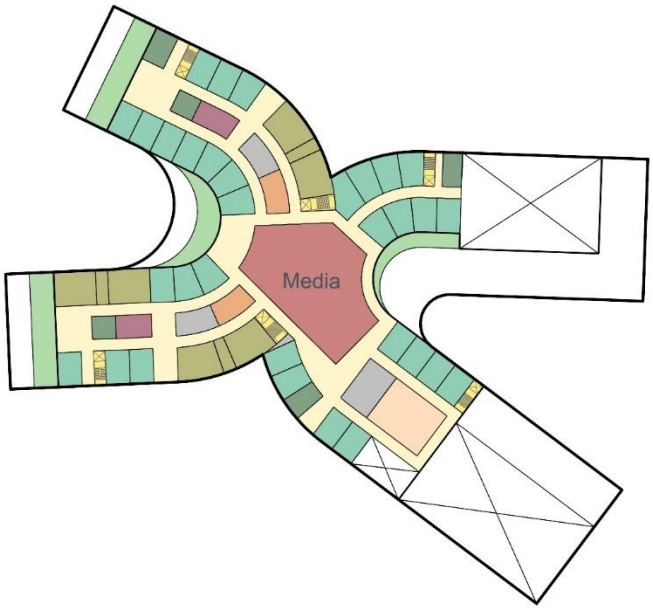
C.2b Braid Aerial View

C.2b Braid Floor Plan Diagram – Level 1

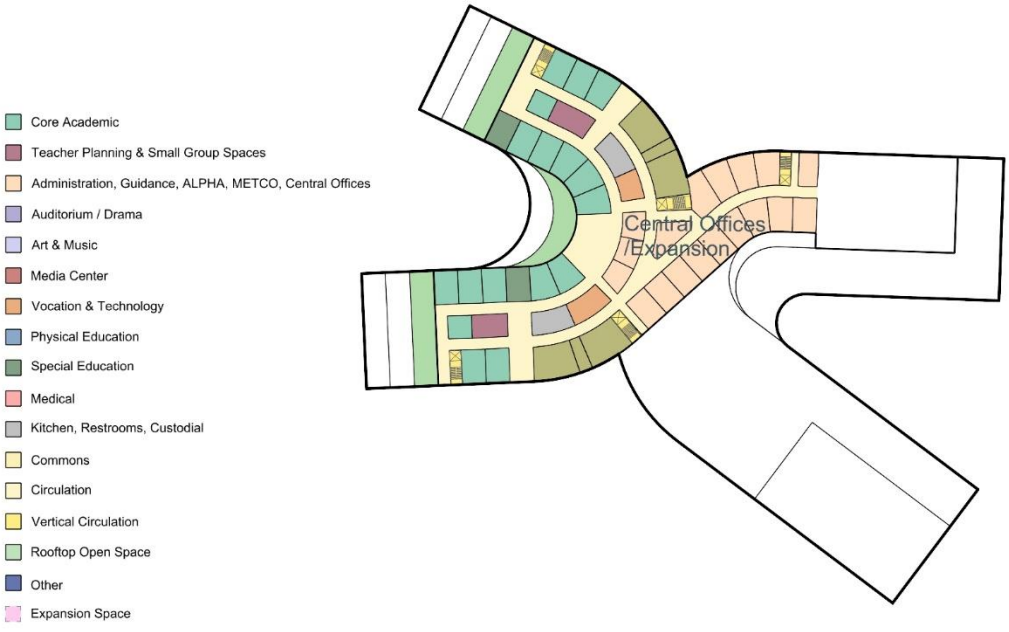


C.2b Braid Floor Plan Diagram – Level 2

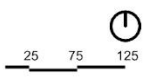




C.2b Braid Floor Plan Diagram – Level 3



C.2b Braid Floor Plan Diagram – Level 4



N

LEGEND

- sanitary sewer
- underground electric
- water service
- grease trap
- transformer
- infiltration area
- hydrodynamic separators
- geothermal well field

0 200'

Utility Diagram| Braid (C.2b)

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LEXINGTON HIGH SCHOOL

3. Construction Alternative C.5b (Bloom)

Design Approach

Alternative option C.5b Bloom features all new construction on existing athletic fields, providing inherent benefits of construction efficiency, minimized disruption to school operations, and cost-effectiveness while delivering highly beneficial educational quality. The configuration of the Bloom alternative takes a more organic approach to interdisciplinary programmatic adjacencies by establishing a language of three L-shaped wings that can be subdivided into pod-like neighborhoods while still being closely connected to a central nexus space. This approach provides for an efficient and dynamic relationship of spaces whose organizational clarity derives from a relationship to “the center”.

For school and community use the major public access spaces are located adjacent to the central commons space, and will possibly include elements such as innovation labs, maker space, and Large Group Instruction. These educational hubs would be configured to also enrich the environments of the educational neighborhoods on the “private” side of the wing. The Media Center is also a primary public use space and together with the Auditorium and Gymnasium would be organized to connect to the cafeteria/commons as a major shared feature of the design.

This alternative features a significant outdoor commons space at Level 3 as a rooftop courtyard offering a place of respite and connection with nature, as well as the possibility of programmed areas for educational instruction and practice.

The massing of this alternative occupies a more central location on the site than either of the Branch or Braid options, allowing for more of the athletic fields to maintain their adjacency to the Center Recreation Facility, but also pushing the building closer to the existing school and requiring attention and possible mitigation measure during construction. The compact, pinwheel geometry of the Bloom alternative emerged to address multiple desirable conditions: to accommodate access from multiple directions, while defining small outdoor spaces immediately outside the building, and to present the short ends of its wings to the community, reducing its bulk.

Refer to C1.d Branch for Life Safety Code Compliance, Accessibility Code Limitations, Energy Code Compliance, Site, Architecture, Capacity Constraints, Program Delivery Impediments, School Requirements, Schedule Overview, Pros & Cons, System Narratives & Permitting Requirements.

New Building in One Phase

Construction of 461,516 gross square feet of new 4-story building in one phase on existing athletic fields, followed by emolition of the 320,720 gross square foot existing high school. Total estimated construction duration of 4 years.

