# Proposed – Southwest Regional Chilled Water Plant, CP23037

**01/06/2024**

Director of Planning, Design and Construction (PDC):
John LeFevre, P.E.
lefevr20@msu.edu
PH#: 517-256-6447

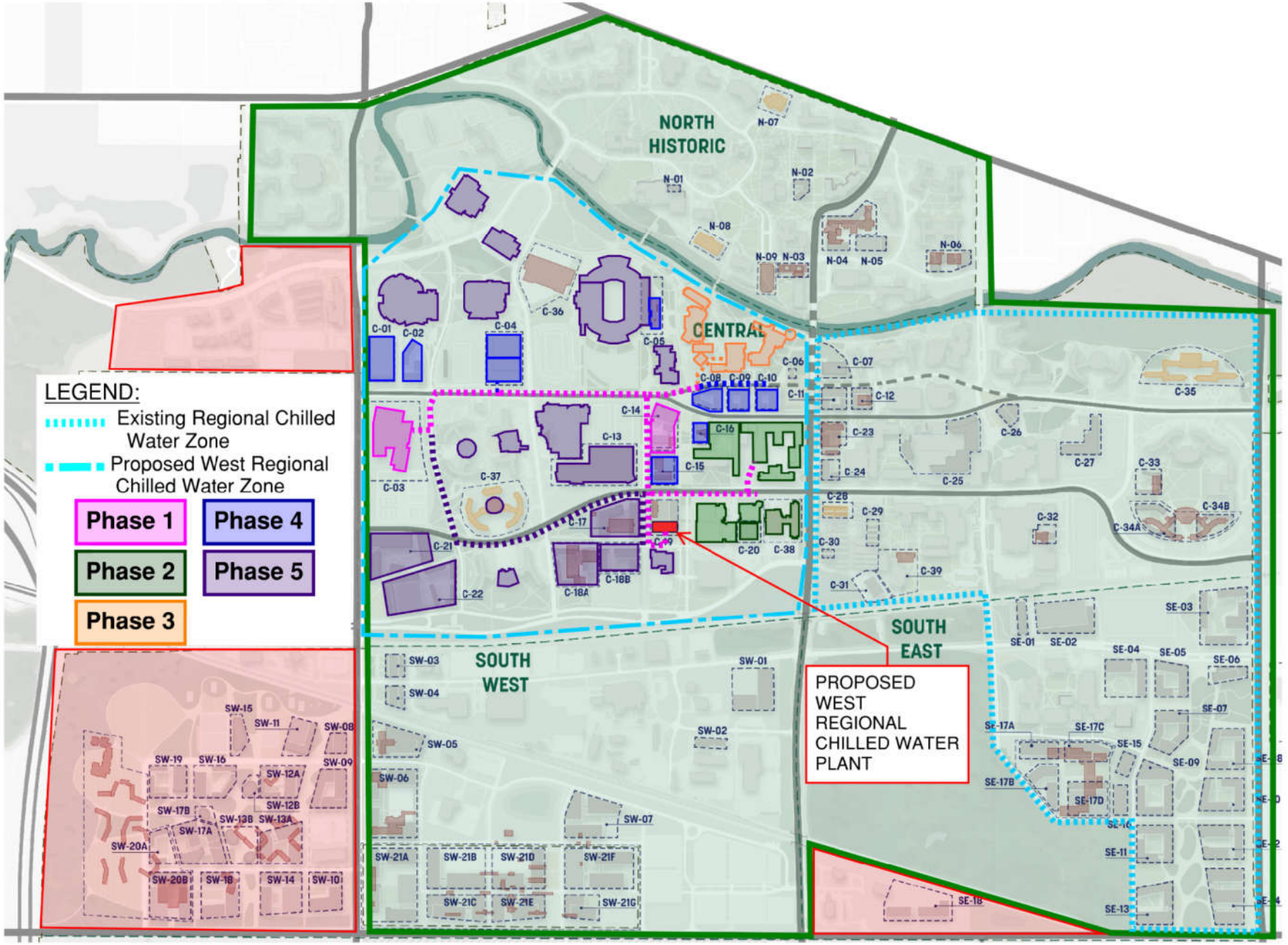
Project Manager:
M. Scott Gardner, P.E.
gardne21@msu.edu
PH#: 517-432-0782

# Opportunity:

The proposed West Regional Chilled Water Plant (with future expansion) will provide cooling to Engineering Digital Imaging Center, existing facilities with failing chillers (Anthony, Food Science, Erickson, Wells,& International Center), and provide future cooling capacity for anticipated Building Opportunities in the Land Use Master Plan Framework.

Regional plants provide a cost-effective platform to deliver energy savings and sustainability technologies across a large geographic regions.

# West Regional Chilled Water Plant - Phases



# Regional Plant Advantages:

- **Greater opportunity for significant energy savings and meeting sustainability goals.**
  - Can leverage Thermal Storage to reduce peak demands.
  - "Free" Winter Chilled Water Source - The proposed regional chilled water plant would provide winter chilled water (process cooling) service via a waterside economizer cycle using the plant's cooling towers and plate heat exchangers.
  - Provides a platform for other energy technologies to be deployed.
  - Regional Plants play a major role in achieving sustainability goals.
  - Regional Plant approach will play a key role in balancing the electric and thermal loads at the Power Plant allowing the plant to operate at optimal performance (reducing our carbon footprint).
- **Diversity among connected loads and strategic load balancing thereby reducing the tonnage of chiller capacity needed.**
  - Allows chillers to be fully loaded for optimal energy efficiency while providing N+1 redundancy versus running equipment partially loaded conditions.
- **Allows operations and maintenance to be performed without disruption of service.**
  - When multiple chillers are in series, one can be removed from service for repair or replacement without affecting the connected load.
  - Maintenance can be completed centrally, away form teaching and research functions to avoid disruption. I.E., cooling tower plume, chemical handling, vibration, truck deliveries, noise, etc.
  - Regional Plants require less equipment (chillers, cooling towers, pumps, and electrical distribution equipment) to provide the same level of cooling capacity and redundancy.
- **Capital costs are more economical than numerous individual localized chillers.**
  - Regional Plant require less equipment (chiller and cooling tower capacity, pumps, electrical equipment, etc..) while maintaining N+1 reliability.
  - Regional Plants require less Utility Infrastructure than de-centralized (individual Buildings/Additions) system approach.
  - Reduces the required mechanical and electrical room space in future buildings and additions (approximately 43,000 SF for this region).

# Advantages related to Technologies:

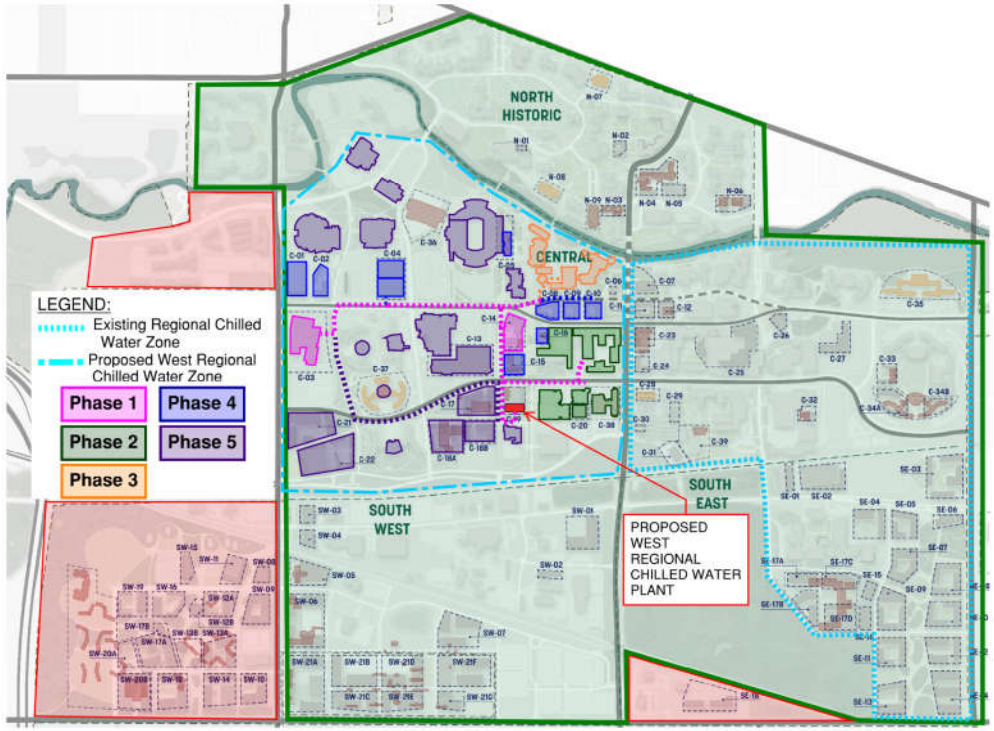
- The steam/electric option for the regional chilled water plant provides the following additional advantages:
  - STEAM-SOURCED COOLING - This option provides the most cost effective and practical way to provide steam-sourced cooling to the campus if the long term campus utility plan includes the continued use of centrally distributed steam.
  - LESS ELECTRCAL DISTRIBUTION – Greatly reduced campus electrical distribution requirements than with the all-electric regional chilled water plant option or the decentralized option, freeing available primary circuits for campus building growth. Makes use of existing campus steam distribution system to power 72% of the regional plant's chiller capacity while also helping to balance the steam versus electric load on the central power plant.
  - REDUCED ELECTRIC DEMAND - Reduces cooling-related campus electrical demand by 10 MW as compared to the all-electric regional chilled water plant option, and by 11 MW as compared to the decentralized option.
  - ELECTRIC LOAD SHEDDING CAPABILITY - A standby 2,800 ton chiller is included with the initial phase and onward, which could be energized in place of one of the equal capacity electric chillers in the plant to quickly reduce campus electric demand by 1.7 MW without reducing cooling service.
  - STEAM AND ELECTRIC LOAD BALANCE - Allows switching between steam and electric chillers, a potential benefit to the efficiency of the campus power plant and its steam and electric distribution systems.
  - EFFICIENT STEAM USE - The proposed steam turbine driven chillers reduce steam use by 50% as compared to providing an equivalent amount of cooling from steam absorption chillers.

