University of Wisconsin-Madison
Campus Planning Committee

September 26, 2019

Facilities Planning & Management

Agenda Overview

- Welcome & Introductions
- Old Business
  - Approval of Minutes (September 12, 2019)
- Capital Budget Presentation
  - College of Engineering
  - School of Medicine and Public Health
  - FP&M Utilities & Energy Management
- Announcements / Upcoming Meetings Reminder

8:45a

College of Engineering 2021-27

Ian Robertson, Dean

Campus Planning Committee

September 26, 2019

College of Engineering

1. Engineering Hall - 1948,1950,1961,1990
   265,802 ASF / 464,768 GSF

2. Engineering Research Building - 1966
   84,479 ASF / 157,510 GSF

3. Engineering Centers Building - 2000
   112,402 ASF / 251,334 GSF

4. 1410 Engineering Drive - 1930, 1987
   34,390 ASF / 63,561 GSF

5. Mechanical Engineering Building - 1929, 2007
   153,783 ASF / 297,993 GSF

6. Materials Science and Engineering
   1909, 1974, 1995, 2000
   25,547 ASF / 44,726 GSF

7. Wendt Commons - 1974
   52,778 ASF / 74,459 GSF

NOT SHOWN: Water Science and Engineering Laboratory - 1890, 1905, 1928, 1970s, 1980s 26,540 ASF / 40,867 GSF

College of Engineering Overview

Demand for engineers continues to increase from students to employers.

Over 7500 applications for 1250 positions; 350 + companies participate in career fair

Enrollment Capacity and Space

- Ability to add faculty and staff limits our ability to grow to meet the demand for engineers in Wisconsin
- Instructional and research space quantity and quality limit student experiences and research excellence

Need to attract non-resident students to Wisconsin to meet employment demand

With a decreasing number of high school students in Wisconsin, there is a need to attract out-of-state students to meet the employment opportunities. The quality of our facilities will make this an ongoing challenge

Infrastructure Condition

Facility Condition Analysis completed in 2015. Conclusion: ECB and ME in good condition; MSE and Wendt Commons in acceptable condition; 1410 Engineering Drive, Engineering Hall, ERB and Water Sciences in poor condition

Safety

The age, design and construction of the buildings on the engineering campus, as well as the deferred maintenance backlog, makes renovations to bring instructional and research laboratories to current safety codes expensive and challenging. Immediate challenges are fume hood building density is approaching the maximum; maximum number of allowable gas cylinders in a building has been exceeded; no fire suppression systems in some buildings; etc.

Mechanical Infrastructure

Significant problems exist across the College of Engineering

Time to degree

Lack of high capacity instructional spaces that enable use of emerging pedagogical approaches impacts the quality of the education and increases time to degree. Instructional laboratory expansions are needed to meet current and future enrollment otherwise the time to degree will increase.

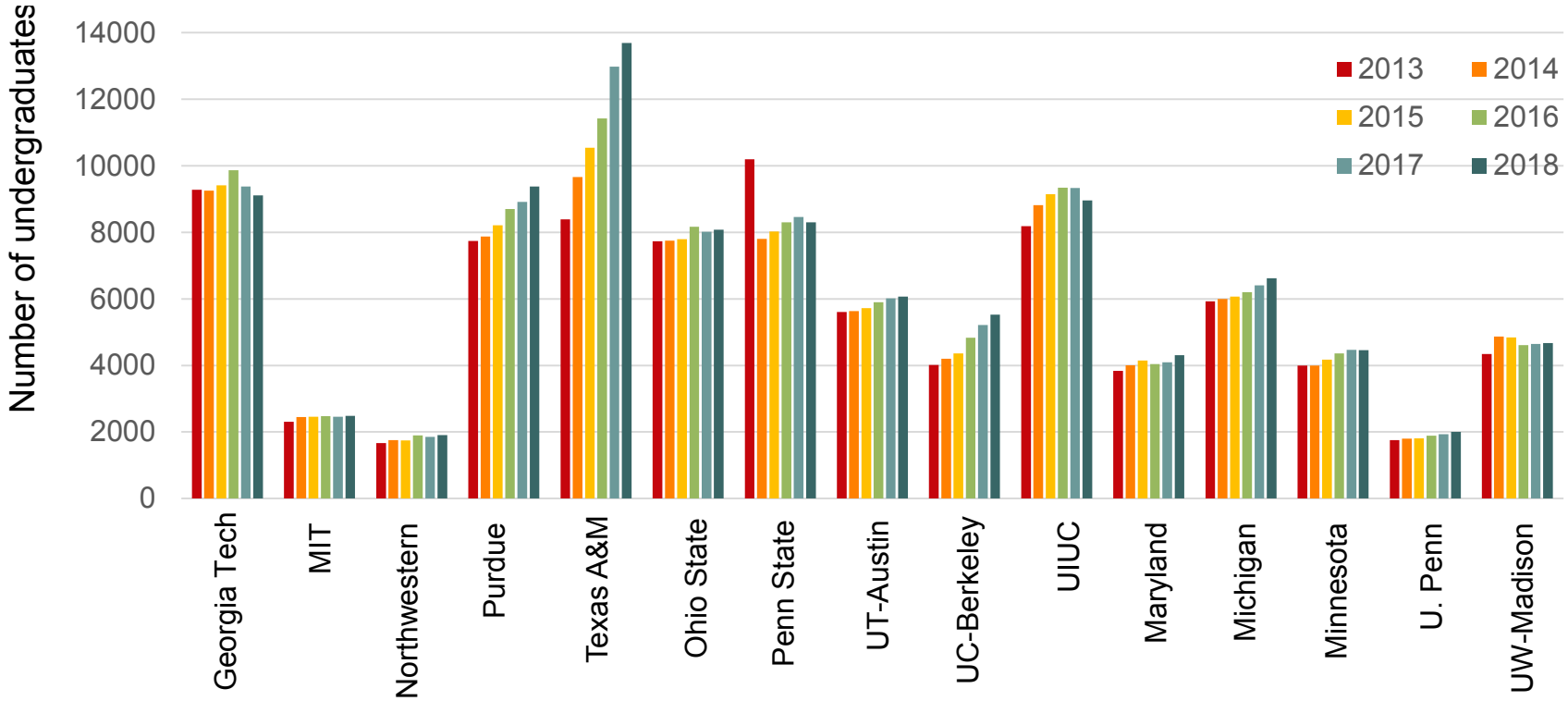
Reputation

Undergraduate program ranking is 15, graduate program ranking is 22 (first time out of top twenty)

Comparison to Peers

(red numbers are 2018 tenure-track faculty, undergraduate to tenure track faculty ratio, and current US News and World Report ranking)

	Georgia Tech	MIT	Northwestern	Purdue	Texas A&M	Ohio State	Penn State	UT-Austin	UC-Berkeley	UIUC	Maryland	Michigan	Minnesota	U. Penn	UW-Madison
faculty	506	385	202	353	462	284	280	468	250	452	216	426	240	126	198
ratio	18	6	9	27	30	28	30	13	22	20	20	16	19	16	24
rank	5	1	13	9	15	29	25	11	3	6	25	6	25	20	15