Cost Overview

The estimated construction cost is:

C.5b $ 478,000,000

The estimated project cost[4] is:

C.5b $ 598,000,000

Alternative C.5b Bloom Pros and Cons

Pros

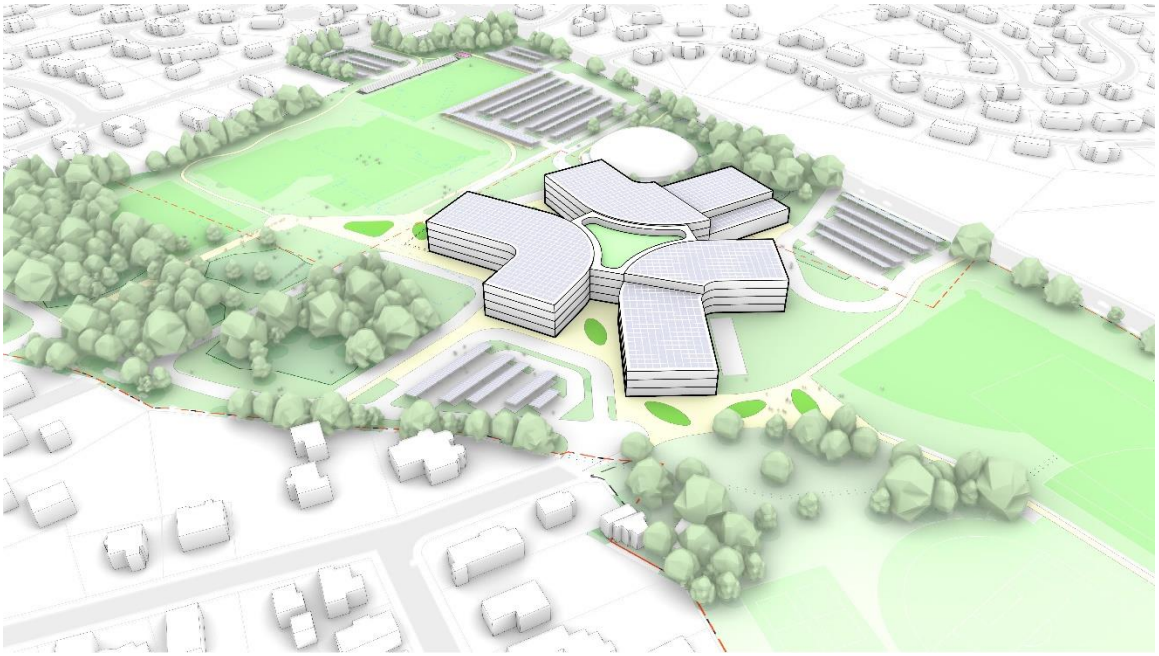
- Current Building Remains in Use Throughout Construction, resulting in minimized disruption to ongoing LHS building uses
- Best opportunity for site access and lay-down space for construction
- Single, economical construction phase
- Freedom of educational planning and adjacencies
- No modulars required
- Allows for more parking spaces than schemes B.1, B.4 and D.2
- Building massing less of a barrier than C.1d or C.2b
- Athletic fields C1 and C7 able to be replaced in current locations adjacent to Center Rec Facility

Cons

- Athletic fields taken offline during construction
- Final field locations may be physically separated from Center Rec Complex
- Requires Article 97 legislation

[4] All pricing is based on GSF of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium.

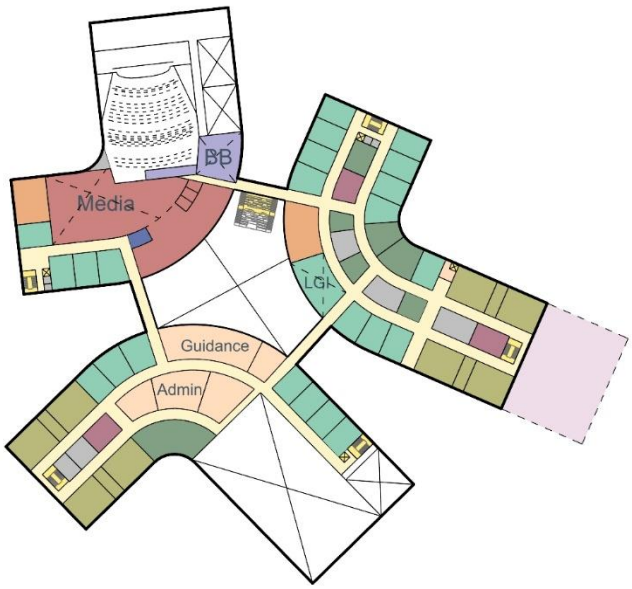
C.5b Bloom Site Plan



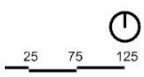
C.5b Bloom Aerial View

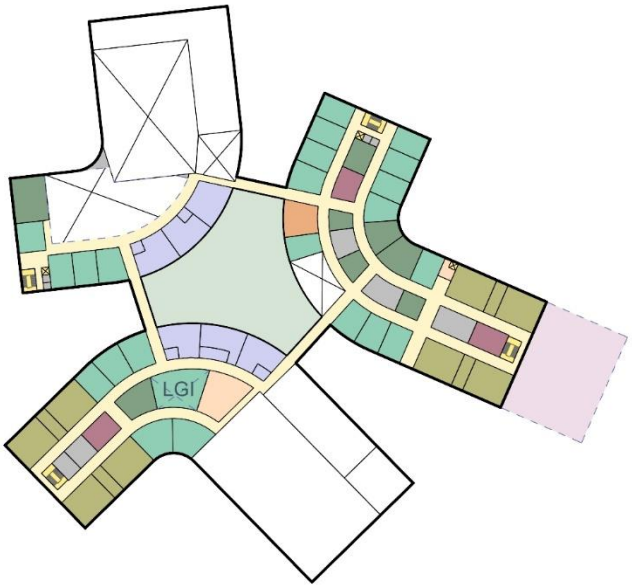
C.5b Bloom Floor Plan Diagram – Level 1

- Core Academic
- Teacher Planning & Small Group Spaces
- Administration, Guidance, ALPHA, METCO, Central Offices
- Auditorium / Drama
- Art & Music
- Media Center
- Vocation & Technology
- Physical Education
- Special Education
- Medical
- Kitchen, Restrooms, Custodial
- Commons
- Circulation
- Vertical Circulation
- Rooftop Open Space
- Other
- Expansion Space