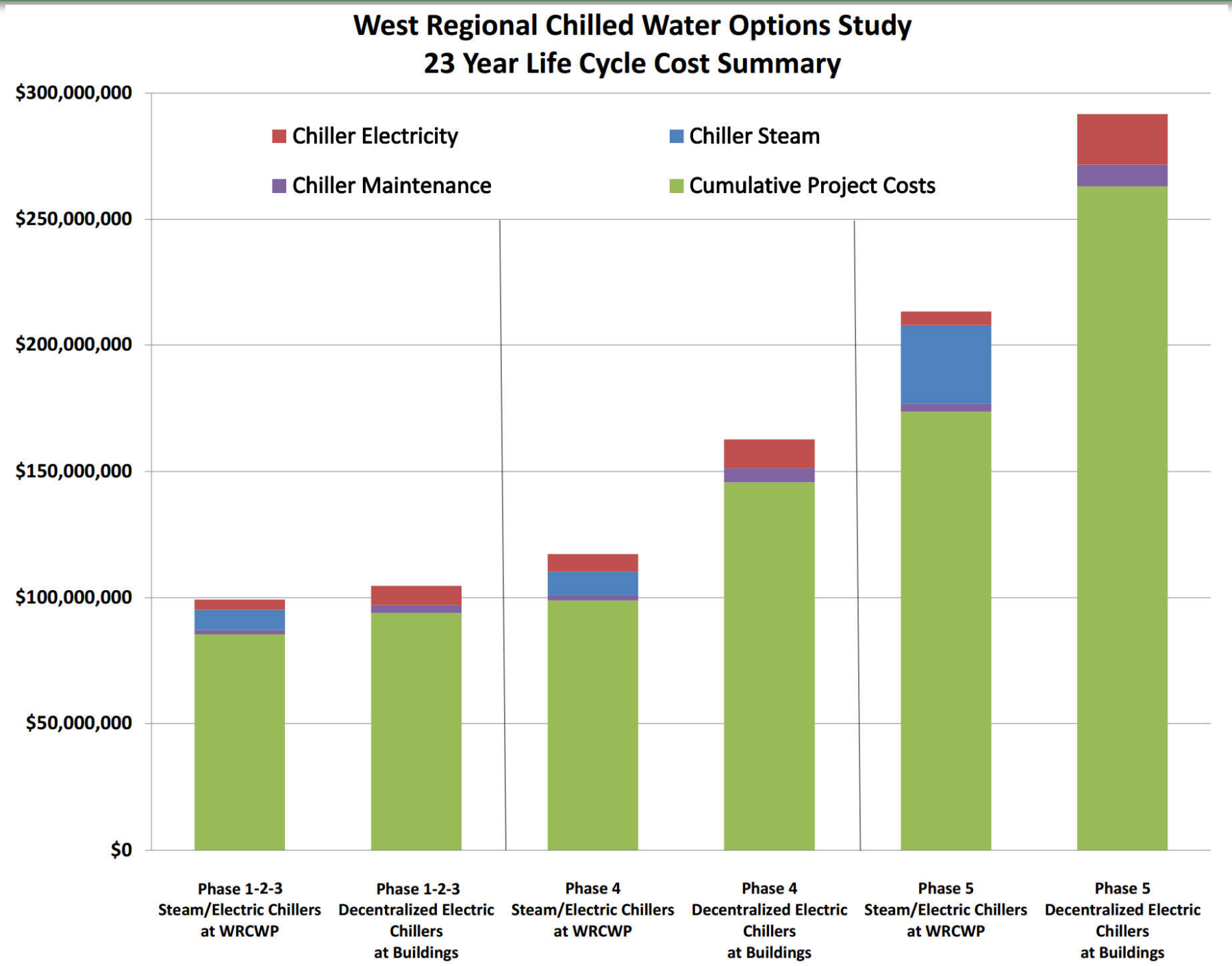
- The all-electric option for the regional chilled water plant provides the following additional advantages:
  - AVOIDS STEAM-SOURCED COOLING - This option avoids steam-sourced cooling if the long term campus utility plan were to discontinue the use of centrally distributed steam.
  - REDUCED ELECTRIC DEMAND - Reduces cooling-related campus electrical demand by 1 MW as

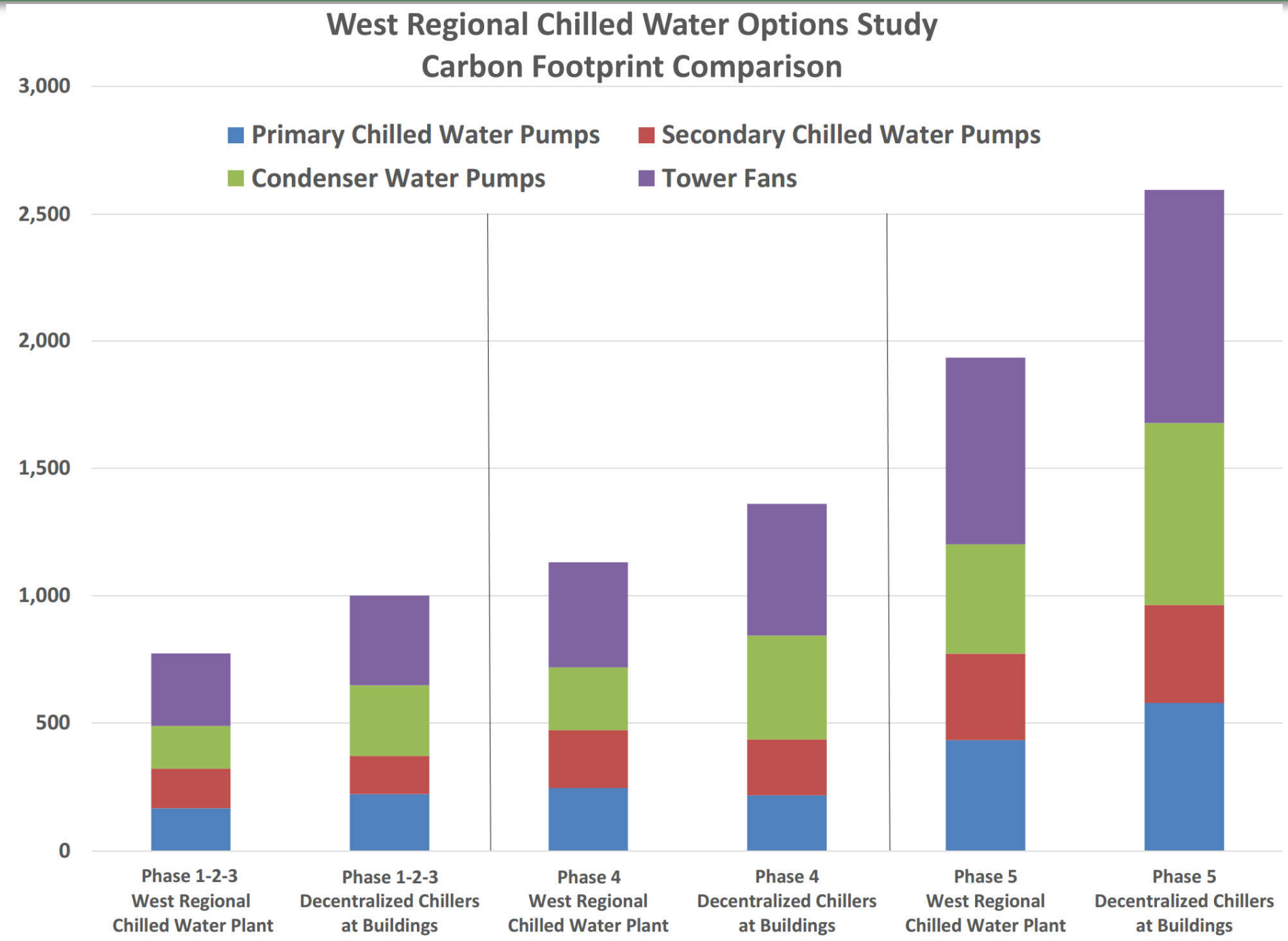
# MSU West Regional Chilled Water Plant Study
# Cumulative Project Cost by Phase (2025 Dollars)

| | | Regional Plant | | | | | Decentralized Chillers at Buildings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Building Net GSF Served | Total Installed Cooling (N+1) | Cooling Tonage (N) | Steam/Electric Chillers at West Regional Chilled Water Plant | Steam (lbs/hr) | Electric (kW) | Decentralized Chillers at Buildings | Steam (lbs/hr) | Electric (kW) |
| Phase 1-2-3 | 2,730,487 | 11,800 | 9,000 | $ 85,557,838 | (56,000) | 3,818 | $ 94,059,106 | (114,600) | 6,850 |
| Phase 4 | 4,180,687 | 14,600 | 11,800 | $ 98,958,926 | (56,600) | 5,914 | $ 145,697,004 | (114,600) | 12,650 |
| Phase 5 | 7,907,683 | 23,400 | 20,600 | $ 173,599,862 | 60,400 | 7,884 | $ 262,977,615 | (114,600) | 19,250 |

Note: **The decentralized approach requires 3 new circuit pairs from the Power Plant** (including a dedicated circuit pair to EDI Center). Additionally, the decentralized option have major second order implications to the Power Plant and Electrical Distribution System.