- Undergraduate student to faculty ratio impacts the educational and research mission and quality
- Graduate program ranking has been decreasing and Engineering is **now out of the top 20**
- **COE has hired 67 faculty since 2013**, which accounts for the current student to tenure-track faculty ratio
- Growth in percentage of **women faculty from 12 % to 20% in 2018**
- Growth in percentage of women engineers from **21 to 29% of the incoming class since 2015** (direct admit)

A selection of new buildings, renovations, additions to engineering campuses at select peer institutions

Iowa State University, 2019

Aerospace UIUC, 2019

Nuclear engineering
building renovation 2017
U. Michigan

Mechanical Engineering UIUC, 2017

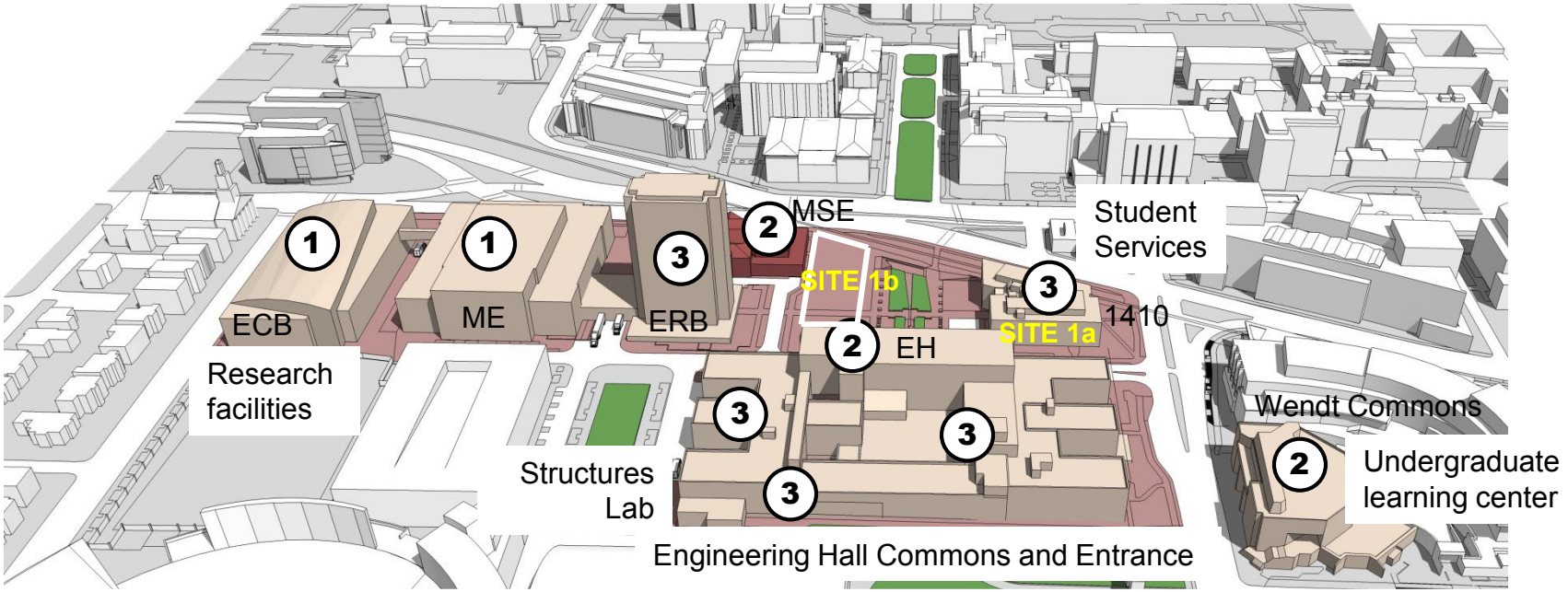
Robotics building,
U. Michigan 2019

Biomedical engineering expansion
Purdue University, 2019

Biomedical engineering,
Ohio State University, 2019

Facility Condition Assessments and Renovations

FLAD Architects 2015 -19



1. Newly constructed or fully renovated within the past fifteen years. These buildings are in good condition and were not subject to the facility condition assessment process.

2. Facility Quality Indexes (FQIs) that are below 50% indicating continued utilization and necessary investments in renovations should be considered

3. FQIs exceeding 50%. Ongoing renovation investments will be made only to address short and mid-term needs. **These are building sites to consider for new construction**

Major renovations in boxes

CoE has spent $18 M + on improving instructional and research facilities

CoE Space Needs Analysis from Flad Architects Facility Review

Current

- Deficit in quantity and quality of research and collaborative learning spaces
- Analysis suggests that there is a surplus of classrooms, however, current classrooms are small, requiring multiple sections for large enrollment courses

Plan horizon – 2021 and beyond

- Existing ***726,530*** assignable square feet (ASF) to projected need of ***1,014,391*** ASF results in a *deficit* of approximately *40% or 287,861* ASF.

- Deficit is based on a projected increase in enrollment to ***6,000*** undergraduates and a *preferred, ideal* ratio of undergraduate students to Tenured/Tenured Track (T/TT) faculty of ***20:1***. (Current ratio even with faculty growth is 22:1)

Two buildings are proposed:
1. Engineering Education building
2. Engineering Research building

Project 1 – Engineering Education Building

(site to be determined)

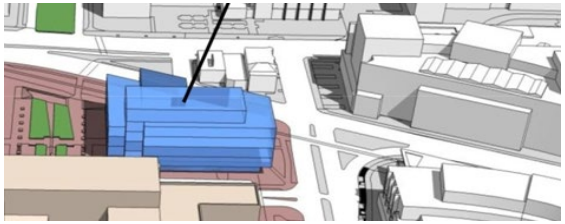
The College of Engineering must increase the number of opportunities for students to pursue an engineering degree to meet the demands of students and of industries in the state of Wisconsin and beyond.

New Engineering Education Building:

- Allow CoE to grow towards 5,500+ undergraduates, increase instructional laboratory space to accommodate much needed growth in experimental stations, increase number of high capacity classrooms, implement much needed educational initiatives, create secure and safe design spaces for student organizations, decrease time to degree through expansion of high demand classes and laboratories
- Address the shortage of space for student services, which includes student academic advising, career services and student wellness
- Transition engineering education to multi-disciplinary
- Improve competitiveness with peers

- Depending on site selected in the feasibility study and if 1410 Engineering Drive site is selected it will address deferred maintenance issue of 1410 Engineering Drive (identified 20 years ago) and maximize use of resources
- Education building optimizes use of resources

Physical Environment Analysis



Building Information

- 1410 Engineering Drive building was constructed in the 1930s as a State of WI DOT Materials Testing Laboratory
- Later assigned to the College of Engineering for educational purposes
- In 1987, an addition to the north side of the building was constructed
- Existing building - 63,561 GSF / 34,390 ASF - 54% Building efficiency

Project 2 – Engineering Research Building

(site to be determined in feasibility study)

The College of Engineering must increase the quality and availability of state-of-the-art research facilities to enable its faculty and staff to be competitive and provide technological solutions to national, worldwide, and societal challenges. The facility would address some of the safety issues in the college.

