This report section will overview the existing plumbing systems at Maine West High School. The sections will include: domestic cold water distribution, domestic hot water distribution, domestic hot water recirculation, domestic hot water generation, and recommendations. The system replacement recommendation(s) follow each equipment’s existing conditions description. To determine the recommendations, our experience with similar systems and the ASHRAE median service life tables were utilized. Estimated equipment service life, according to the 2015 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Handbook, is defined as the economic life of a system or component, or the amount of time it remains in its original service application. The remaining service life values reported in this document are based off the ASHRAE Equipment Life Expectancy Chart, as well as the ASHRAE Preventative Maintenance Guidebook, which use median years to provide an indication of expected equipment service life. Many factors affect equipment service life and with any average, some systems may have lifetimes far from average. However, these median lifetimes provide a reasonable basis for establishing the remaining useful life of existing systems. Equipment recommended for replacement is categorized into the following four groups:

1. Health Life Safety (2019) – Equipment or systems in this category present health, life, or safety risks to building occupants and may not be up to current code standards. Systems in this category are recommended to be replaced as soon as possible.

2. 1 to 2 Years (2019 to 2020) – Equipment in this category should be considered for replacement within the next couple of years.
Domestic hot water for Maine West is provided by one (1) domestic hot water plant. The plant is located in the mechanical chiller room (replaced in 2017).

DOMESTIC HOT WATER PLANT

The domestic hot water plant in the mechanical chiller room is comprised of three (3) 800-MBH high-efficiency gas-fired domestic hot water heaters and two (2) 500-gallon hot water storage tanks. The water heaters and storage tank and localized piping were replaced in 2017. This plant serves entire building’s domestic hot water load, including the cafeteria conveyor dishwasher. The pictures on the right show the equipment and location of the domestic hot water plant.

No alterations are recommended for this equipment within the scope of this report.

Domestic Hot Water Plant Location

Sample of Existing Galvanized Piping

DOMESTIC COLD WATER AND HOT WATER DISTRIBUTION AND RECIRCULATION

The existing original domestic water is galvanized piping. The existing original isolation valves are stem-operated valves. Hot water return piping is without adequate balancing.

DOMESTIC HOT WATER PLANT

The existing original domestic water piping is galvanized piping in various levels of failure. Galvanized piping in domestic water systems corrodes over time and generates corrosion and rust debris. Corroded pipe walls and pipe debris settle in piping creating restrictions and impacting function of isolation valves, balancing valves, check valves, faucet aerators, shower-head flow restrictions, etc. The debris material settles at horizontal sections of pipe and piping at/near fixtures because the pipe diameter is smaller and the debris carried with water flow.

Pipe fails via mechanisms such as pitting, pin-hole leaks, and loss of pipe thickness at threaded fittings. Additionally, the hot water recirculation path is impacted by corrosion, failed isolation valves, failed check valves, and failed balancing valves. The existing isolation valves may or may not properly operate when isolation is necessary for repair or remodel work.

The existing hot water recirculation path is impacted by corrosion, failed isolation valves, failed check valves, and failed balancing valves. Additionally, Maine West High School has observed that the original hot water return branch piping is without any check valves and without any balancing valves. Therefore, the ability to balance the hot water delivery and return pipe paths is not possible. Balancing the pipe paths permits adjustment of the shorter pipe runs to be equivalent to longer pipe runs. Without the ability to balance, the shorter pipe runs (i.e. path of least resistance) flow away, while the longer pipe runs do not flow any recirculation flow to maintain hot water through the longer circuits (i.e. paths).

1 TO 2 YEAR RECOMMENDATION

Due to the fact that the piping is a) galvanized, b) corroding and generating rust/debris, especially on a water shut-downs, c) isolation valves failed/failing, d) check valves failed/failing or not present, e) balancing valves failed/failing or not present, and f) the resultant impact on the ability to balance the hot-water recirculation the domestic cold water and hot water piping is recommended to be replaced. If replacement is necessary to be phased, the immediate focus should be on replacement of common horizontal piping, isolation valves, check valves, and balancing valves.
Thermostatic mixing valves are intended to limit hot temperature downstream of the valve. Per Code for this project, lavatories and showers require a thermostatic mixing valve either upstream of a group of fixtures or at each fixture.