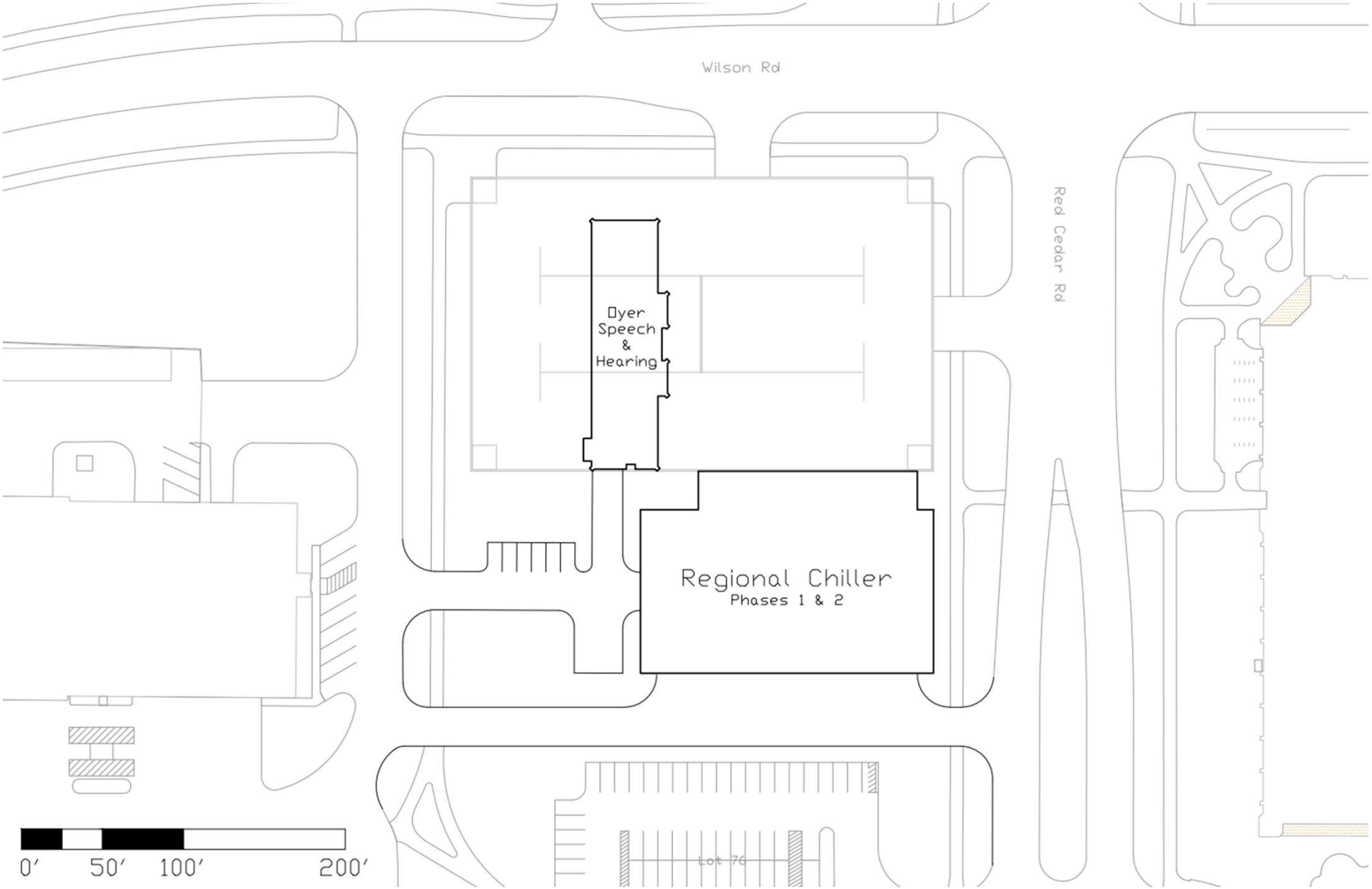

West Regional Chilled Water Options Study
23 Year Life Cycle Cost Summary
$300,000,000
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$0
Chiller Electricity
Chiller Steam
Chiller Maintenance
Cumulative Project Costs
Phase 1-2-3 Steam/Electric Chillers at WRCWP
Phase 1-2-3 Decentralized Electric Chillers at Buildings
Phase 4 Steam/Electric Chillers at WRCWP
Phase 4 Decentralized Electric Chillers at Buildings
Phase 5 Steam/Electric Chillers at WRCWP
Phase 5 Decentralized Electric Chillers at Buildings


West Regional Chilled Water Options Study
Carbon Footprint Comparison
3,000
2,500
2,000
1,500
1,000
500
0
Primary Chilled Water Pumps
Secondary Chilled Water Pumps
Condenser Water Pumps
Tower Fans
Phase 1-2-3 West Regional Chilled Water Plant
Phase 1-2-3 Decentralized Chillers at Buildings
Phase 4 West Regional Chilled Water Plant
Phase 4 Decentralized Chillers at Buildings
Phase 5 West Regional Chilled Water Plant
Phase 5 Decentralized Chillers at Buildings

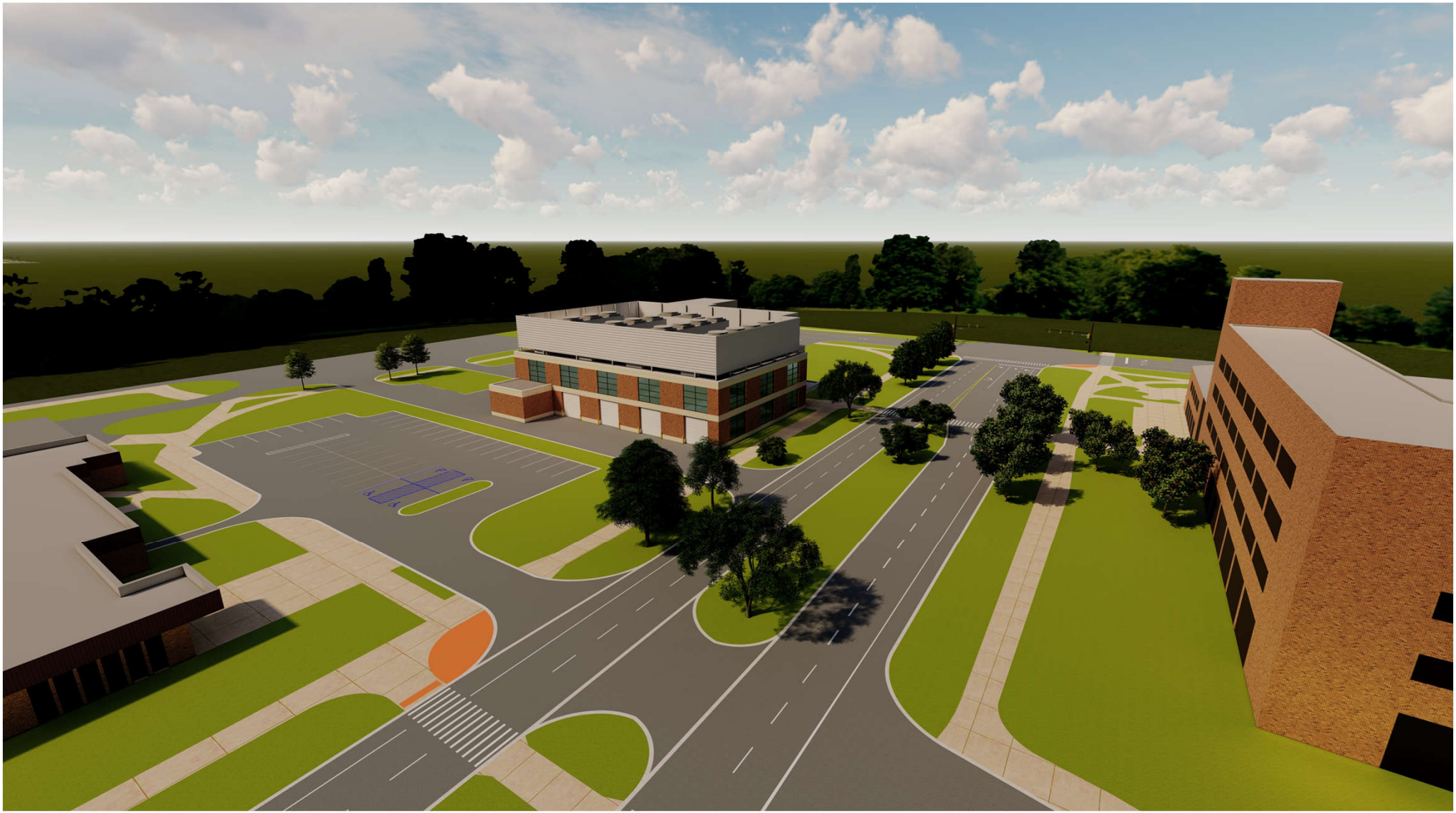
# Summary:

- Investment for a regional plant is $8.5 M less than anticipated decentralized investment for Facilities outlined in Phase 1-2-3.
- Investment offset by approx. $18 M from stand alone project chillers that are slated to be deployed currently (EDI Center, Packaging and Student Rec.)
- Retires approximately $45.6M (Anthony/Food Sci. @$20.3M, International Center @$12.8M, and Wells Hall @$12.5M) of Capital Renewal for chillers which need to be replaced within the next 5 years.
- The 23 Year Life Cycle Cost Analysis for this regional plant vs decentralized cooling will save approximately the following:
  - Phase 1-2-3: $ 5.4 M
  - Phase 4: $45.3 M
  - Phase 5: $78.1 M
- Central Chilled Water Plants require approximately 35% less equipment than a decentralized plants and allow the equipment to be staged for optimum performance, thus significantly reducing the amount of energy required and minimizing the embodied carbon footprint for primary equipment.
- The proposed Regional Chilled Water Plant creates a platform to save significant amounts of energy, allows other energy technology to be deployed regionally (Thermal Storage, etc.) to meet sustainability goals, reduces overall cost of operations and maintenance.
- Regional Plant's **significantly** reduce the amount of Utility Infrastructure Distribution Systems (electric, steam, water, etc.) required versus decentralized thermal (cooling and/or heating) approaches.
- The proposed regional plant is being coordinated with Major Capital Projects, and the Campus Land Use and Utility Infrastructure Plans.