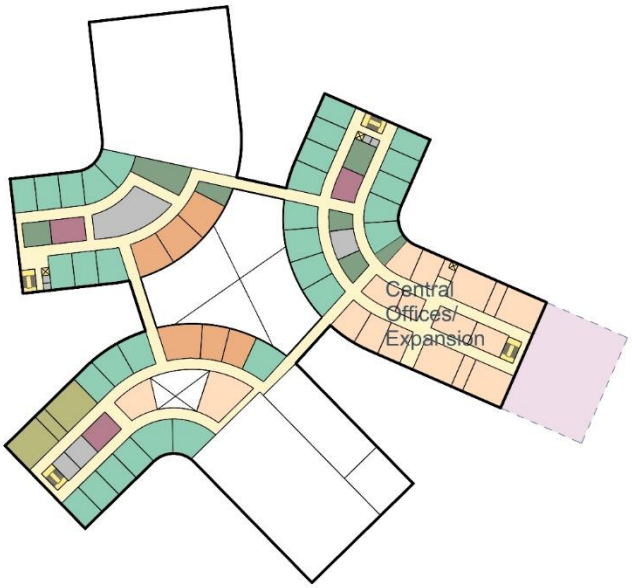
C.5b Bloom Floor Plan Diagram – Level 2



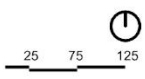


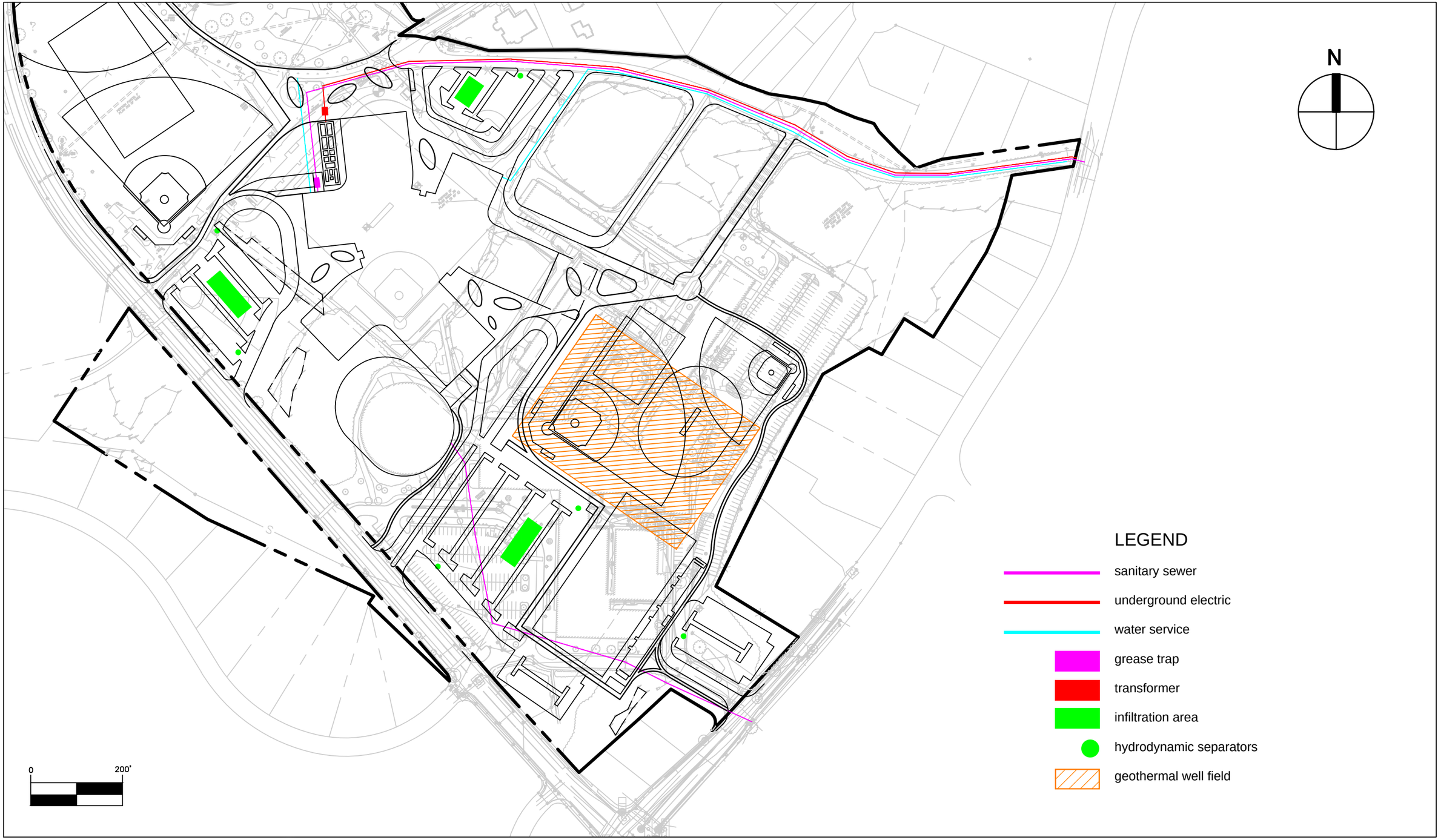
C.5b Bloom Floor Plan Diagram – Level 3

- Core Academic
- Teacher Planning & Small Group Spaces
- Administration, Guidance, ALPHA, METCO, Central Offices
- Auditorium / Drama
- Art & Music
- Media Center
- Vocation & Technology
- Physical Education
- Special Education
- Medical
- Kitchen, Restrooms, Custodial
- Commons
- Circulation
- Vertical Circulation
- Rooftop Open Space
- Other
- Expansion Space



C.5b Bloom Floor Plan Diagram – Level 4





Utility Diagram| Bloom (C.5b)

Lexington High School Feasibility Study / Town of Lexington

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LEXINGTON HIGH SCHOOL

4. Construction Alternative D.2 (Weave)

Design Approach

New Building in Multiple Phases on Existing High School Site

Building construction similar to Alt B.1 except with all new construction at 461,516 gross square feet phased in place on the footprint of the existing building.

Description

This scheme emerged at the request of the School Building Committee in response to the practical limitations of Renovation and Addition Alternative B.1, which utilizes the structural framework of Buildings G and J. By creating a similar footprint to B.1 that uses phased demolition and construction, the scheme is able to preserve desirable vehicular access and parking on the southern Worthen Road side of the building. Making the scheme all new construction then affords the ability to build classroom wings more compactly and efficiently up to a four-story height, and to reduce potential impacts on wetlands and Article 97 land. The scheme also improves orientation of the academic wings compared with Alternative B.1 once reuse of existing structures is removed.