**THERMOSTATIC MIXING VALVES**

Thermostatic mixing valves are generally present at showers either with an upstream master mixing thermostatic mixing valve or at the shower valve body. Some components such as temperature gauges are non-functional due to age.

Thermostatic mixing valves are generally present at lavatories; in nearly all cases these were retrofitting on original installation or incorporated with remodel scope.

Thermostatic mixing valves present at all lavatories is being addressed already by the school’s building engineering staff currently.

HEALTH LIFE SAFETY – HOWEVER ALREADY BEING ADDRESSED

For basic scald protection, thermostatic mixing valves are required and shall be immediately implemented. However, as stated above, the school’s building engineering staff is already addressing.

---

**Existing Lavatories without TMVs**

**MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION CONDITIONS**

**THERMOSTATIC MIXING VALVES**

Existing Lavatories without TMVs

**PLUMBING COST ESTIMATES**

<table>
<thead>
<tr>
<th>Recommended Replacement Type</th>
<th>Location</th>
<th>System Type</th>
<th>2019 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold/Hot Water Distribution and Circulation</td>
<td>Throughout</td>
<td>New Copper Pipe</td>
<td>$125,000</td>
</tr>
</tbody>
</table>

**Total**

$2,500,000
The table below shows the total estimated replacement costs for each discipline as if they were implemented on the first recommended replacement year. For example, equipment that was recommended for replacement from 2019 to 2021 would have only the 2019 inflated cost shown.

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommended Replacement Timeframe</th>
<th>Existing System Type</th>
<th>2019 Cost</th>
<th>2021 Cost</th>
<th>2024 Cost</th>
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<tbody>
<tr>
<td>Mechanical</td>
<td>2019 - 2020</td>
<td>RTUs</td>
<td>$127,000</td>
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<tr>
<td></td>
<td>2019 - 2020</td>
<td>AHUs</td>
<td>$3,755,000</td>
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<td></td>
<td>2024 - 2028</td>
<td>Exhaust fans</td>
<td>$100,000</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$16,000</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>2024 - 2028</td>
<td>UVs</td>
<td>$4,000,000</td>
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<tr>
<td></td>
<td>2024 - 2028</td>
<td>Exhaust fans</td>
<td>$100,000</td>
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<tr>
<td></td>
<td>2019 - 2020</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2024 - 2028</td>
<td>Pumps</td>
<td>$270,000</td>
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<td></td>
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<tr>
<td>Electrical</td>
<td>2021 - 2023</td>
<td>Unit Substation</td>
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<td></td>
<td>2021 - 2023</td>
<td>Distribution Panelboard</td>
<td>$358,414</td>
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<td></td>
<td>2021 - 2021</td>
<td>Thermal Inspections</td>
<td>$20,000</td>
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<tr>
<td></td>
<td>2021 - 2022</td>
<td>DMF Power Supply</td>
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<td>$10,000</td>
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<td></td>
<td>2021 - 2022</td>
<td>DMF Power Supply</td>
<td></td>
<td>$10,000</td>
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<td></td>
<td>2021 - 2022</td>
<td>DMF Power Supply</td>
<td></td>
<td>$10,000</td>
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<tr>
<td></td>
<td>2019 thru 2024</td>
<td>LED Lighting &amp; Controls</td>
<td>$2,166,667</td>
<td>$2,298,617</td>
<td>$2,511,760</td>
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<tr>
<td></td>
<td>2019 - 2020</td>
<td>Fire Alarm</td>
<td>$1,000,000</td>
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<td></td>
<td>2019 - 2021</td>
<td>Domestic Hot Water Distribution and Circulation</td>
<td>$2,500,000</td>
<td>$2,500,000</td>
<td>$2,500,000</td>
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</tbody>
</table>

**TOTALS:** $8,594,667

Note: See Budget Estimates in Part 3 for total building cost.
## ASHRAE Median Service Life Table