New Engineering Research Building

- Attract and retain the faculty and staff needed to educate the growing population of engineering students
- Create flexible and reconfigurable research space
- Enable and encourage interdisciplinary research
- Optimize use of laboratory space and equipment
- Optimize use of resources (startup packages, equipment acquisition and usage etc.)
- Improve competitiveness with peers and address the declining ranking of the College of Engineering
- Depending on site selected in the feasibility study and if 1410 Engineering Drive site is selected it will address deferred maintenance issue of 1410 Engineering Drive (identified 20 years ago) and maximize use of resources.
- Two building plan positions campus for the replacement of ERB, another building with significant deferred maintenance.

Physical Environment Analysis

Observations and Conclusions

2005 UW-Madison Campus Master Plan indicated this building should be demolished

2015 College of Engineering Facilities Master Plan indicated that the cost of renovation exceeds 75% of the replacement value, making the 1410 Engineering Drive site a prime candidate for new construction

Both sections of the building are in poor/ unsatisfactory condition. The current condition of the building reflects the deferral of building maintenance projects.

Capital Project Request: Engineering Education and Research Buildings

1410 Engineering Drive Site 1a

Site 1b

Site 1a: 1410 Demolition and Replacement

Engineering Education Building Details:
169,412 GSF / 101,647 ASF – 7 floors

Total Project Cost Estimate is: $150,000,000

If timeline is extended beyond 2023, a 6% annual increase is assumed

Timeline:
Advanced Planning: 01/2020 – 01/2021
Design / Approvals / Bidding: 07/2021 – 07/2023
Construction: 08/2023 – 08/2025

Request to state
80% of projected total cost based on timeline; 20% CoE gift/grant funds

Engineering Research Building Details:
170,000 GSF 7 floors
Total Project Cost Estimate: $170,000

If timeline is extended beyond 2025, a 6% annual increase is assumed

Timeline:
Advanced Planning: 01/2022 – 01/2023
Design / Approvals / Bidding: 07/2023 – 07/2025
Construction: 08/2025 – 08/2027

Funding: gift/grant funds

Strategic Investment for the College of Engineering, UW-Madison, and Wisconsin!

IMPACT

- Remain competitive
- Grow to meet demand for engineers for Wisconsin
- Expand educational opportunities
- Increase research expenditures
- Increase IP disclosures to WARF
- Increase alumni support
- Provide research space that meets safety standards and promotes research innovation

IMPACT

- Attract and retain talented faculty
- Continue to lead in engineering education innovation
- Provide students with essential support services
- Reverse trend of declining rankings at both undergraduate and graduate level
- Attract non-resident students

Additional Slides

Impact to UW-Madison of not building a new instructional and research building on the 1410 Engineering Drive site

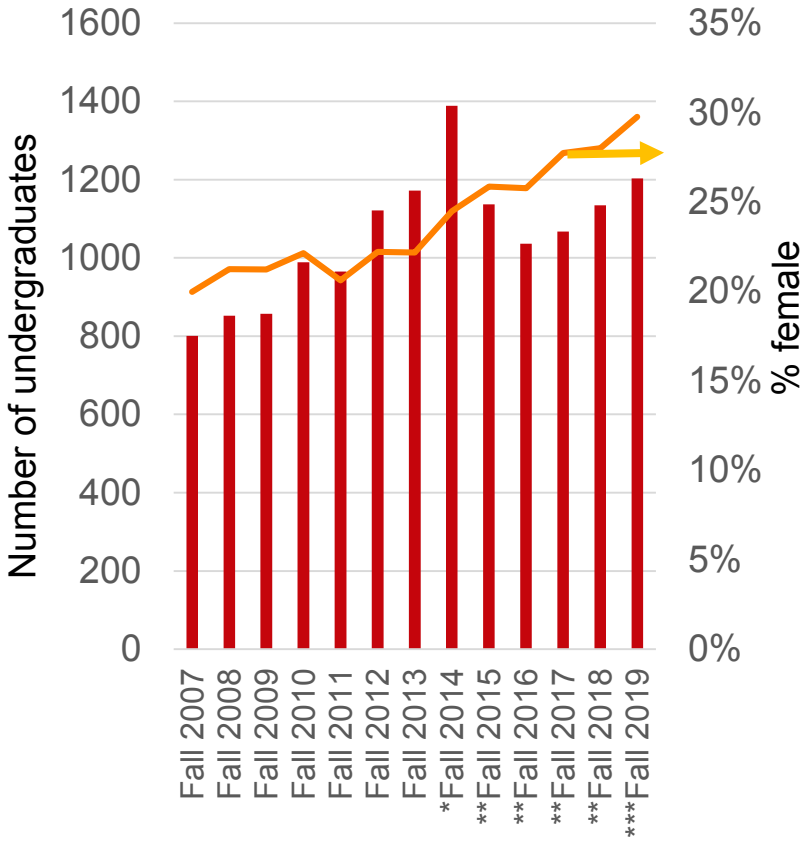
- Engineering at UW-Madison will not be competitive with peer institutions that have increased capacity to educate students and can provide faculty with state-of-the-art research facilities
- Instructional experiences will decline as existing facilities are not easily reconfigurable to meet emerging educational challenges
- Engineering at UW-Madison will be less attractive to out-of-state students, which will decrease our ability to meet Wisconsin industry demand for engineers
- Engineering will not be able to grow beyond current student or faculty numbers
- If industries cannot meet their employment needs at UW-Madison or the quality of education declines, they will recruit at other institutions. This will impact industrial research as companies tend to conduct research at institutions from which they recruit
- Deferred maintenance costs will continue to increase and will increase in urgency to complete
- It will become difficult to recruit and retain high quality faculty as we cannot provide them with the research facilities they can find at other institutions. Ultimately, this will impact research expenditures, IP disclosures, reputation and ranking. Re-establishing a top 20 ranking is a difficult task and will take years
- Alumni support, which is remarkably strong today will decline. They expect the college and the departments to provide a high quality educational experience, to be research leaders and be highly ranked

FP&M Capital Planning Principles

- Maximize use and reuse of existing facilities
  - 1410 Engineering Drive has already met this requirement when it was repurposed as a College of Engineering Education and Research Facility from a State of WI Transportation Lab. The building has been repurposed and is now primarily office space for student services, staff, and computer aided engineering
- Design adaptable, efficient, and easily maintainable buildings
  - New building would focus on functionality and keep with the architectural and engineering standard requirements currently on campus
  - Instructional and research laboratories will be designed to be flexible and readily reconfigurable to meet emerging needs
- Reduce deferred maintenance
  - Master and Facilities plans have indicated that the cost to renovate and maintain the current building exceeds 75% of the replacement value
- Strategic alignment to maximize resources
  - Eliminates a building in need of significant renovation and replaces it with a new building
  - Shared interdisciplinary experimental research laboratories optimizes space usage, equipment usage, and will reduce the need to build new experimental laboratories in existing buildings which is expensive