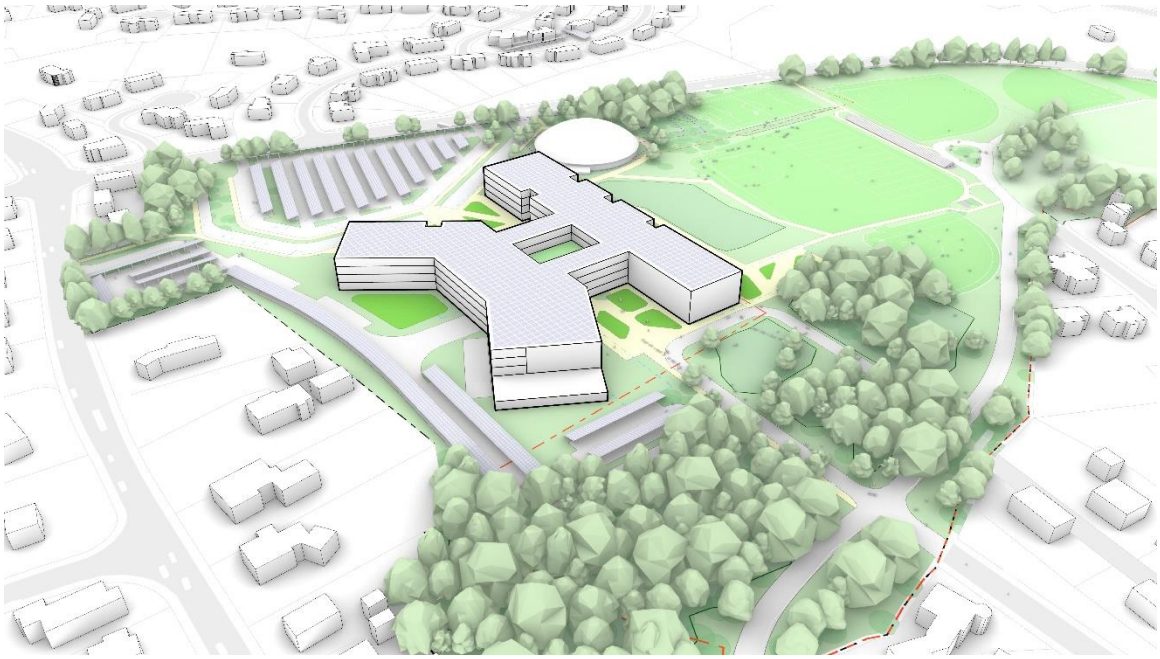
The New Construction Alternative will include compliance with the Lexington Integrated Design Policy, a Net Zero Energy school building with an energy target EUI of 25 kBtu/SF/yr. or 30% better than ASHRAE 90.1-2019 whichever is lower, LEEDv4 for Schools Gold Certification with a goal for Platinum, an embodied carbon reduction strategies such as low carbon concrete and materials such as structural wood components.

Refer to C1.d Branch for Life Safety Code Compliance, Accessibility Code Limitations, Energy Code Compliance, Site, Architecture, Capacity Constraints, Program Delivery Impediments, School Requirements, System Narratives, and Permitting Requirements.

Site

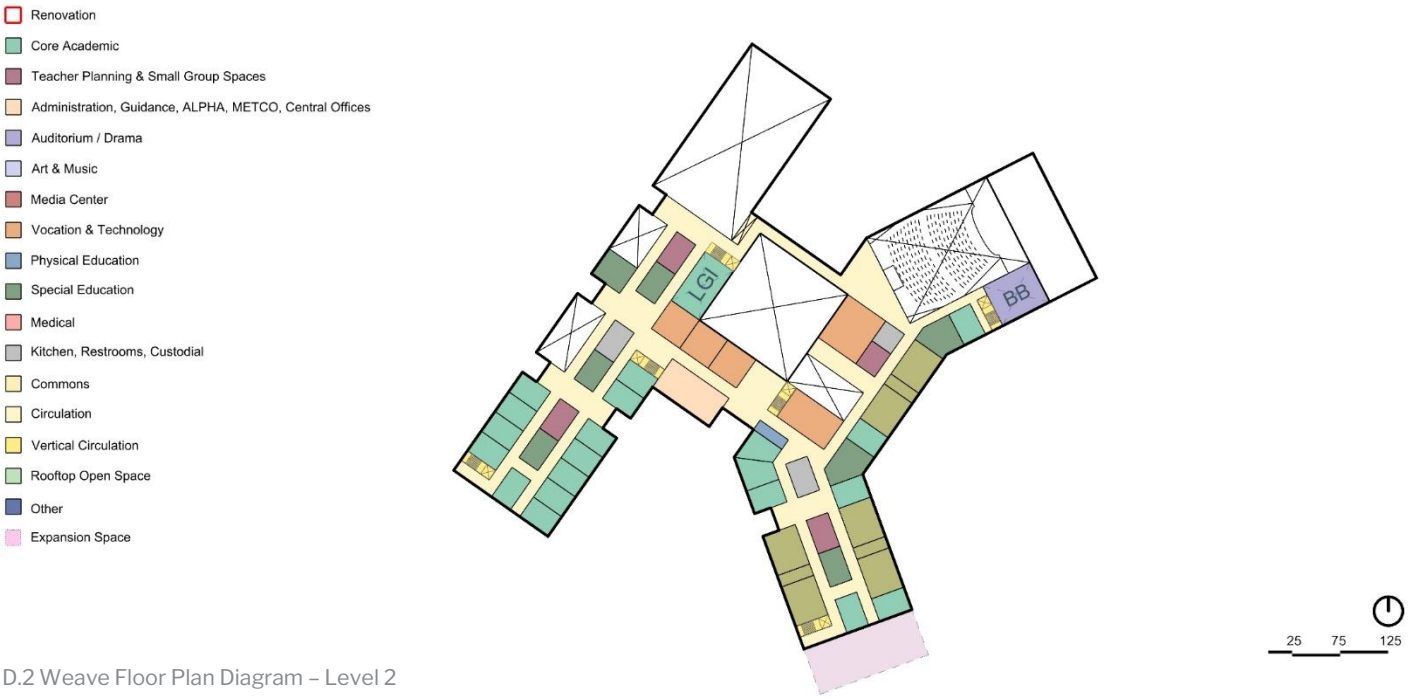
Site work within this phased new construction alternative is consistent with the scope of the B.1 Quad alternative.