### MAINE WEST HIGH SCHOOL

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Tag</th>
<th>Service</th>
<th>Approximate Unit Age as of 2018 (Years)</th>
<th>ASHRAE Median Service Life (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pumps</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CWP-2</td>
<td>D-Bin Condenser</td>
<td>1</td>
<td>25</td>
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<tr>
<td>CWP-3</td>
<td>D-Bin Condenser</td>
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<td>25</td>
<td></td>
</tr>
<tr>
<td>CWP-9</td>
<td>Primary High Loop</td>
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</tr>
<tr>
<td>P-W-2</td>
<td>Primary High Loop</td>
<td>1</td>
<td>25</td>
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</tr>
<tr>
<td>MWP-7</td>
<td>O-Wing Loop</td>
<td>23</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>MWP-8</td>
<td>O-Wing Loop</td>
<td>23</td>
<td>25</td>
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<tr>
<td><strong>Air Handling Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHU S-12</td>
<td>A-Wing Gymnasium</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU S-11</td>
<td>B-Wing Gymnasium</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU S-13</td>
<td>C-Wing Gymnasium</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AH-2</td>
<td>North Cafeteria</td>
<td>46</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AH-3</td>
<td>South Cafeteria</td>
<td>46</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU H-81</td>
<td>East End Track</td>
<td>5</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU H-82</td>
<td>E-Wing 1st Floor</td>
<td>53</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU H-86</td>
<td>E-Wing 2nd Floor</td>
<td>53</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU H-83</td>
<td>H-Wing</td>
<td>16</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU H-2</td>
<td>H-Wing</td>
<td>16</td>
<td>30</td>
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<tr>
<td><strong>Unit Ventilators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDU-1</td>
<td>Pool</td>
<td>1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>FDU-2</td>
<td>Pool</td>
<td>1</td>
<td>15</td>
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</tr>
<tr>
<td>AHU-S1</td>
<td>Auditorium</td>
<td>1</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU-S2</td>
<td>Auditorium</td>
<td>1</td>
<td>30</td>
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</tr>
</tbody>
</table>

### Roof Top Units

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Tag</th>
<th>Service</th>
<th>Approximate Unit Age as of 2018 (Years)</th>
<th>ASHRAE Median Service Life (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R209</td>
<td>Classroom A200 and Offices</td>
<td>34</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RTU A122</td>
<td>Room A 202 &amp; Offices</td>
<td>26</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RTU A124</td>
<td>Room A 212 &amp; Offices</td>
<td>26</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RTU B1</td>
<td>B-Wing Conference Room</td>
<td>26</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RTU B201</td>
<td>B-200 - Susp Fire</td>
<td>19</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RTU B202</td>
<td>B-222 - Varsity Gym</td>
<td>19</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-M4</td>
<td>West half of M-Building</td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-SW</td>
<td>A-Wing Basement Offices</td>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-11</td>
<td>West of House Auditorium</td>
<td>16</td>
<td>15</td>
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</tr>
<tr>
<td>JT-202</td>
<td>Auto shop lab</td>
<td>1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-1</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-2</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-3</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-4</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-5</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>JT-6</td>
<td>E-Wing</td>
<td>4</td>
<td>15</td>
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<tr>
<td>JT-R211</td>
<td>L-Wing</td>
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<td>25</td>
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</tr>
<tr>
<td>FDU-1</td>
<td>Pool</td>
<td>1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>AHU-S1</td>
<td>Auditorium</td>
<td>1</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>AHU-S2</td>
<td>Auditorium</td>
<td>1</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Device Types and Service Areas:**

- **Pumps:** D-Bin Condenser, Primary High Loop
- **Air Handling Units:** A-Wing Gymnasium, B-Wing Gymnasium, C-Wing Gymnasium, North Cafeteria, South Cafeteria, East End Track, E-Wing 1st Floor, E-Wing 2nd Floor, H-Wing, H-Wing, Classroom UVs, Pool, Auditorium, Auditorium
- **Unit Ventilators:** Pool, Auditorium
- **Roof Top Units:** Classroom A200 and Offices, Room A 202 & Offices, Room A 212 & Offices, B-Wing Conference Room, B-200 - Susp Fire, B-222 - Varsity Gym
- **Unit Ventilators:** Classroom UVs, Pool, Auditorium
PART 3
RECOMMENDATIONS
- CONSENSUS APPROACHES
- BUDGET ESTIMATES
CONSENSUS APPROACHES