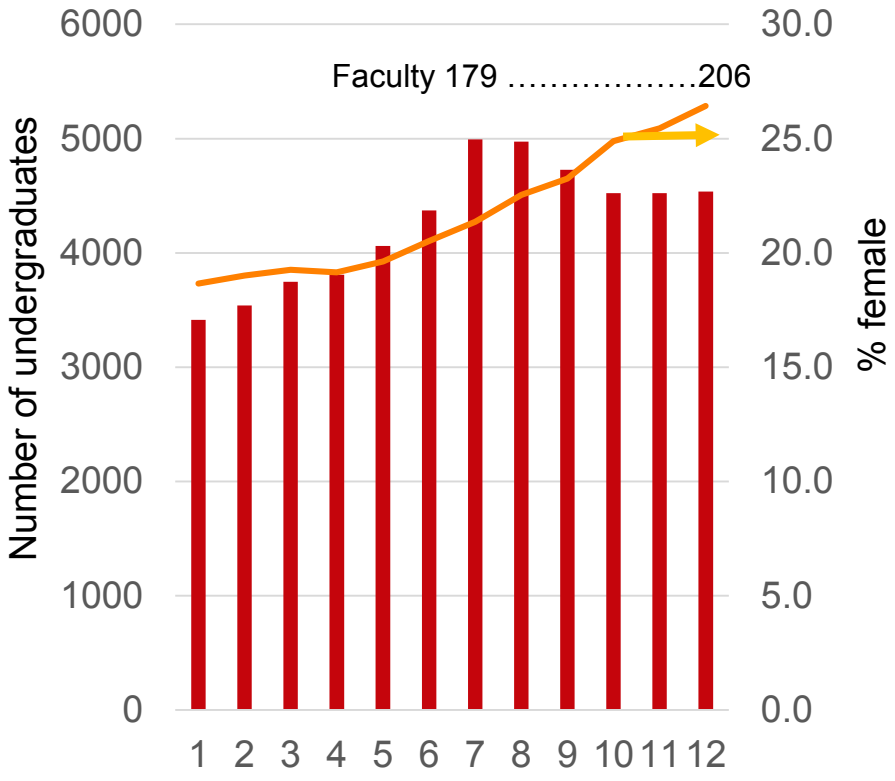
Undergraduate Engineering at UW-Madison

Incoming class



*Pilot direct admit
**Direct admit
***Direct admit, Unofficial count (9/9/2019)

Total



Compared to our peers we have fallen beyond in terms of expanding to meet demand from employers

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School of Medicine and Public Health
2021-27 Six-Year Capital Plan

Richard L. Moss, PhD – Senior Associate Dean for Basic Research, Biotechnology and Graduate Studies

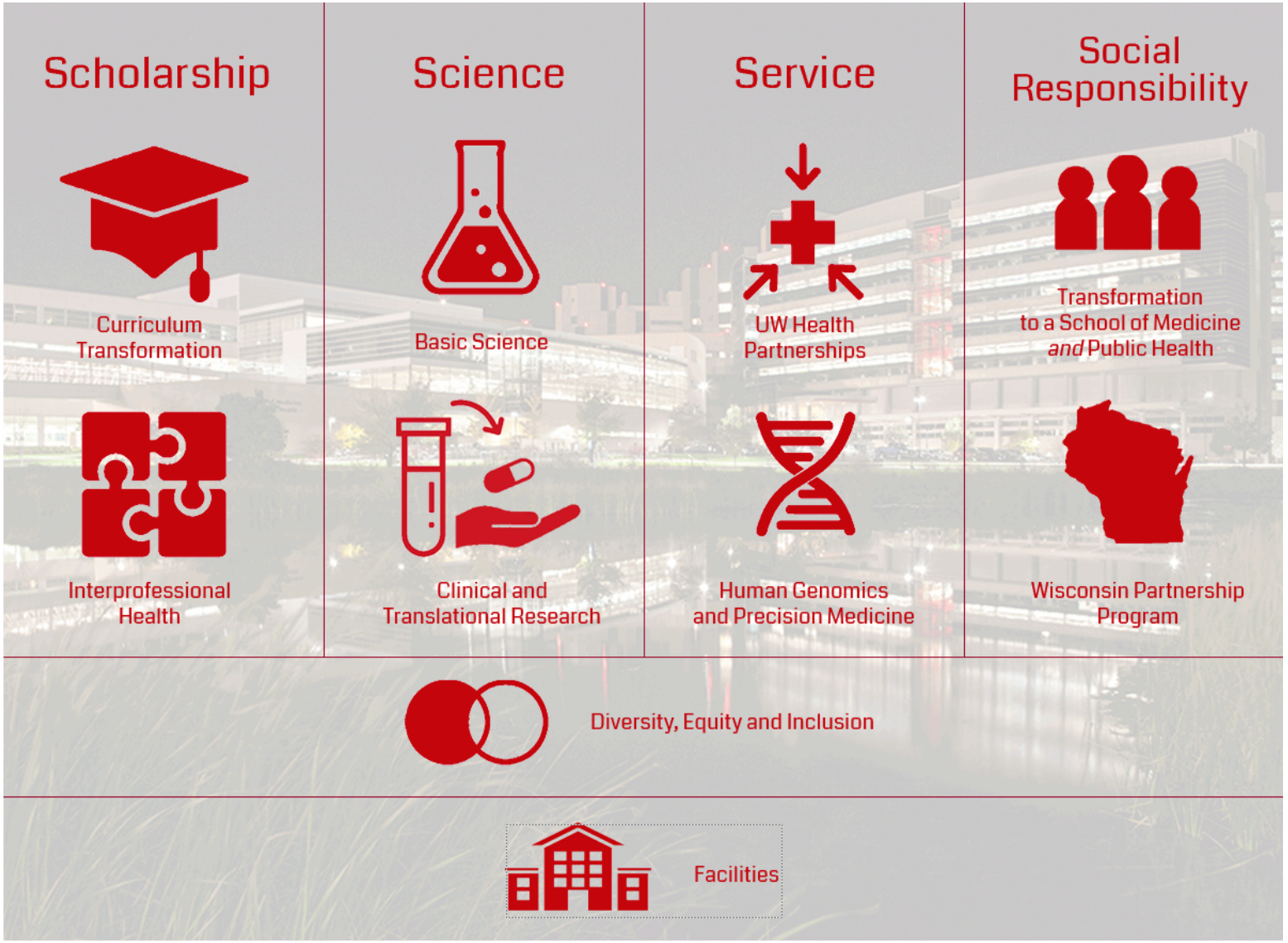
Mark Wells,MS, AIA – Assistant Dean for Facilities

Campus Planning Committee Meeting
September 26, 2019

School of Medicine and Public Health Overview

- $383.5M total extramural research funding and $210M Federal research funding awarded to the SMPH in 2017 – 2018
- $646M total research expenditures at the SMPH in 2017 – 2018 (UW-Madison annual research expenditures is $1.2B)
- SMPH was ranked 24 among U.S. medical schools for NIH funding in fiscal year 2018
- 576 Graduate students & 210 Postdoctoral Fellows in 2018-’19
- 9,577 employees & 1,951 Principal Investigators in 2018-’19

School of Medicine and Public Health Strategic Planning



Connecting Strategic Plan to a Facilities Plan

Strategic Objectives

1. **Maximize the use and reuse of existing facilities**
2. **Create adaptable, efficient, & easily maintainable facilities**
3. **Reduce deferred maintenance**
4. **Be strategically aligned to optimize use of limited resources**

Major Project Priorities 2021-27

1. Wisconsin Alumni Research Foundation (WARF) Building Floors 3-7,10

- GSF size of project: 60,750
- Current cost estimate: $12.5M
- Proposed Biennium: 2019 – 2021
- *Strategic Objective Score: 1,2,3,4*