# Site Planimetric View

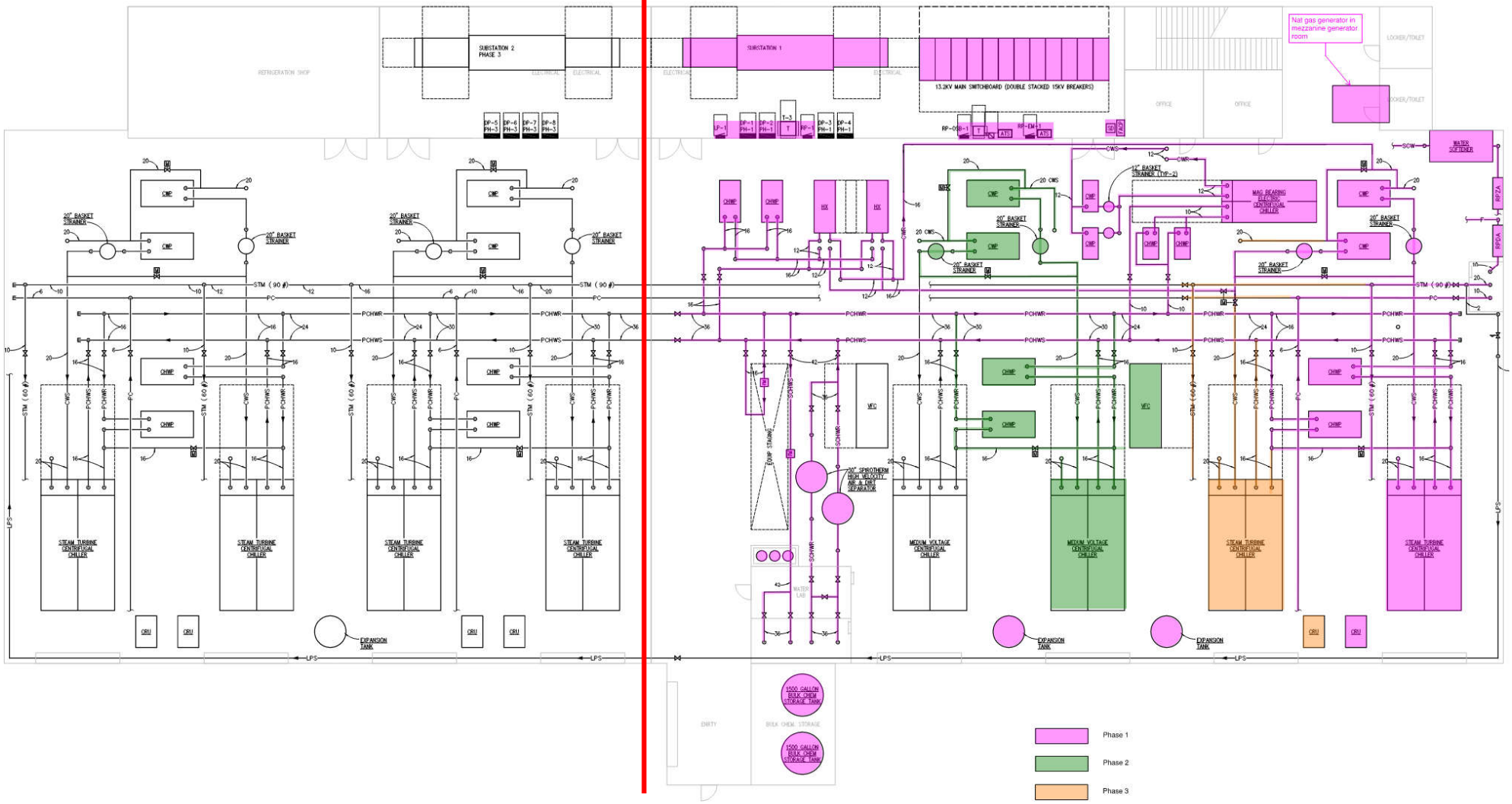


# Phase 1-2: Looking from the Southeast



# Proposed Building Floor Plan

Phase 5 (Future) → Phase 1-2-3-4



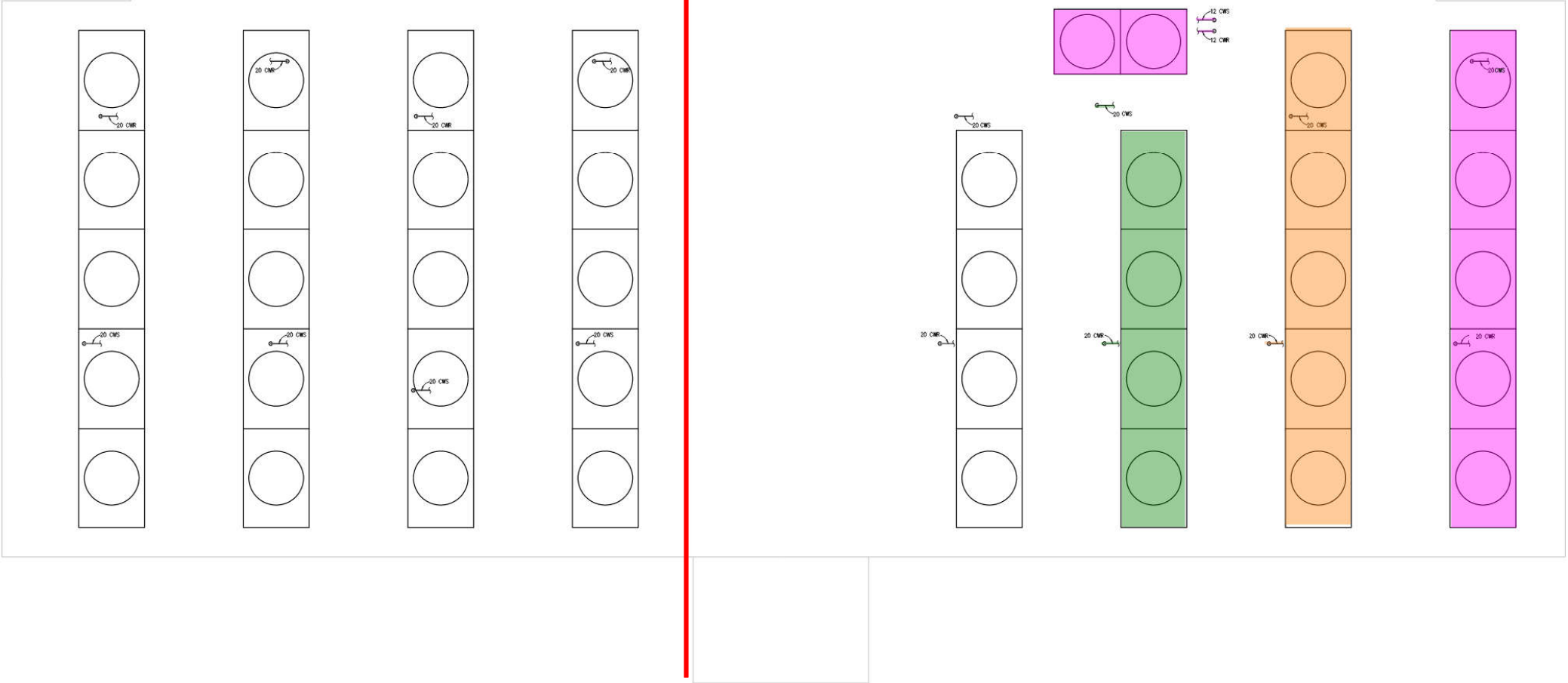

FIRST FLOOR PLAN – STEAM & ELECTRIC BLEND OPTION
1/8" = 1'-0"

PETER BASSO ASSOCIATES
12-15-2023

# Proposed Building Roof Plan

Phase 5 (Future)

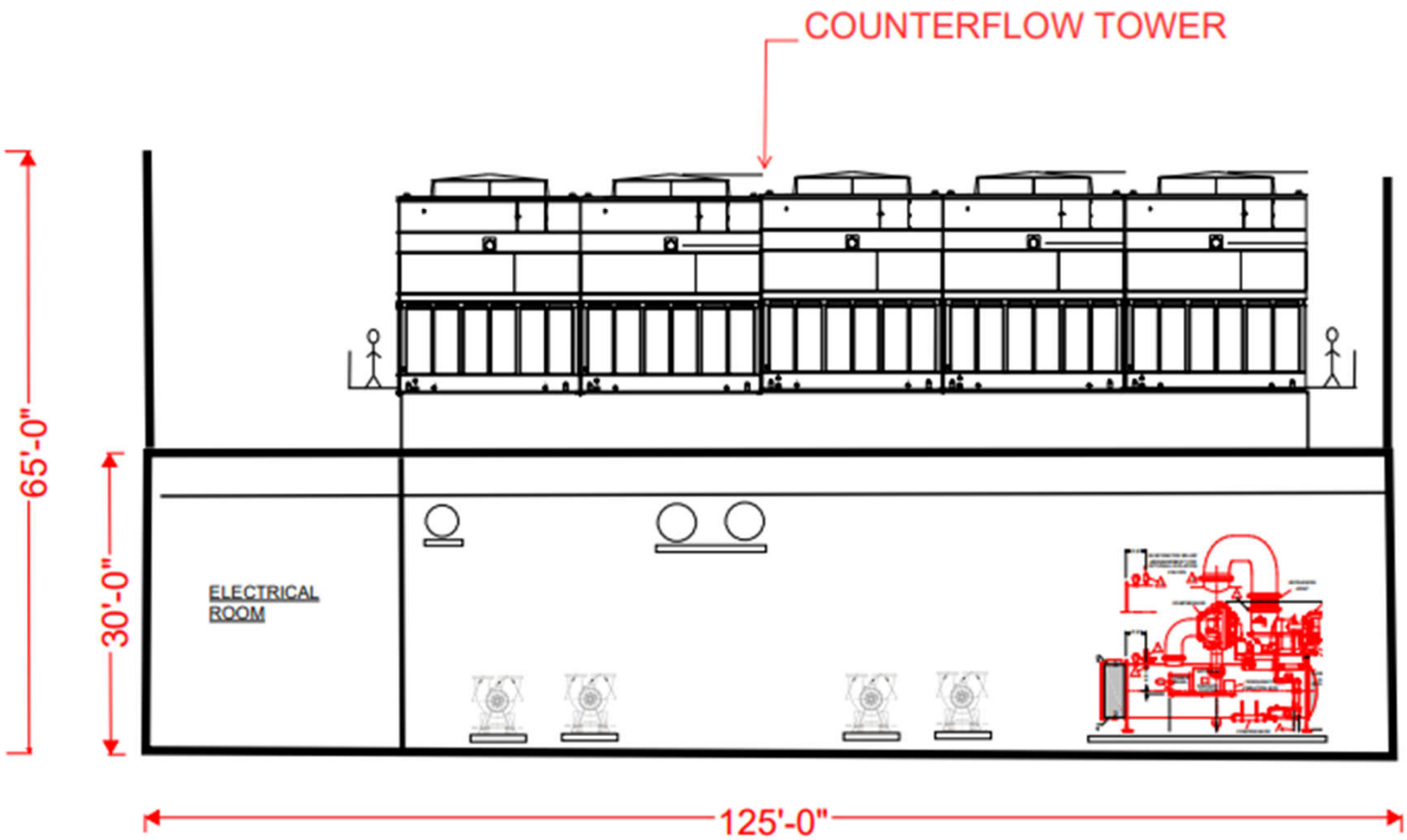
Phase 1-2-3-4



ROOF PLAN
1/8" = 1'-0"