D.2 Weave Site Plan

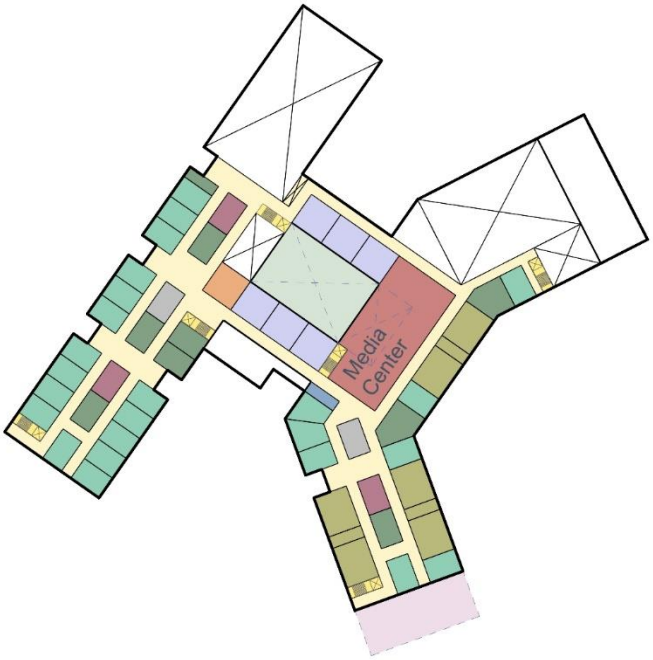


D.2 Weave Aerial View

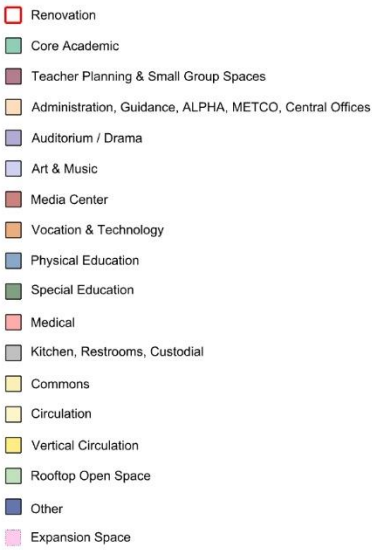
D.2 Weave Floor Plan Diagram – Level 1

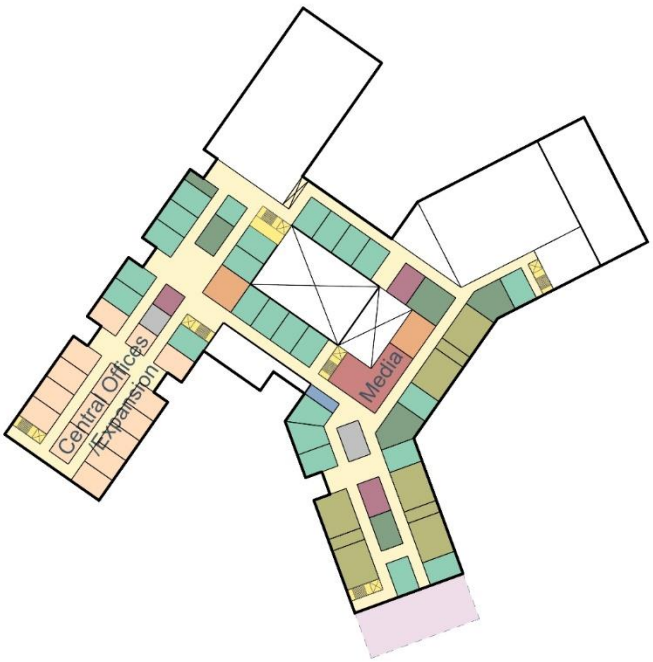


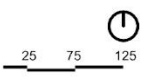
D.2 Weave Floor Plan Diagram – Level 2



D.2 Weave Floor Plan Diagram – Level 3







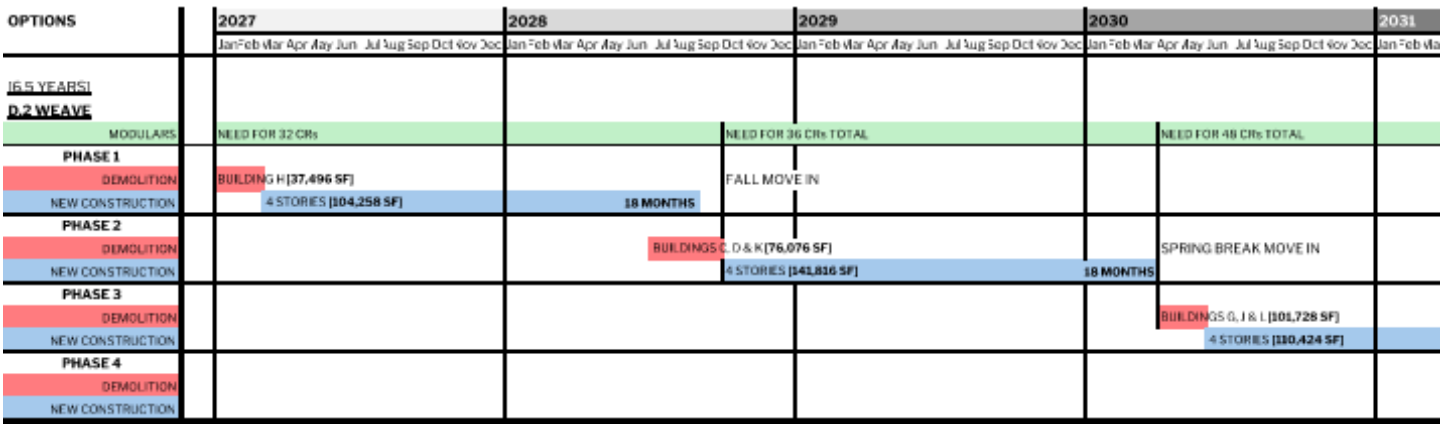
D.2 Weave Floor Plan Diagram – Level 4

Schedule Overview

Alternative D.2 would be implemented over seventy-eight (78) months across five (5) phases. Portions of the building would come online over the course of the construction duration, and students would rotate into the newly built portions while vacated areas of the existing building are then demolished. As noted in the estimated construction schedule below, these multiple move-ins reside within very short windows of opportunity, which puts tremendous pressure on the schedule and greatly reduces the tolerance for construction delays.