2. McArdle Building Floors 5 & 8

- GSF size of project: 16,030
- Current cost estimate: $4M
- Proposed Biennium: 2019 – 2021
- *Strategic Objective Score: 1,2,3,4*

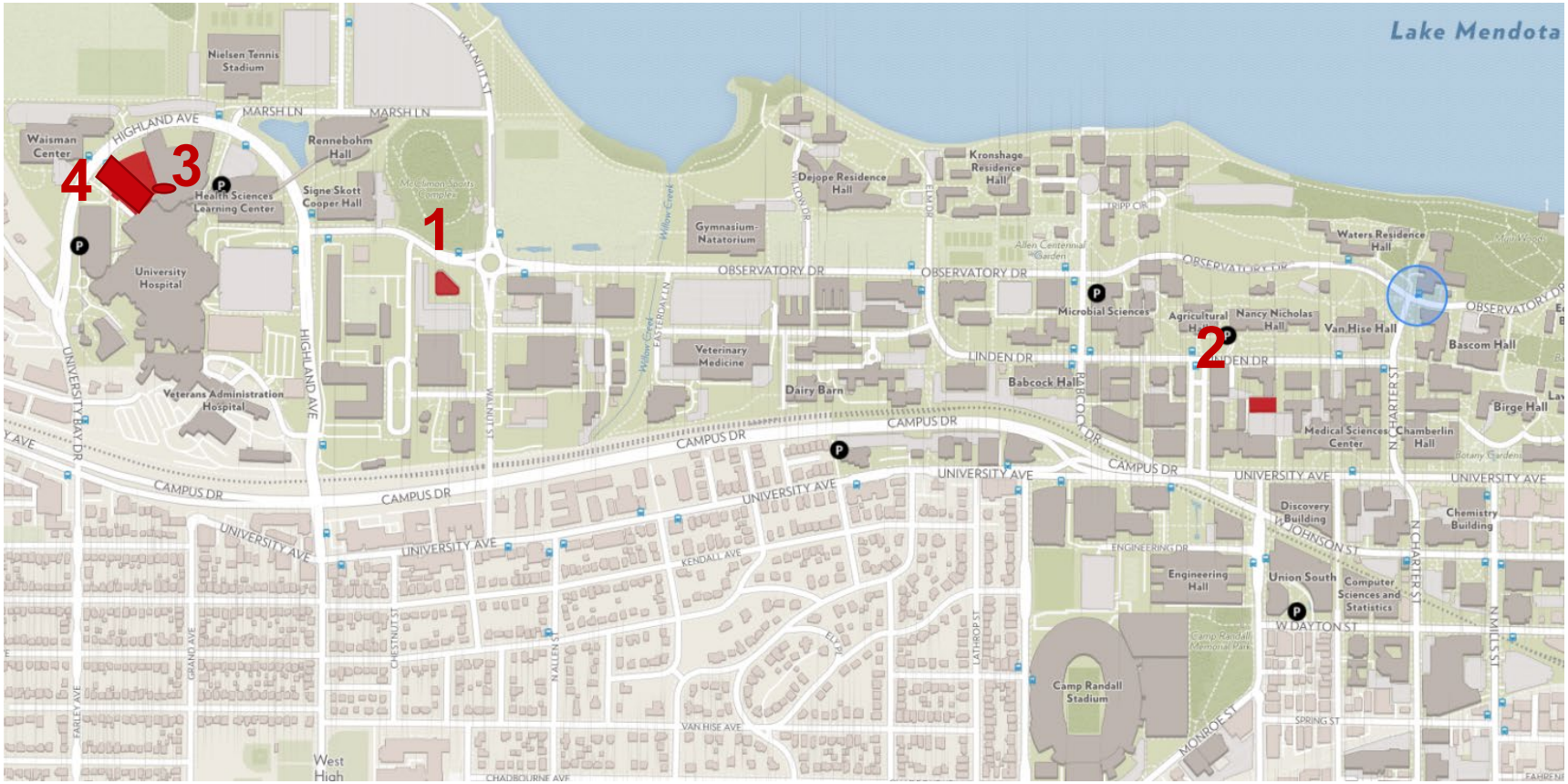
3. Wisconsin Institutes for Medical Research (WIMR) Primate Center Addition (NIH)

- GSF size of project: 4,500 lab
- Current cost estimate: $4M
- Proposed Biennium: 2019 – 2021
- *Strategic Objective Score: 1,2,3,4*

4. WIMR III

- GSF size of project: 400,000+
- Current cost estimate: $406M
- Proposed Biennium: 2027+
- *Strategic Objective Score: 2,3,4*

UW-Madison Campus Map: Project Locations



1 – WARF Building Floors 3 – 7, & 10
2 – McArdle Building Floors 5 & 8
3 – WIMR Primate Center
4 – WIMR III

WARF Building Floors 3 – 7 & 10

- Increase in outcomes research & demand for more office space on the Clinical Campus necessitates renovation of inefficient space
- Decision Support System for space assignment for all SMPH space

This project will:

- Decant employees out of lease space
- Improve adjacencies for research collaboration
- Boost recruitment of high performing faculty and staff
- Build efficient modern office space

Preliminary programming for this project has shown it will:

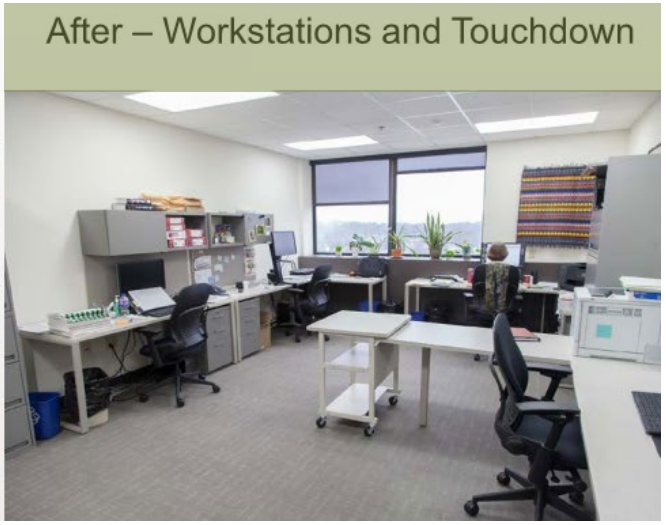
- Increase building occupancy average from 35 to 70 seats per floor
- SMPH Office Allocation Guidelines to assign space
- Reduce our current lease space portfolio

- Project estimate is $12.5M
- Start with $1.7M project for overall plan and floor 4
- Project estimated to be completed 2023 (~4 year timeframe)

WARF Building

- Construction Date: 1969
- 155,085 GSF
- 5 Minute walk from Clinical Sciences Center & UW Hospital

Previous 9th Floor Renovation



McArdle Building Floors 5 & 8

- Increase in outcomes research & demand for more office and -80 research freezer space necessitates renovation of inefficient space

This project will:

- Add a dedicated freezer facility for SMPH and the Graduate School
- Convert outdated lab space into modern office space for Biostatistics and Medical Informatics Chair recruitment
- Allow reuse of existing Medical Sciences Center space