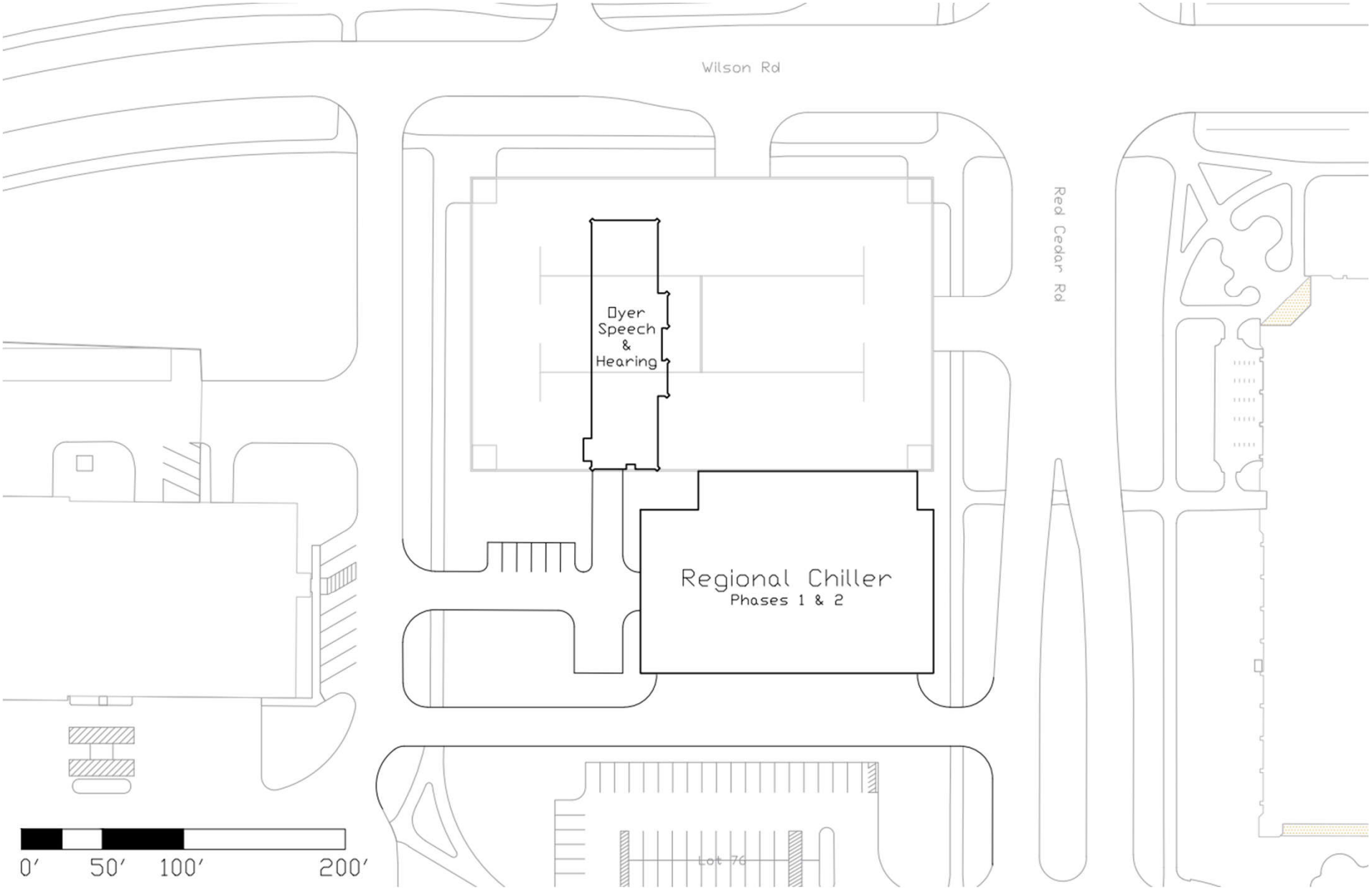
PETER BASSO ASSOCIATES
2023-09-15

# Proposed Building Cross Section

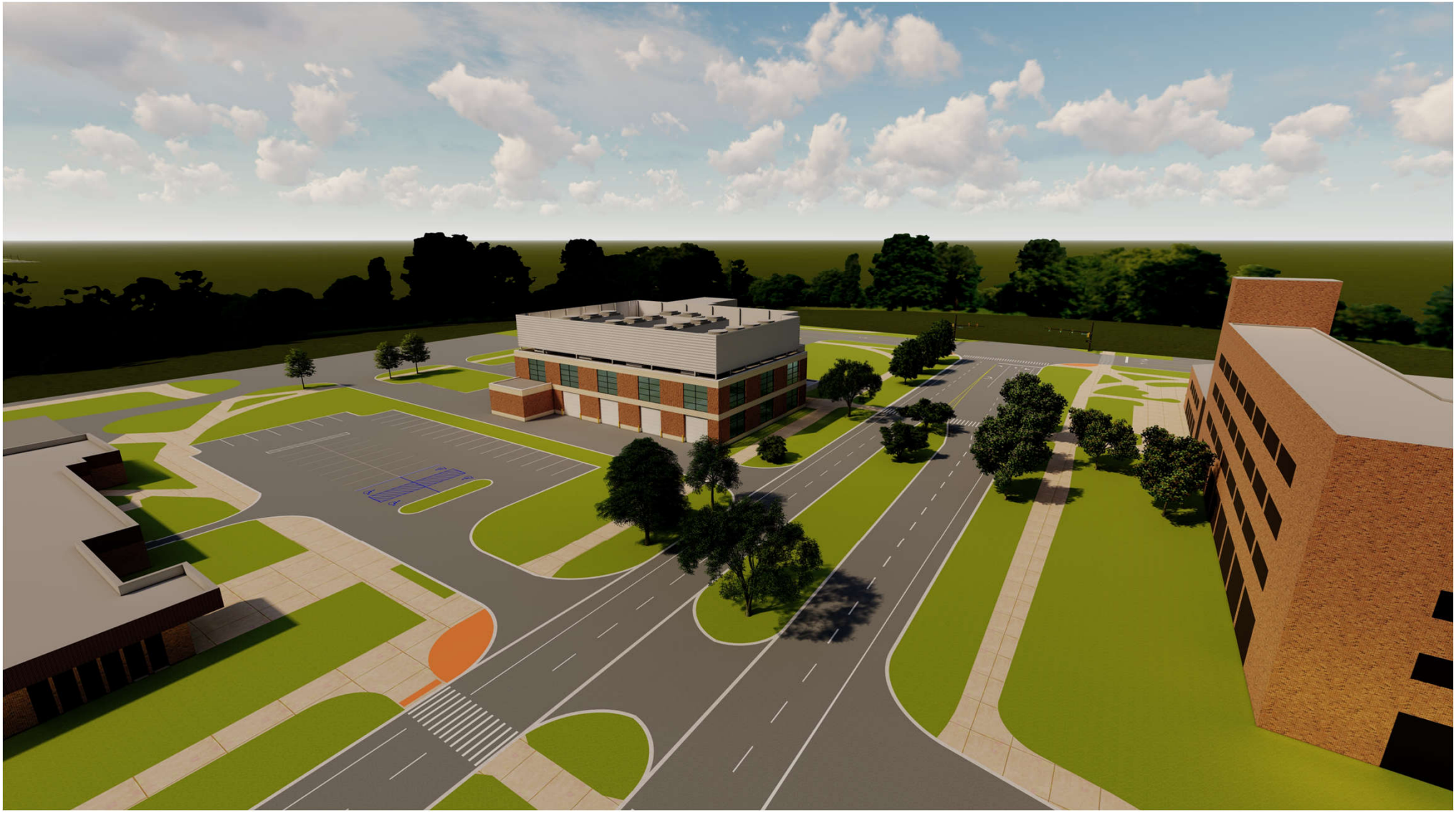



SECTION

# Site Planametric View

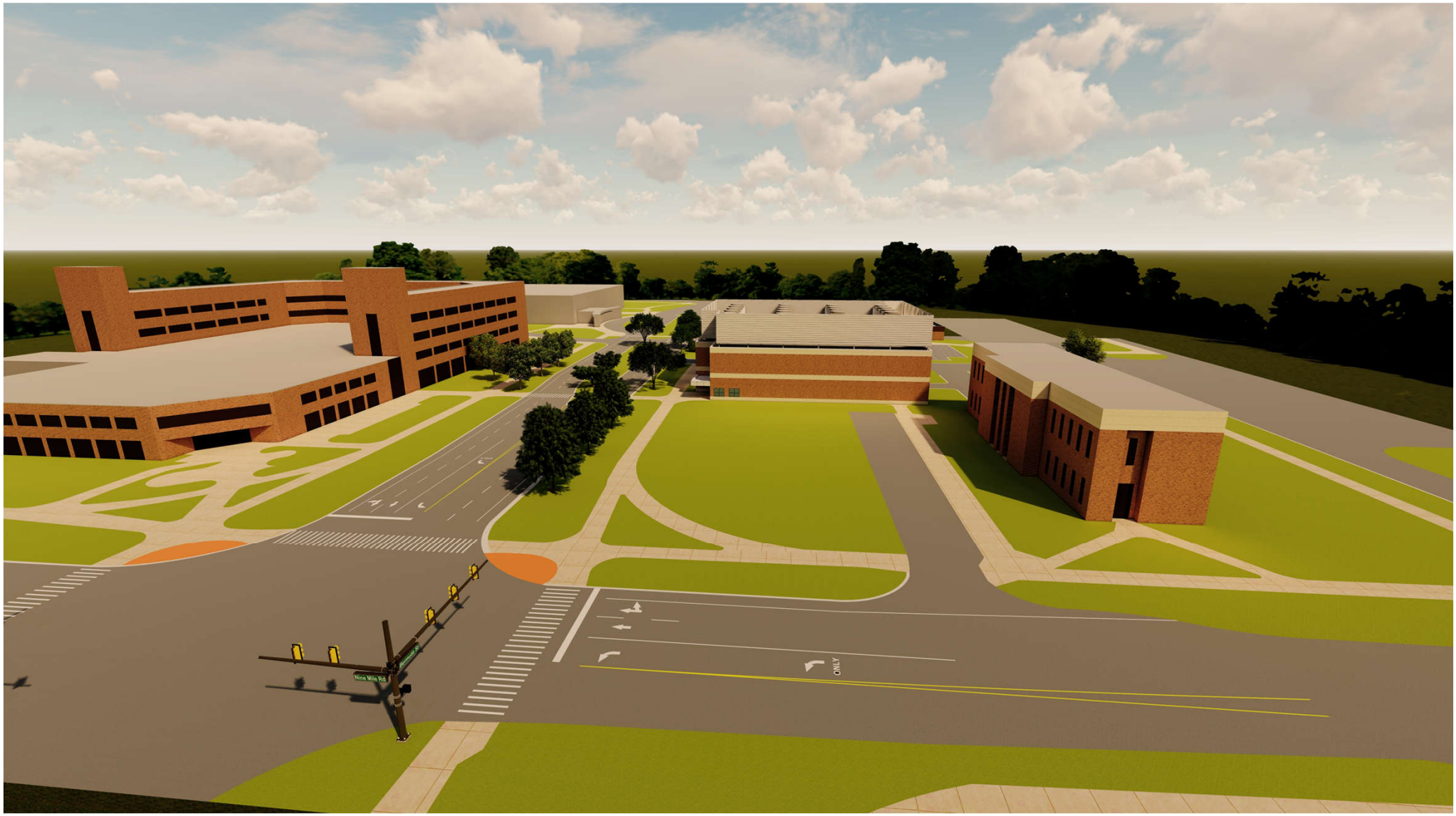


# Phase 1-2: Looking from the Southwest

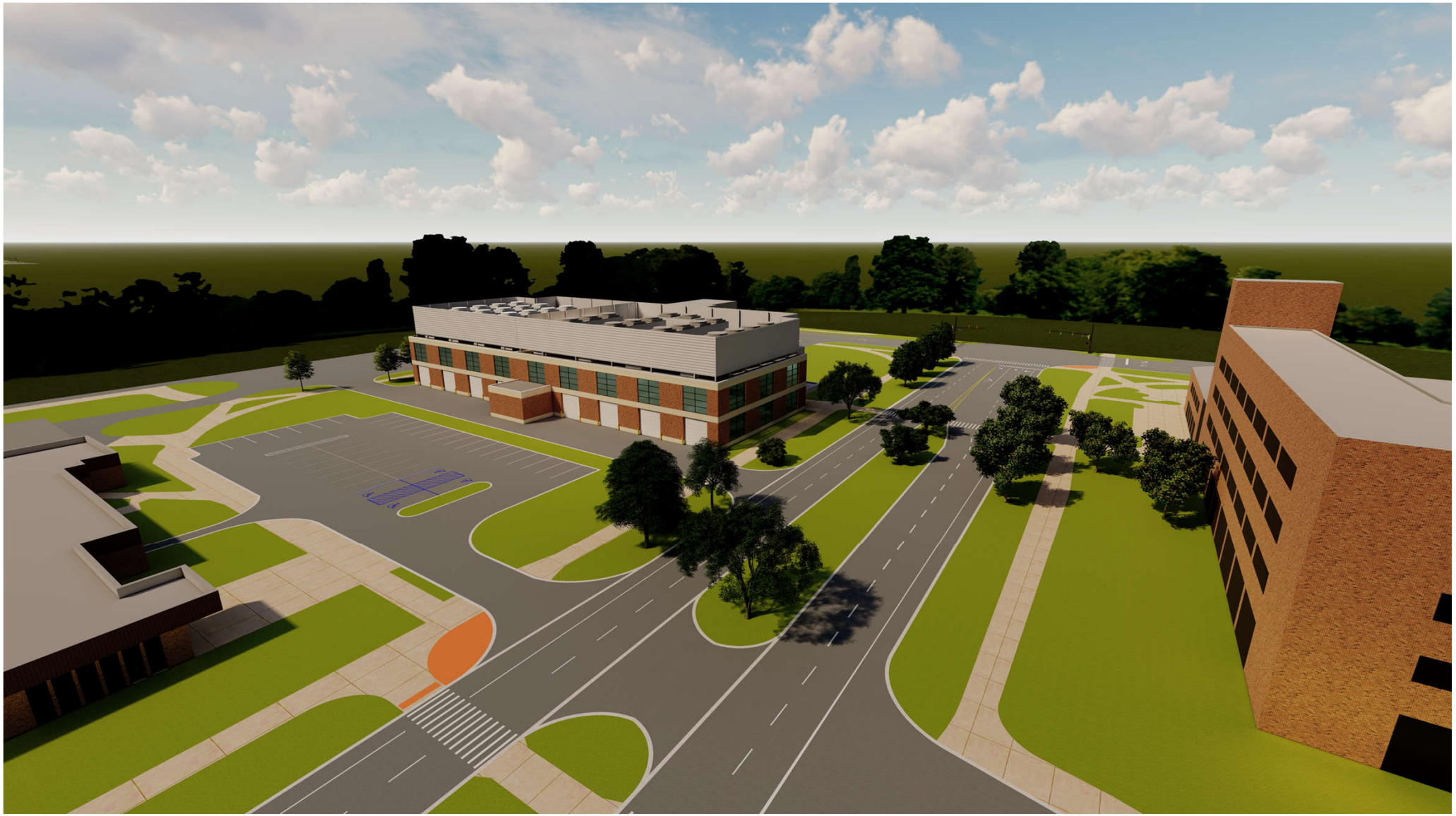


# Phase 1-2: Looking from the Southwest

# Phase 1-2: North Elevation

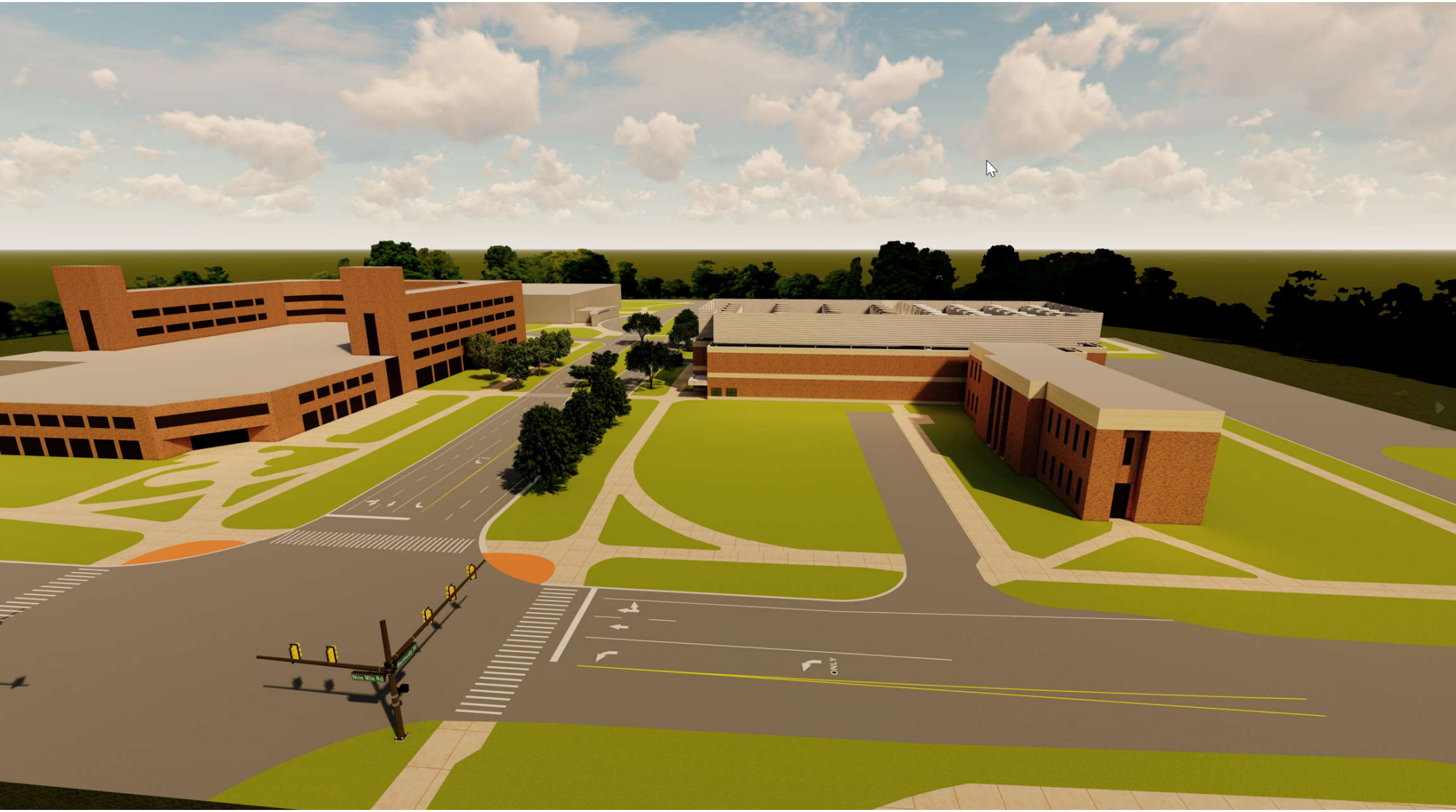


# Phase 1-3: Looking from the Southeast

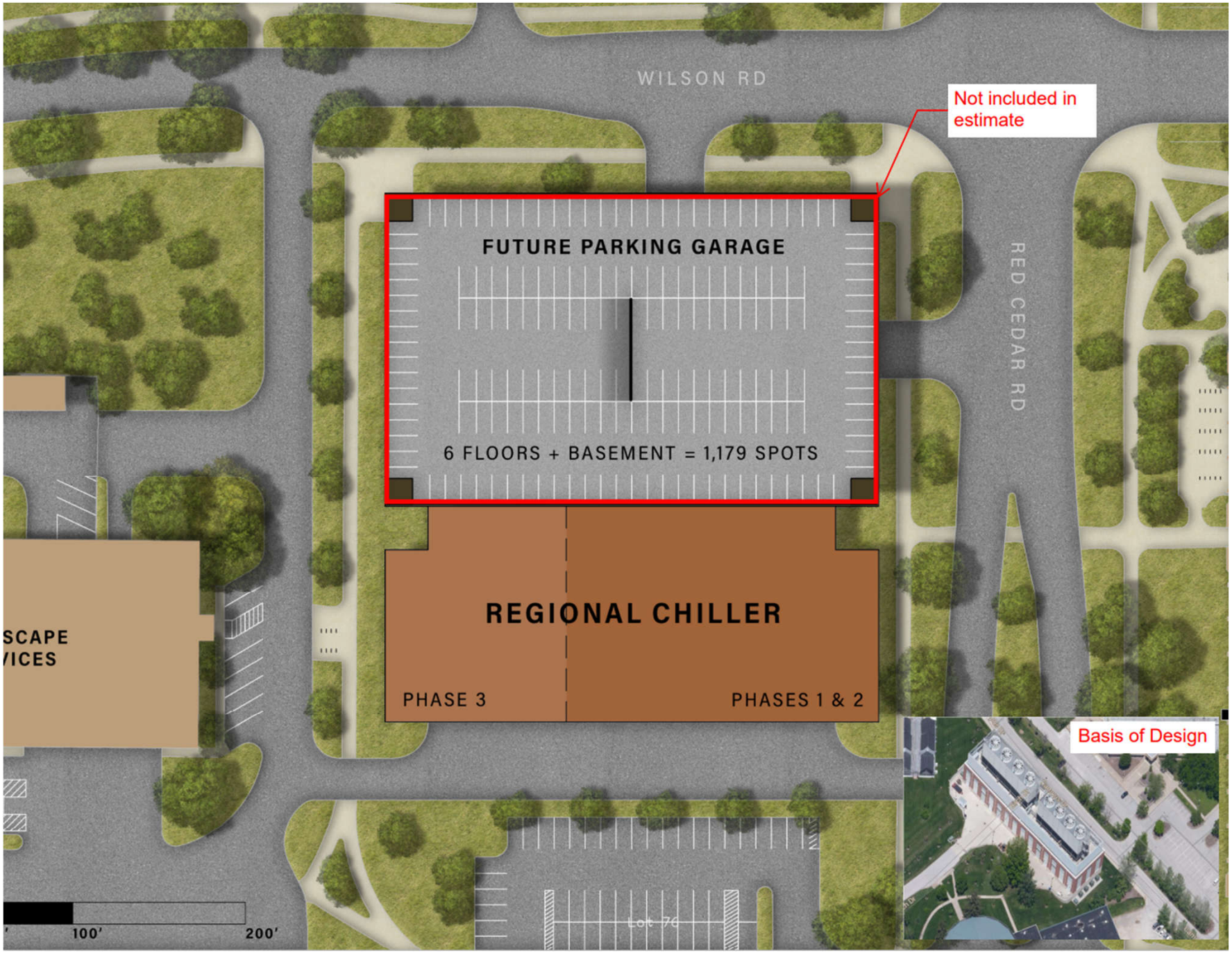


# Phase 1-3: Looking from the Southwest

# Phase 1-3: North Elevation



# XXX

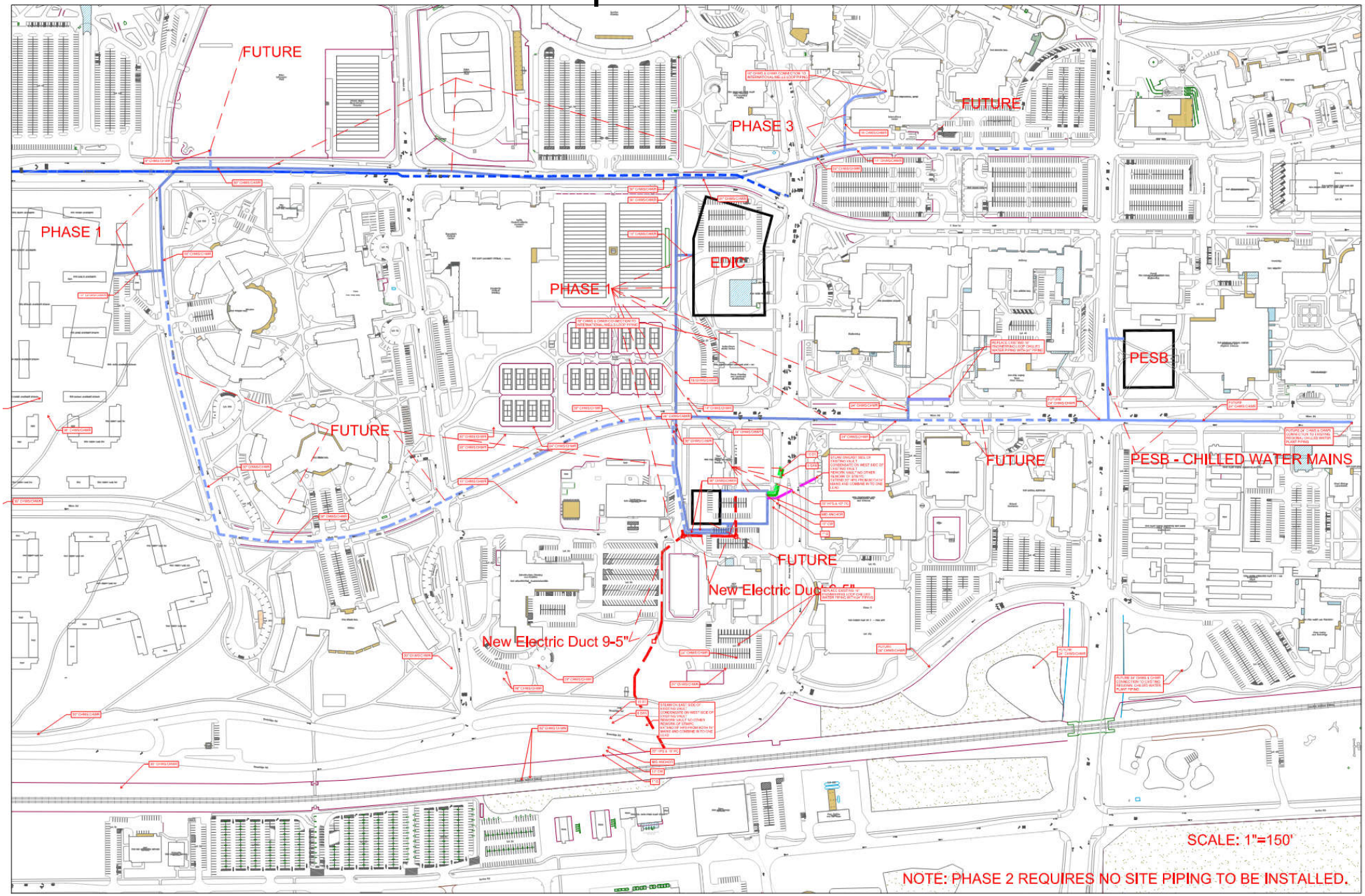

WILSON RD
Not included in estimate
FUTURE PARKING GARAGE
6 FLOORS + BASEMENT = 1,179 SPOTS
RED CEDAR RD
REGIONAL CHILLER
PHASE 3
PHASES 1 & 2
SCAPE
/ICES
Basis of Design
100'
200'
Lot 76

# Questions ?

Project Manager:
M. Scott Gardner, P.E.
gardne21@msu.edu
PH#: 517-432-0782

Information Technology Asst Director:
Sharon Bennett
bennet50@msu.edu
PH#: 517-884-3067

# Detailed Schematic Site Map



# Phase 1

| PHASE 1 | | | |
|---|---|---|---|
| **Buildings Served** | | | |
| Building | Sq Ft | Tons | Present Cooling Source |
| C14 - EDIC | 262,500 | 1,500 | Not yet constructed |
| C20 - PACKAGING ADDITION | 64,400 | 215 | Not yet constructed |
| ENGINEERING BUILDING | 421,497 | 1,531 | Engineering CHW Loop |
| COMM. ARTS AND SCIENCES | 262,442 | 612 | Engineering CHW Loop |
| ANTHONY HALL | 319,754 | 1,347 | Engineering CHW Loop |
| PACKAGING | 56,162 | 206 | Engineering CHW Loop |
| FOOD SCIENCE | 120,101 | 608 | Engineering CHW Loop |
| NATURAL RESOURCES | 149,972 | 395 | Engineering CHW Loop |
| C-03 STUDENT RECREATION AND WELLNESS CENTER | 305,000 | 987 | Not yet constructed |
| Total Connected Loop Load | 1,961,828 | 7,401 | |
| Diversified Loop Load | 80% | 5,921 | |
| **Existing Loop Chillers and Cooling Towers to Remain Operational** | | | |
| Location | Quantity | Tons Capacity | |