There will be a need for temporary accommodations for many functions including classrooms & assembly spaces during construction (refer to the phasing impacts diagram for more detail). The costs for modular classrooms have been included as the alternative requires.

Temporary conditions during construction will also be required and will at minimum change at the start of each new phase of construction. Mitigation of dead-end corridors, temporary life safety systems, maintenance of egress, altered vehicle circulation and site access, noise & vibration, air quality control, and usable square footage reductions due to construction needs, such as laydown space and safety buffers, all add to the complexity of D.2's phased-in-place construction.



Excerpt of Estimated Construction Schedule for D2 Weave

D.2 Weave Phasing Impacts

78 Months Total

Construction Zone

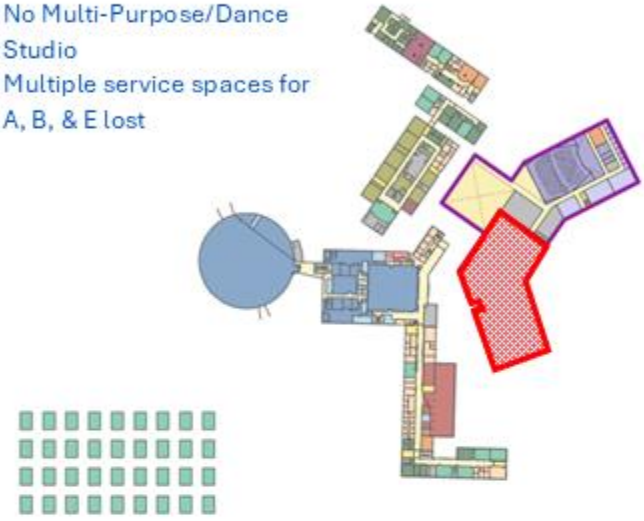
Phase 1

18 Months
32 Modulars

Phase 2

18 Months
36 Modulars

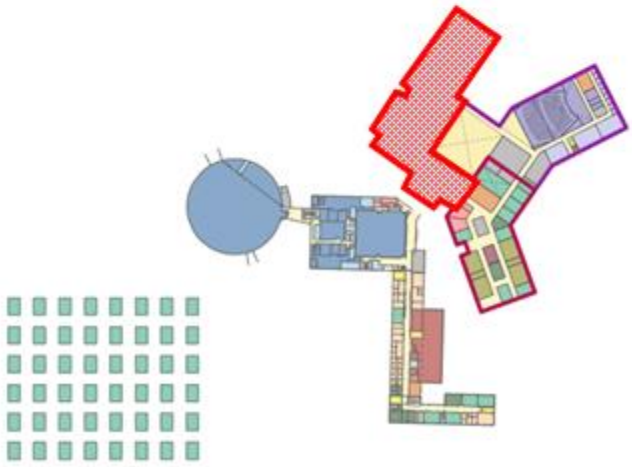
- No Multi-Purpose/Dance Studio
- Multiple service spaces for A, B, & E lost



Phase 3

19 Months
48 Modulars

- No Multi-Purpose/Dance Studio



Phase 4

16 Months
48 Modulars

- No Multi-Purpose/Dance Studio
- No Nurse's Suite
- No Locker Rooms
- No Team Rooms
- No Fitness Center
- No Media Center

Cost Overview

The estimated construction cost is:

D.2 $ 513,000,000

The estimated project cost is:

D.2 $ 670,710,000

All pricing is based on GSF of educational program only. It does not include costs for additional functions such as Central Office, Field House or a Natatorium

Alternative D.2 Pros and Cons

Pros

- Reduced site scope
- Maintains general location of the current school and its relationship to Muzzey Street
- May mitigate Article 97 impacts

Cons

- Added cost and inconvenience due to longer construction duration and need for modular classrooms.
- Requires Multi-Phased Construction, causing extended schedule
- Deep disruption to school activities and multiple migrations of students to new building over several phases.
- Temporary disruption and displacement of some existing fields
- Temporary replacement of critical building infrastructure due to renovations in place.

System Narratives

For general systems information applicable to New Construction Alternates C1.d, C2.b, C5.b & D.2, refer to the System Narratives under C1. d Branch. Conditions unique to Alternate D.2 Weave are enumerated below.

HVAC

D.2 Weave Phasing

Temporary heating services will be required for Phase 3 to support the remaining existing systems, after the existing heating plant is taken out of service.

Plumbing

D.2 Weave Phasing

The phasing for the Weave will be difficult as the first two phases are not attached to the existing building. A temporary service will be required. Provide a new domestic water service and domestic hot water heating (electric) system in the Phase 1 area. Part D systems will remain active until phase 2 where the building service room will be demolished. These systems will need to be back fed. Provide temporary services to back-feed part D (serves E B and A buildings that need to be maintained.

Extend the new system to phase 3 and 4 areas as required.