- APPROACH A (COMPREHENSIVE)
- APPROACH B (SCALED-BACK)
BUILDING SPECIFIC CHALLENGES

Create secured front entrance
Modernize dated footprint / spaces for active learning styles & program evolution (the arts/athletics/special education)
Resolve accessibility issues through updating multiple additions

DEPARTMENT LEGEND

- Art activities
- Band
- Choir
- Competitive Sports
- Dance / Theatre
- English
- Fine Arts
- Foreign Language / ESL
- Guidance
- Mathematics
- Music / Fine Arts
- Science
- Special Education
- Social Science

Areas of New Construction
Areas of Light Renovation
Areas of Medium/Heavy Renovation

RECOMMENDATIONS

EXISTING FLOOR PLAN

MAINE EAST HIGH SCHOOL
RECOMMENDATIONS

APPROACH B (SCALED-BACK)

MAINE EAST HIGH SCHOOL

First Floor Plan

AUDITORIUM

FIELD HOUSE

POOL

STUDENT SERVICES

SPECIAL ED.

MAIN ENTRANCE

STUDENT / EVENT ENTRANCE

STUDENT / EVENT ENTRANCE

STUDENT / EVENT ENTRANCE

RECEIVING COURTYARD

COURTYARD

SERVERY

KITCHEN

EVENT ENTRANCE

ELEV.

CTE

CTE

TRAINERS /

STORAGE

WOMEN'S LOCKER ROOM

MEN'S LOCKER ROOM

GYMNASIUM

DINING COMMONS

EXCLUDES:

• Wash upgrades in classrooms (paint / flooring / casework / doors)
• Professional development area / entrepreneurial center
• Auditorium & pool upgrades

INCLUDES:

• Wash upgrades in classrooms (paint / flooring / casework / doors)
• Professional development area / entrepreneurial center
• Auditorium & pool upgrades

DEPARTMENT LEGEND

- Athletic activities
- Mathematics
- Cafeteria
- Circulation
- CTE
- English
- Fine Arts
- Foreign Language / ELL
- Special Education
- Social Science
- Special Ed. / Transition
- Student Services
- Tech. / Library
- Vacant
- Student Activities

Building Support

Areas of New Construction

Areas of Light Renovation

Areas of Medium/Heavy Renovation

Areas of Heavy Renovation

RECOMMENDATIONS

APPROACH B (SCALED-BACK)

MAINE EAST HIGH SCHOOL

Second Floor Plan

LIBRARY

VISUAL ARTS

DANCE

FITNESS /

WEIGHTS

WRESTLING

VISUAL ARTS

RECOMMENDATIONS

APPROACH B (SCALED-BACK)

MAINE EAST HIGH SCHOOL

Third Floor Plan

VISUAL ARTS

FITNESS /

WEIGHTS

WRESTLING

VISUAL ARTS

RECOMMENDATIONS

APPROACH B (SCALED-BACK)

MAINE EAST HIGH SCHOOL

Lower Floor Plan

LIBRARY

VISUAL ARTS

DANCE

FITNESS /

WEIGHTS

WRESTLING

VISUAL ARTS
RECOMMENDATIONS

EXISTING FLOOR PLAN
MAINE SOUTH HIGH SCHOOL

BUILDING SPECIFIC CHALLENGES
Provide a more secure, visible and welcoming front entrance
Modernize efficient footprint / spaces for active learning styles & program evolution (fine arts/athletics/special education)
Establish secured circulation between remote parts of the facility

DEPARTMENT LEGEND
- Administration
- Mathematics
- Cafeteria
- Circulation
- C.T.E.
- English
- Fine Arts
- Foreign Language / ELL
- Interior
- Mathematics
- MFL / MIE/ELL
- Science
- Shared Spaces
- Special Services
- Special Ed / Transfer
- Student Activities
- Student Services
- Tech / Library
- Itinerant
- Student Services
- Tech / Library
- Vacant