| Engineering - 1200 ton electric centrifugal | 2 | 2400 | |
| Anthony Hall - 955 ton steam absorption | 2 | 1910 | |
| Food Science - 620 ton steam absorption | 2 | 1240 | |
| **Existing Loop Chillers and Cooling Towers to be Removed** | | | |
| Location | Quantity | Tons Capacity | |
| None | | | |

| | | |
|---|---|---|
| **New Chiller Plant Building Size (approx.)** | 160'x125' | |
| New Chillers | Quantity | Tons Capacity |
| 1000 ton electric centrifugal | 1 | 1000 |
| 2800 ton steam turbine centrifugal | 1 | 2800 |
| 2800 ton electric centrifugal | 0 | 0 |
| Total installed chiller capacity in WRCW plant | 2 | 3800 |
| Total Installed chiller capacity on WRCWP loop | 8 | 9350 |
| N-1 chiller capacity on WRCWP loop | 7 | 6550 |
| Chiller capacity on WRCWP loop if all absorption chillers failed but all centrifugal chillers operational | 4 | 6200 |
| Installed Chiller Capacity on WRCWP loop as % Diversified Load | | 158% |
| N-1 Chiller Capacity on WRCWP loop as % Diversified Load | | 111% |
| Chiller capacity on WRCWP loop as % Diversified Load if all absorption chillers failed but all centrifugal chillers operational | | 105% |
| Site Steam Piping | New 20" steam and 10" condensate services to plant through crawl tunnel. Connect steam service to both existing 24" steam service mains at Vault #210 | |
| Net added campus summer steam load for cooling, cumulative through phase (lbs/hr) | Steam turbine | 29,000 |
| | Absorption | no change |
| | Total | 29,000 |
| Site Chilled Water Piping | Extend site chilled water piping from WRCWP to Engineering Loop, to EDIC, to Student Recreation and Wellness Center and to northwest side of the intersection of Red Cedar Road and North Shaw Lane. | |
| Site Electrical | 1. Need a new electrical duct bank from ELE 1848 (Trowbridge Road, north of Railroad Crossing) to the south side of the WRCWP.<br>2. Requires a new 15kV circuit pair (H-11 & H-31) from T.B. Simon Power Plant to the new WRCWP building. MSU Cost: $1,472,000 | |