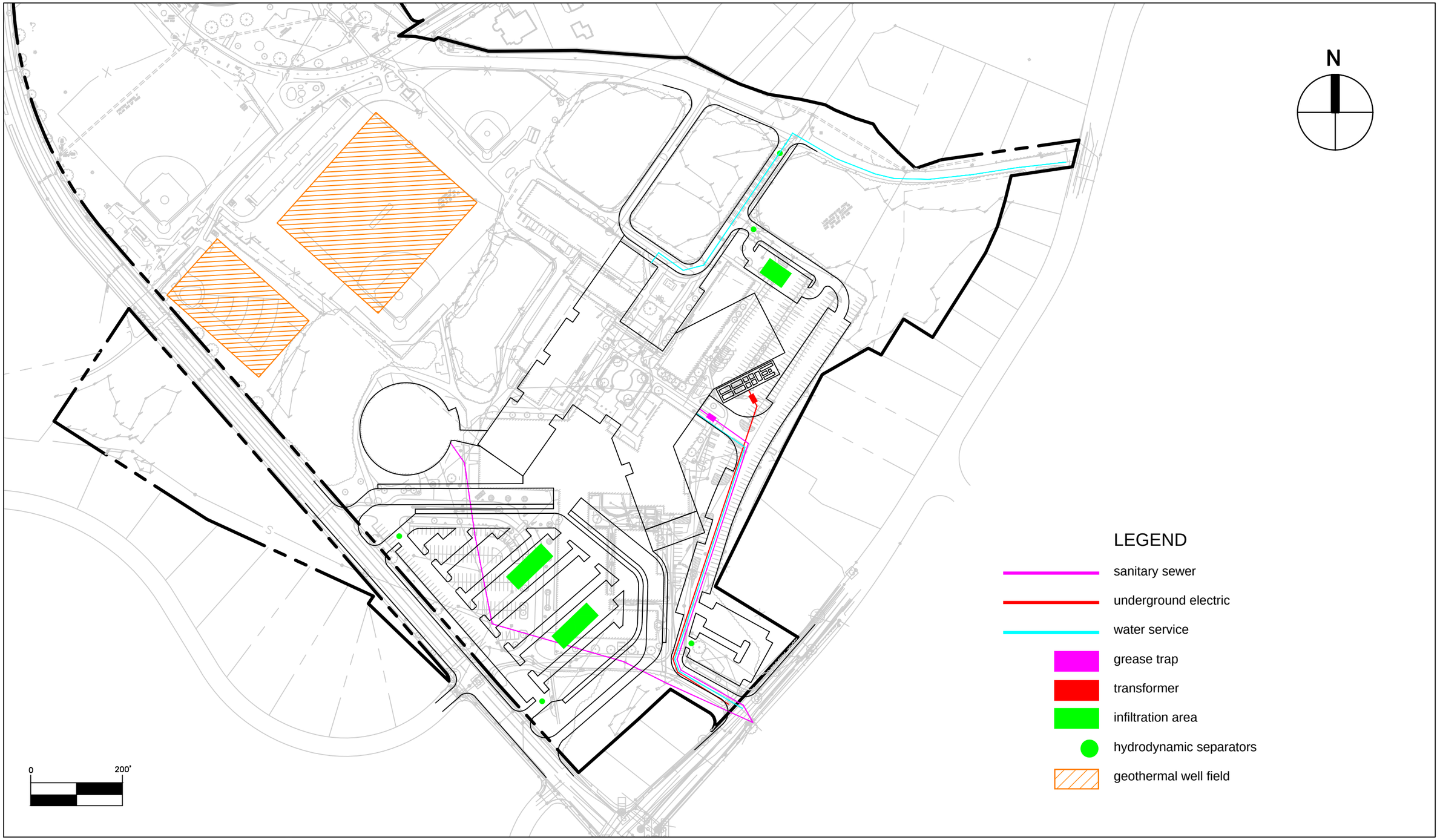
Electrical

D.2 Weave Phased in Place Approach

Since the location of the building will not change during this new construction option, the electrical service can continue to be supplied from Waltham Street. The core building electrical service must remain operational until the new service is constructed and ready for transfer. This will be accomplished by maintaining the existing service transformer, pad-mounted generator, and service entrance equipment in Building D during Phase 1 of construction.

During phase 1, construct new main electrical rooms and emergency electrical rooms in the newly constructed wings. Utility equipment and a new outdoor generator will also be installed on-site to power the new electrical rooms. Once this is complete, Phase 2 will begin, allowing for the decommissioning of the current electrical service, the demolition of existing equipment, and the installation of the new systems.

Phased construction will require on-going operation of portions of the existing electrical systems to support the continued occupancy of existing building areas. Temporary measures will be included to ensure existing areas remain fully operational while construction occurs.



Utility Diagram| Weave (D.2)

Lexington High School Feasibility Study / Town of Lexington

smma

LEXINGTON HIGH SCHOOL

Lexington High School
Possible Permitting Schedule

DRAFT

11/21/2024

Lexington High School		2023		2024												2025												2026											
SMMA #23090		Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
11/21/2024 DRAFT																																						
ARTICLE 97 & MEPA	**Initial Article 97 Local Groundwork and Support (incl. Local boards and State representatives)**													25-Nov																								
	Center Recreation Cmte Working Group Meetings	13-Nov		01/05 01/23			23-Apr																															
	Recreation Committee Support																																					
	Conservation Committee Support																																					
	Project Introduction Meeting with MEPA			2-Jan																																		
	PLPA Initial call					15-Mar																																
	PLPA follow up calls							15-May																														
	PLPA Strategy																																					
	Submission of Legislation through PLPA:																																					
	Documentation of public notification (Town of Lexington)																																					
	Alternatives analysis (SMMA)																																					
	Description of replacement land (Metes and Bounds Surveyor - SMMA/Town of Lexington)																																					
	Appraisals of the properties (Town of Lexington)																																					
	PLPA Portal notification (if necessary)																																					
	Town Meeting Approval of Land Swap																																					
	Town Meeting Package																20-Feb																						
	State Legislative Approval of Article 97 Bill - Prep and Filing																																					
	State Legislative Approval of Article 97 Bill - Filing Jan 20+/-																																					
	MEPA Filing:																																					
	Engage MEPA Consultants, start Traffic Report, GHG, etc.																																					
	Prepare **Expanded** Environmental Notification Form (EENF) Filing, Environmental Justice (EJ) Outreach																						15-Aug																
	EENF Noticed in Environmental Monitor, site visit, public comment, MEPA issues Certificate on the EENF																																					
	Single Environmental Impact Report (SEIR) Filing, Environmental Justice (EJ) Outreach																										15-Jan												
	SEIR Noticed in Environmental Monitor, public comment, MEPA issues Certificate on the SEIR																																					
Wetlands	Abbreviated Notice of Resource Area Delineation (ANRAD) preparation and file with Conservation																																					
	Conservation public hearings Order of Resource Area Delineation (ORAD) received																																					
	Notice of Intent (NOI) preparation and file with Conservation																																					
	Conservation public hearings and Order of Conditions (OoC) received																																					
	(IF >5,000 sf of bordering wetlands are filled):																																					
	Meet with Conservation, New England Regional Office (NERO - Boston)																																					
	Notice of Intent (NOI) preparation and file with Conservation																																					
	Conservation public hearings and Order of Conditions (OoC) received																																					
	Variance review with DEP Northeast Regional Office (NERO)																																					
	DEP 401 Water Quality Certificate with Variance received (not until after MEPA)																																					
	[Federal, parallel to DEP] Army Corps of Engineers (ACOE) 404 Category II Permit																																					

E. Alternatives For Other Functions

Construction Alternatives Including Cost Estimate for other functions.