Preliminary programming for this project has shown it will:

- Provide office space for ~60 occupants on one floor
- Provide space for ~116 research freezers on one floor
- Decant SMPH staff from MSC & freezers from various campus locations

- Initial project estimate is $3M
- Project completion timeframe TBD

McArdle Building Floors 5 & 8

- Construction Date: 1964
- 95,660 GSF

WIMR Primate Center Remodel

- National Institute for Health (NIH) C06 Construction Grant Application

This project will:

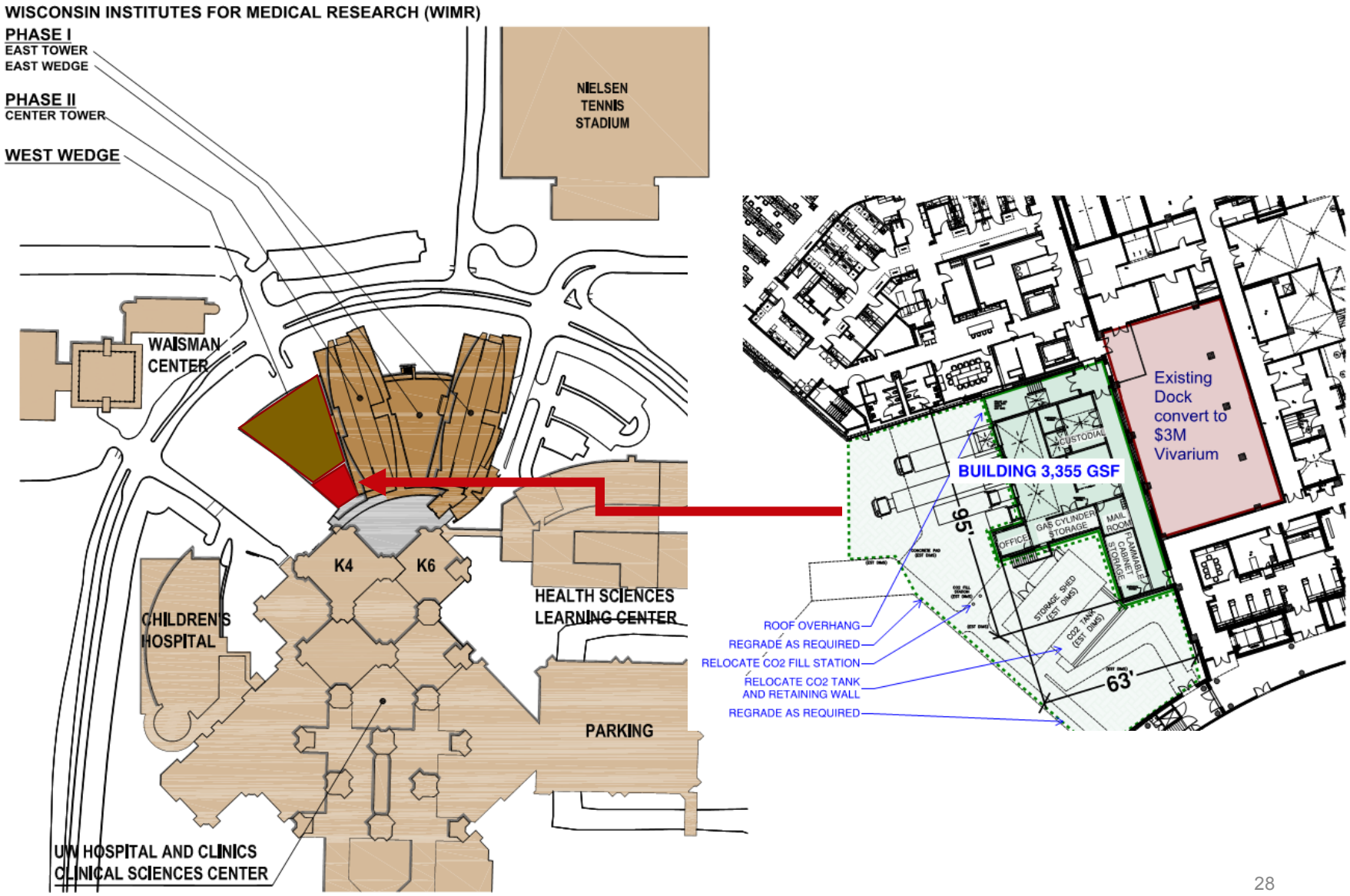
- Provide additional modern vivarium space for SMPH and UW National Primate Center priorities freeing up space on central campus.
- Support national goal of a cure for HIV/AIDS

Preliminary programming for this project has shown it will:

- Convert existing Wisconsin Institutes for Medical Research (WIMR) loading dock space to vivarium
- Provide a temporary loading dock as WIMR III planning proceeds

- Initial project estimate is $4M
- Project completion timeframe Fall, 2022

WIMR Primate Center Remodel



Wisconsin Institute for Medical Research (WIMR III)

- Increase dry and wet research space capacity for the Clinical campus

This project will:

- Provide an additional ten to twelve 33,000 GSF (20,000 ASF) floors of modern dry and wet research space in the clinical science campus
- Provide more Medical Sciences Center space for reuse

Preliminary programming for this project is not started:

- Initial project estimate is $406M
- Project completion timeframe: Proposed Biennium: 2027+

Wisconsin Institute for Medical Research (WIMR III)

WIMR I - 2008 - 460K GSF -		$182M
WIMR II - 2014 - 260K GSF -		$132M
WIMR West Wedge - 2019 - 37K GSF-		$21M
Total		$335M

WIMR III

GSF size of project: 400,000+

Current cost estimate: $406M

Proposed Biennium: 2027+

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- Proposed Biennium: 2027+
- *Strategic Objective Score: 2,3,4*

Questions?

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FP&M Utilities & Energy Management (UEM)