| Net added campus summer electrical load for cooling, cumulative through phase (kW) | 1,230 | |

# Phase 2

| PHASE 2 | | | |
|---|---|---|---|
| **Additional Buildings Served** | | | |
| Building | Sq Ft | Tons | Present Cooling Source |
| C20 - PACKAGING ADDITION | 64,400 | 215 | Not yet constructed |
| Additional Connected Load | 64,400 | 215 | |
| Total Connected Loop Load | 2,026,228 | 7,616 | |
| Diversified Loop Load | 80% | 6,093 | |
| **Existing Loop Chillers and Cooling Towers to Remain Operational** | | | |
| Location | Quantity | Tons Capacity | |
| Engineering - 1200 ton electric centrifugal | 2 | 2400 | |
| WRCWP - 1000 ton electric centrifugal | 1 | 1000 | |
| WRCWP - 2800 ton steam turbine centrifugal | 1 | 2800 | |
| **Existing Loop Chillers and Cooling Towers to be Removed** | | | |
| Location | Quantity | Tons Capacity | |
| Anthony Hall - 955 ton steam absorption | 2 | 1910 | |
| Food Science - 620 ton steam absorption | 2 | 1240 | |
| **New Chiller Plant Building Size (approx.)** | | No Change | |
| New Chillers | | Quantity | Tons Capacity |
| 1000 ton electric centrifugal | | 0 | 0 |
| 2800 ton steam turbine centrifugal | | 0 | 0 |
| 2800 ton electric centrifugal | | 1 | 2800 |
| Total installed chiller capacity in WRCW plant | | 3 | 6600 |
| Total Installed chiller capacity on WRCWP loop | | 5 | 9000 |
| N-1 chiller capacity on WRCWP loop | | 4 | 6200 |
| Installed Chiller Capacity on WRCWP loop as % Diversified Load | | | 148% |
| N-1 Chiller Capacity on WRCWP loop as % Diversified Load | | | 102% |
| Site Steam Piping | | No Change | |
| Net added campus summer steam load for cooling, cumulative through phase (lbs/hr) | | Steam turbine | 29,000 |
| | | Absorption | -58,905 |
| | | Total | -29,905 |
| Site Chilled Water Piping | | No Change | |
| Site Electrical | | No Change | |
| Net added campus summer electrical load for cooling, cumulative through phase (kW) | | | 3,326 |