RECOMMENDATIONS
EXISTING FLOOR PLAN
MAINE SOUTH HIGH SCHOOL

BUILDING SPECIFIC CHALLENGES
Provide a more secure, visible and welcoming front entrance
Modernize efficient footprint / spaces for active learning styles & program evolution (fine arts/athletics/special education)
Establish secured circulation between remote parts of the facility

DEPARTMENT LEGEND
- Administration
- Mathematics
- Cafeteria
- Circulation
- C.T.E.
- English
- Fine Arts
- Foreign Language / ELL
- Interior
- Mathematics
- MFL / MIE/ELL
- Science
- Shared Spaces
- Special Services
- Special Ed / Transfer
- Student Activities
- Student Services
- Tech / Library
- Itinerant
- Student Services
- Tech / Library
- Vacant

EXISTING FLOOR PLAN
MAINE SOUTH HIGH SCHOOL

BUILDING SPECIFIC CHALLENGES
Provide a more secure, visible and welcoming front entrance
Modernize efficient footprint / spaces for active learning styles & program evolution (fine arts/athletics/special education)
Establish secured circulation between remote parts of the facility

DEPARTMENT LEGEND
- Administration
- Mathematics
- Cafeteria
- Circulation
- C.T.E.
- English
- Fine Arts
- Foreign Language / ELL
- Interior
- Mathematics
- MFL / MIE/ELL
- Science
- Shared Spaces
- Special Services
- Special Ed / Transfer
- Student Activities
- Student Services
- Tech / Library
- Itinerant
- Student Services
- Tech / Library
- Vacant
BUILDING SPECIFIC CHALLENGES:

- Create secured front entrance
- Modernize dated footprint/spaces for active learning style & program evolution (fine arts/athletics/special education)
- Consolidate athletic/PE spaces to max. resources & increase after-hour security

DEPARTMENT LEGEND

- Administration
- Mathematics
- Circulation
- CTE
- Fine Arts
- Foreign Language / ELL
- Visual
- Mathematics
- IE / Autistics
- Science
- Shared Spaces
- Visual
- Special Ed / Transfer
- Modern Exclusives
- Student Services
- Arts / Library
- Building Support
- Vacant

Areas of New Construction
Areas of Light Renovation
Areas of Medium/Heavy Renovation

EXISTING FLOOR PLAN
MAINE WEST HIGH SCHOOL
RECOMMENDATIONS
APPROACH B (SCALED-BACK)
MAINE WEST HIGH SCHOOL

EXCLUDES:
• Basic upgrades in classrooms (paint / flooring / casework / doors)
• Fully developed commons
• Selected core instruction remodeling
• Multipurpose / pool upgrades

N.T.S.
• Finish upgrades in classrooms (paint / flooring / casework / doors)
• Fully developed commons
• Selected core instruction remodeling
• Multipurpose / pool upgrades

FACILITIES MASTER PLAN | MAY 2018 | 245
# Recommendations

## Facilities Master Plan - May 2018

### Budget Estimate

#### Maine East High School

<table>
<thead>
<tr>
<th>Category</th>
<th>Initial Cost Estimate</th>
<th>Summary Cost Estimate</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Renovation</td>
<td>$8,819,939</td>
<td>$11,340,743</td>
<td>$2,520,804</td>
</tr>
</tbody>
</table>

#### Lighting Lighting

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<tr>
<th>Item</th>
<th>Cost Estimate</th>
<th>Change</th>
</tr>
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#### Budget Totals

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### Additional Information

- **Light Renovation**
  - cinemas, auditorium, etc.
  - $8,819,939
  - $11,340,743
  - $2,520,804

- **Lighting**
  - cinemas, etc.
  - $11,340,743
  - $8,819,939

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**Total Budget**

- $11,340,743

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**Total**

- $11,340,743

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End High School - Grand Total Approach A

- $81,500,000

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End High School - Grand Total Approach B

- $53,200,000
A

COMPREHENSIVE

East: $81,900,000
South: $75,500,000
West: $83,300,000
TOTAL: $240,700,000

B

SCALED-BACK

East: $59,200,000
South: $51,600,000
West: $61,000,000
TOTAL: $171,800,000