2021-27 Six-Year Capital Plan Request

Jeffrey A. Pollei, Director of Utilities & Energy Management

Campus Planning Committee Meeting

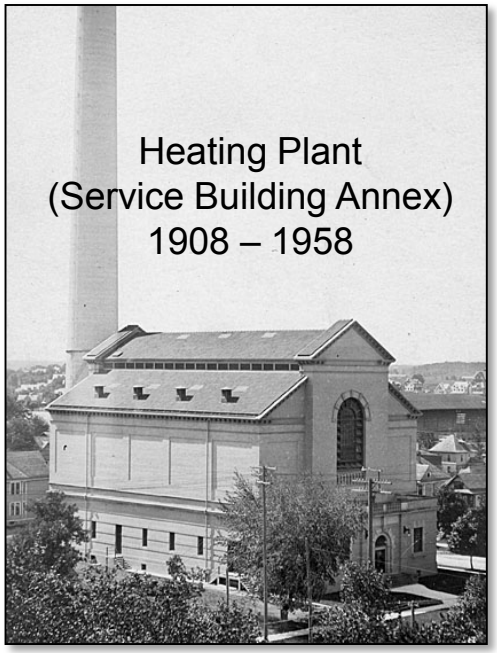
September 26, 2019

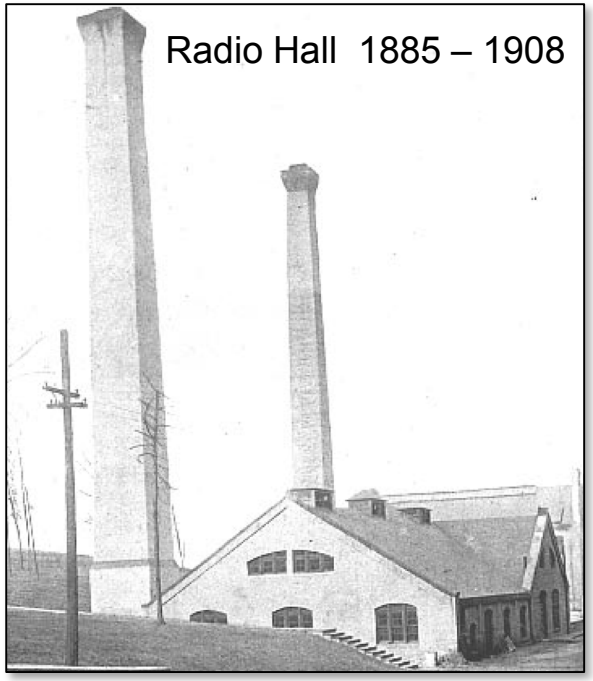
UEM Overview

- To support the UW-Madison FP&M mission by providing excellence in facilities and services for our university community in a safe, reliable and efficient manner.
- UEM operates and maintains a “District Energy” system that provides steam (heating), chilled water (cooling), compressed air (temperature control) and power to Campus, State and Federal facilities.
  - Definition: “When more than one building is connected to a common thermal energy generating source”.
  - District Energy has been around for over 130 years at UW-Madison.

UEM Overview

- Radio Hall 1885 – 1908
- Ag Bulletin 1899 – 1937
- Heating Plant 1908 – 1958





UEM Overview

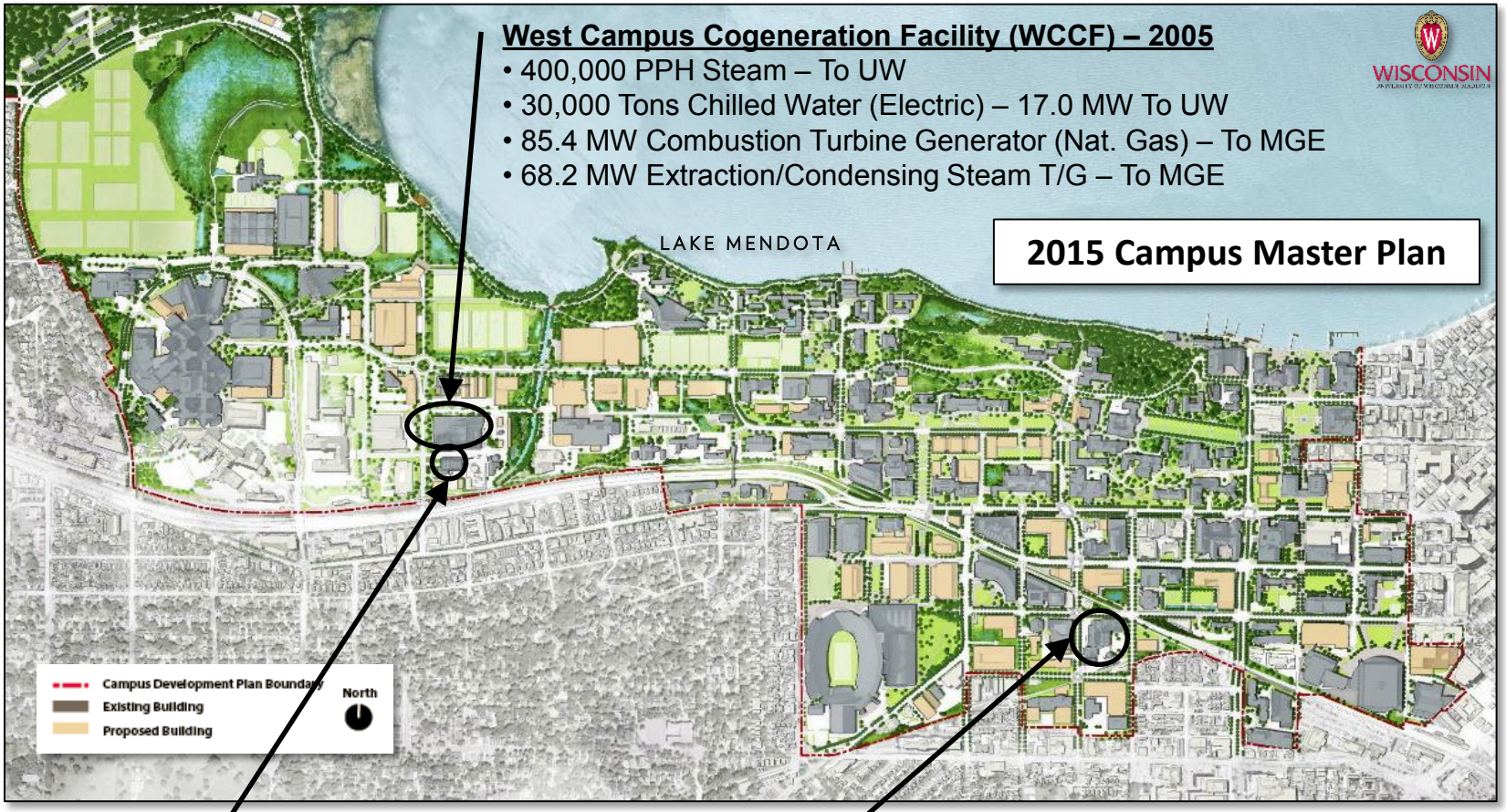
- Radio Hall 1887 – 1908
- Ag Bulletin 1889 – 1908
- Heating Plant 1908 – 1958
- Charter Street H&C Plant 1958 – Present
- Walnut Street H&C Plant 1975 – Present
- West Campus Cogeneration Facility 2005 – Present