As part of the analysis during PDP & PSR, the SBC included various other functions in the planning and estimating process. These items were discussed in detail during the PSR and the outcome for inclusion are noted below.

Included in the Project:

Central Office: 20,700 GSF
$ 23,000,000

Field House: 48,000 GSF
$ 41,000,000 (Existing Reno with Addition)

Not included in the Project:

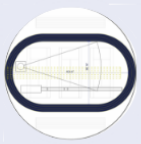
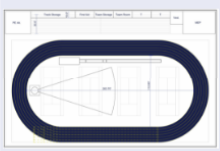
Natatorium: 16,400 GSF
$ 24,000,000

Field House: 34,400 GSF
$ 27,000,000 (Existing Reno)

Field House: 36,000 GSF
$ 38,000,000 (New)

Field House 60,000 GSF
$ 60,000,000 (New)

Field House 72,000 GSF
$ 71,000,000 (New)

	Renovation	Add/Reno	Small	Medium	Large
Project Cost	$27,000,000	$41,000,000	$38,000,000	$60,000,000	$71,000,000
Footprint	34,000 SF	48,000 SF	36,000 SF	60,000 SF	72,000 SF
Track Size	146m	200m	146m	200m	200m
Lane Count	4	4	4	4	6
Bleacher Count	750	1500	750	1500	1500
					

Field House Alternatives & Track Sizes

Field House (34,400 GSF Renovation)

The alternative for renovating existing Building F (the Field House) will include new exterior walls, new energy code compliant windows, new roof including insulation and membrane resting on the existing wood roof structure to remain, and new 5" slab on grade. New finishes will be provided including a 4-lane resilient surface running track, rubber athletic flooring at the weight room and PE space, wall pads, and paint. The existing retractable bleachers will be replaced with new ones, sized for roughly 160 seats. The existing foundations, columns and roof structure are to be preserved.

Field House (48,000 GSF Add/Reno)

The alternative for renovating existing Building F (the Field House) will include new exterior walls, new energy code compliant windows, new roof including insulation and membrane resting on a new steel roof structure (see below), and new slab on grade. New finishes will be provided including a 4-lane resilient surface running track. The existing retractable bleachers will be replaced with two new bleacher banks, sized for roughly 1500 seats total.

For Add/Reno Field House on existing footings:

- Test pits are required to determine existing foundations type and size.
- Demo existing wood dome structure and slab on grade.
- New 5" slab on grade on ground improvement
- New steel-framed superstructure (steel columns, spandrel beams, long-span trusses and 3" acoustic deck)

Field House (All New Alternatives)

For New Field House on new footings:

- New 12" concrete frost wall on 3'x1' continuous footing on ground improvement along perimeter.
- New 5" slab on grade on ground improvement

New steel-framed superstructure (steel columns, spandrel beams, long-span trusses and 3" acoustic deck

F. Evaluations and Conclusions

Throughout the PSR phase, the design team and SBC analyzed and reviewed in detail the opportunities and constraints offered by each of the six alternatives and the code upgrade option. To assist the decision-making process of the School Building Committee, the design team provided a visual summary of the complex array of priorities and considerations being discussed, which was modified at critical stages of the evaluation process. Above is the final version of the Criteria Matrix used by the SBC to support the narrowing of options down to D.2 Weave and C.5b Bloom, then ultimately the selection of C.5b Bloom as the Preferred Solution.

In the Criteria Matrix, the C.5b Bloom Alternative scored highest among all options across all but two categories – Displacement of Fields and Article 97 Implications. Bloom scored higher in the Displacement of Fields category than the other two New Construction alternatives because it was able to be moved east to allow two existing, lighted athletic fields to remain in their current locations - addressing a clear Community desire for maintaining contiguity of the Recreation Department assets to the highest degree possible. And while building on the athletic fields would require a 1-for-1 reconstruction of fields (already included in the project cost analysis) as well as Article 97 land swap legislation, the District is committed to mitigating its impacts on the community.

	In Place			On Fields		
	B.1 Quad	B.4 Figure Eight	**D.2 Weave**	C.1d Branch	C.2b Braid	**C.5b Bloom**
Project Cost	$699 Million	$701 Million	$720 Million	$646 Million	$645 Million	$648 Million
Modulars	32	42	48	0	0	0
Construction Duration (years)	6	6.25	6.5	4.5	4.5	4.5
Displacement of Fields (assumes ground source)	Fair	Fair	Fair	Poor	Poor	Fair
Disruption to Students	Poor	Poor	Fair	Good	Good	Good
Academic Adjacencies	Fair	Fair	Good	Good	Good	Good
Connections to Outdoors	Fair	Fair	Fair	Good	Good	Good
Organizational Flexibility	Fair	Fair	Good	Good	Good	Good
Site Circulation	Fair	Fair	Fair	Fair	Fair	Good
Future Expansion	Fair	Fair	Good	Good	Good	Good
Facilitates Inclusive Interactions	Fair	Fair	Good	Good	Good	Good
Civic Presence	Fair	Fair	Fair	Fair	Good	Good
MEP Systems Design Efficiency	Poor	Poor	Good	Good	Good	Good
Efficiency of Design	Poor	Poor	Good	Good	Good	Good
Article 97 Implications	Fair	Fair	Good	Poor	Poor	Poor
Project Complexity	Poor	Poor	Fair	Good	Good	Good
Delay Potential	Most Likely	Most Likely	Likely	Unlikely	Unlikely	Unlikely
Need for Specialty Swing Space	Fair	Poor	Good	Good	Good	Good

In summary, the School Building Committee cites four major criteria in which the Bloom alternative offers clear advantages:

Educational Excellence – provides optimized educational space and adjacencies to foster high degrees of collaboration and innovation.

Cost Effectiveness – The new construction approach costs significantly less than building in place.

Efficiency of Construction – a reduced timeline has positive impacts on both cost and disruptions.

Minimized Disruption - the Bloom approach, which allows the existing school to operate without interruption, provides a more suitable environment for learning and working during construction.

The following section 3.3.4 Preferred Solution details the new construction option on existing fields -Alternative C5.b (Bloom) – which was chosen by the SBC to move into Schematic Design.