# Phase 3

| PHASE 3 | | | |
|---|---|---|---|
| **Additional Buildings Served** | | | |
| Building | Sq Ft | Tons | Present Cooling Source |
| WELLS HALL | 315,886 | 980 | International Center/Wells Hall CHW Loop |
| ERICKSON HALL | 219,249 | 730 | International Center/Wells Hall CHW Loop |
| INTERNATIONAL CENTER | 133,524 | 564 | International Center/Wells Hall CHW Loop |
| Additional Connected Load | 668,659 | 2,274 | |
| Total Connected Loop Load | 2,694,887 | 9,890 | |
| Diversified Loop Load | 80% | 7,912 | |
| **Existing Loop Chillers and Cooling Towers to Remain Operational** | | | |
| Location | Quantity | Tons Capacity | |
| Engineering - 1200 ton electric centrifugal | 2 | 2400 | |
| WRCWP - 1000 ton electric centrifugal | 1 | 1000 | |
| WRCWP - 2800 ton steam turbine centrifugal | 1 | 2800 | |
| WRCWP - 2800 ton electric centrifugal | 1 | 2800 | |
| **Existing Loop Chillers and Cooling Towers to be Removed** | | | |
| Location | Quantity | Tons Capacity | |
| Wells Hall - 490 ton steam absorption | 2 | 980 | |
| International Center - 800 ton steam absorption | 2 | 1600 | |
| **New Chiller Plant Building Size (approx.)** | | No Change | |
| New Chillers | | Quantity | Tons Capacity |
| 1000 ton electric centrifugal | | 0 | 0 |
| 2800 ton steam turbine centrifugal | | 1 | 2800 |
| 2800 ton electric centrifugal | | 0 | 0 |
| Total installed chiller capacity in WRCWP | | 3 | 9400 |
| Total Installed chiller capacity on WRCWP loop | | 5 | 11800 |
| N-1 chiller capacity on WRCWP loop | | 4 | 9000 |
| Installed Chiller Capacity on WRCWP loop as % Diversified Load | | | 158% |
| N-1 Chiller Capacity on WRCWP loop as % Diversified Load | | | 114% |
| Site Steam Piping | | No Change | |
| Net added campus summer steam load for cooling, cumulative through phase (lbs/hr) | | Steam turbine | 58,000 |
| | | Absorption | -107,151 |
| | | Total | -49,151 |
| Site Chilled Water Piping | | Extend site chilled water piping from northwest side of the intersection of Red Cedar Road and North Shaw Lane and connect to existing Wells Hall/International Center loop piping | |
| Site Electrical | | No Change | |
| Net added campus summer electrical load for cooling, cumulative through phase (kW) | | | 3,818 |

# Phase 4

**PHASE 2**

Additional Buildings Served

| Building | Sq Ft | Tons | Present Cooling Source |
|---|---|---|---|
| C-01 | 57,600 | 160 | Not yet constructed |
| C-02 | 122,400 | 510 | Not yet constructed |
| C-04 Remainder of master plan 218,000 gsf | 118,300 | 328 | Not yet constructed |
| C-05 | 324,000 | 900 | Not yet constructed |
| C-08 | 175,200 | 584 | Not yet constructed |
| C-09 | 160,000 | 533 | Not yet constructed |
| C-10 | 160,000 | 533 | Not yet constructed |
| C-15 | 259,500 | 865 | Not yet constructed |
| C-16 | 73,200 | 244 | Not yet constructed |
| Additional Connected Load (Tons) | 1,450,200 | 4658 | |
| Total Connected Loop Load (Tons) | | 14611 | |
| Diversified Loop Load (Tons) | 80% | 11689 | |

| | **Steam/Electric Chillers in Regional Chilled Water Plant** | | **Decentralized** | |
|---|---|---|---|---|
| Chiller Plant Building Size (approx.) | No change | | None | |
| New Chillers | Quantity | Tons Capacity | | |
| 2800 ton steam turbine centrifugal | | 0 | | |
| 2800 ton electric centrifugal | 1 | 2800 | Chillers at buildings (based on average capacities): | |
| Total installed chiller capacity in plant | 5 | 12200 | (3) 244 ton electric air cooled chillers, and associated incremental 480V substation capacities | |
| Total Installed chiller capacity on loop | 7 | 14600 | | |
| N-1 chiller capacity on loop | 6 | 11800 | | |
| Installed Chiller Capacity as % Diversified Load | | 125% | (12) 523 ton electric centrifugal chillers, with cooling towers, condenser water pumps, dedicated water softener, a total of 20,000 sf of associated mechanical room floor space and associated incremental 480V substation capacities. | |
| N-1 Chiller Capacity as % Diversified Load | | 101% | | |
| | | | 5,800 kW total added electrical load for cooling equipment at new buildings | |
| Site Steam Piping | No change | | None | |
| Net added campus summer steam load for cooling, cumulative through phase (lbs/hr) | Steam turbine chillers | 59,000 | Steam turbine chillers | 0 |
| | Absorption chillers | -114,600 | Absorption chillers | -114,600 |
| | Total | -55,600 | Total | -114,600 |
| Site Chilled Water Piping | Extend site chilled water piping mains from near International Center to master plan C-10 building site (existing Parking Lot #40) | | None | |
| Electrical | No change | | No change | |
| Net added campus summer electrical load for cooling, cumulative through phase (kW) | 5,914 | | 12,650 | |

# Phase 5

**PHASE 3**

Additional Buildings Served

| Building | Sq Ft | Tons | Present Cooling Source |
|---|---|---|---|
| JENISON FIELDHOUSE | 203,109 | 677 | Stand-alone Building System |
| DEMONSTRATION HALL | 96,208 | 321 | Stand-alone Building System |
| SPARTAN STADIUM | 422,218 | 900 | Stand-alone Building System |
| MUNN ICE ARENA | 155,901 | 528 | Stand-alone Building System |
| STEM | 192,208 | 580 | Stand-alone Building System |
| BRESLIN STUDENT EVENTS CENTER (includes HOH ad | 336,185 | 1200 | Stand-alone Building System |
| DUFFY DAUGHERTY FOOTBALL - S.A.A.C. - excludes ir | 138,156 | 584 | Stand-alone Building System |
| PUBLIC SAFETY | 36,941 | 123 | Stand-alone Building System |
| CASE HALL - Center Section Only | 76,505 | 400 | Stand-alone Building System |
| WILSON HALL - Center Section Only | 72,130 | 262 | Stand-alone Building System |
| WONDERS HALL - Center Section Only | 82,735 | 301 | Stand-alone Building System |
| HOLDEN HALL - Center Section Only | 114,450 | 416 | Stand-alone Building System |
| C-13 | 304,950 | 847 | Not yet constructed |
| C-17 | 247,600 | 825 | Not yet constructed |
| C-18A | 314,500 | 953 | Not yet constructed |
| C-18B | 190,400 | 635 | Not yet constructed |
| C-21 | 78,000 | 260 | Not yet constructed |
| C-22 | 664,800 | 1385 | Not yet constructed |
| Existing buildings | 1,926,746 | | |
| Future new buildings per master plan | 1,800,250 | | |
| Additional Connected Load (Tons) | | 11197 | |
| Total Connected Loop Load (Tons) | | 25808 | |
| Diversified Loop Load (Tons) | 80% | 20647 | |

Existing Loop Chillers and Cooling Towers to be Removed

| Location | Quantity | Tons Capacity |
|---|---|---|
| Engineering - 1200 ton electric centrifugal | 2 | 2400 |

| | Steam/Electric Chillers in Regional Chilled Water Plant | | Decentralized | |
|---|---|---|---|---|
| Chiller Plant Building Size (approx.) | 120'x125' addition | | None | |
| New Chillers | Quantity | Tons Capacity | Engineering: Replace existing (2) 1200 ton electric centrifugal chillers, cooling towers, condenser water pumps | |
| 2800 ton steam turbine centrifugal | 4 | 11200 | | |
| 2800 ton electric centrifugal | 0 | 0 | | |
| Total installed chiller capacity in plant | 9 | 23400 | Chillers at buildings (based on average capacities): | |
| Total Installed chiller capacity on loop | 9 | 23400 | (16) 298 ton electric air cooled chillers and associated incremental 480V substation capacities | |
| N-1 chiller capacity on loop | 8 | 20600 | | |
| Installed Chiller Capacity as % Diversified Load | | 113% | (14) 734 ton electric centrifugal chillers, with cooling towers, condenser water pumps, dedicated water softener, a total of 23,000 sf of associated mechanical room floor space associated incremental 480V substation capacities and . | |
| N-1 Chiller Capacity as % Diversified Load | | 100% | 6,600 kW total added electrical load for cooling equipment at new buildings (asssumes no net change in electrical load at existing buildings) | |
| Site Steam Piping | No change | | No change | |
| Net added campus summer steam load for cooling, cumulative through phase (lbs/hr) | Steam turbine chillers | 176,000 | Steam turbine chillers | 0 |
| | Absorption chillers | -114,600 | Absorption chillers | -114,600 |
| | Total | 61,400 | Total | -114,600 |
| Site Chilled Water Piping | Extend site chilled water piping mains to complete the loop along Wilson and Birch roads, from the new chilled water plant to the Student Recreation and Wellness Center | | None | |
| Electrical | Additional (second) 2.5MVA double ended substation in WRCWP | | To support the decentralized chiller load in future new buildings, an additional new 15kV circuit pair would be required from T.B. Simon Power Plant to near Shaw Lane and Harrsion Road. MSU Cost: $2,689,000 | |
| Net added campus summer electrical load for cooling, cumulative through phase (kW) | 7,884 | | 19,250 | |