Charter Street


Walnut Street


West Campus Cogeneration

UEM Overview

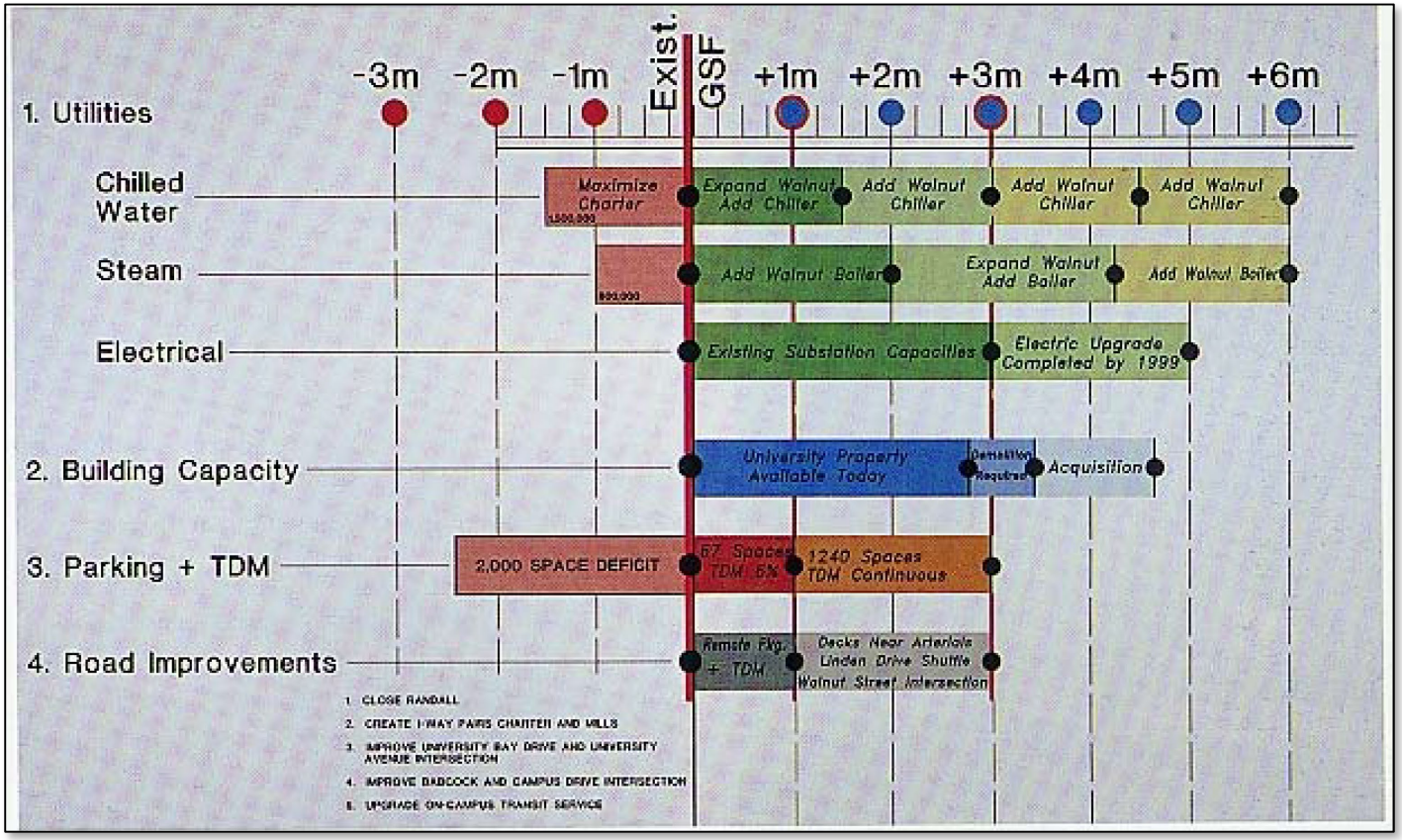


Walnut Street Heating Plant (WSHP) – 1975
- 600,000 PPH Steam (Nat. Gas)
- 11,200 Tons Chilled Water (Electric)
- 9,000 Tons Chilled Water (Steam)

Charter Street Heating Plant (CSHP) – 1958
- 1,200,000 PPH Steam (Nat. Gas)
- 25,000 Tons Chilled Water (Steam)
- 9.7 MW Back Pressure Steam Turbine Generator

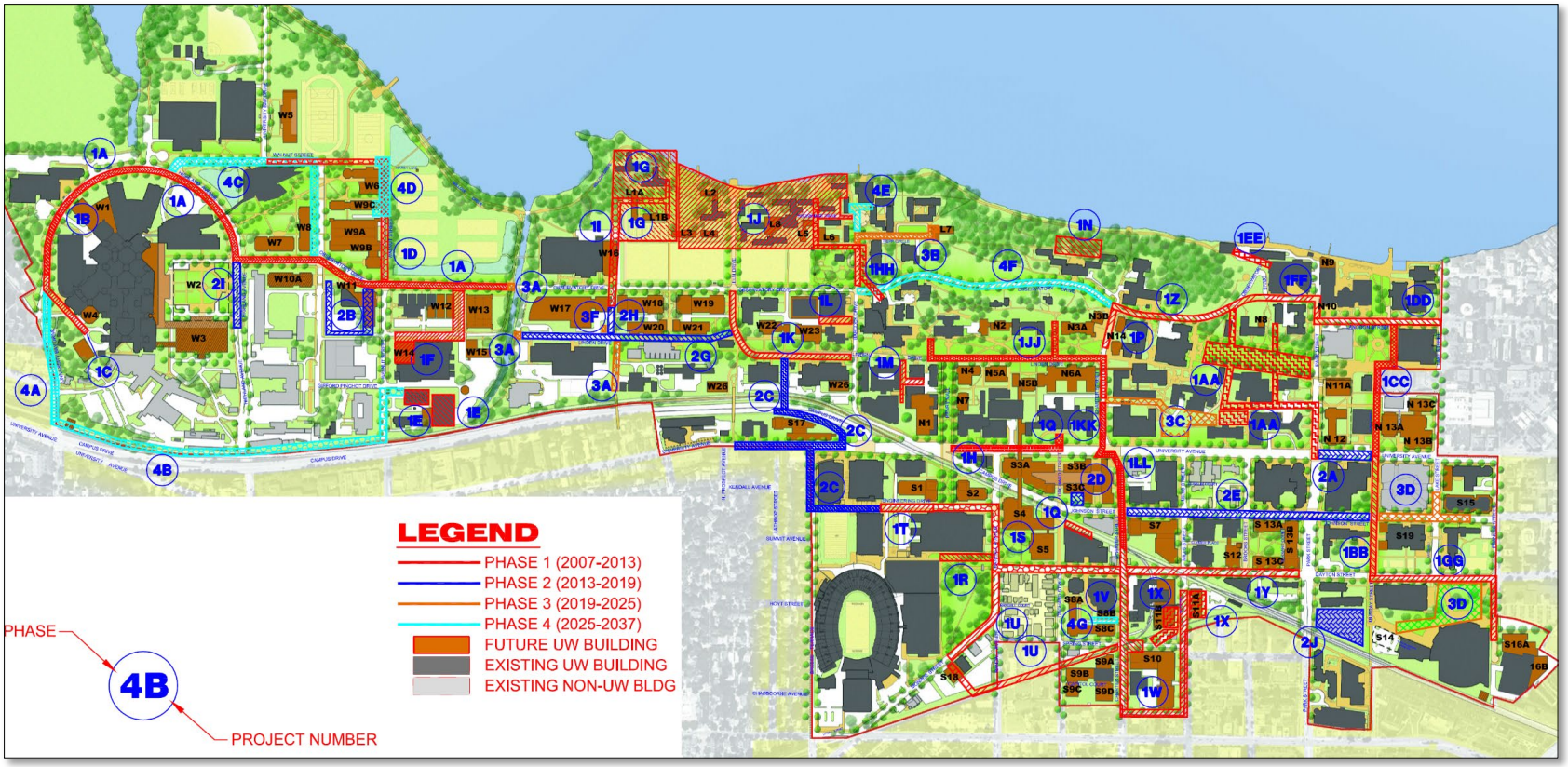
UEM Overview

- 1996 Master Plan – Resulting Utility Investment
  - Production $100,000,000.
  - Distribution $25,000,000.
  - Total $125,000,000.



UEM Overview

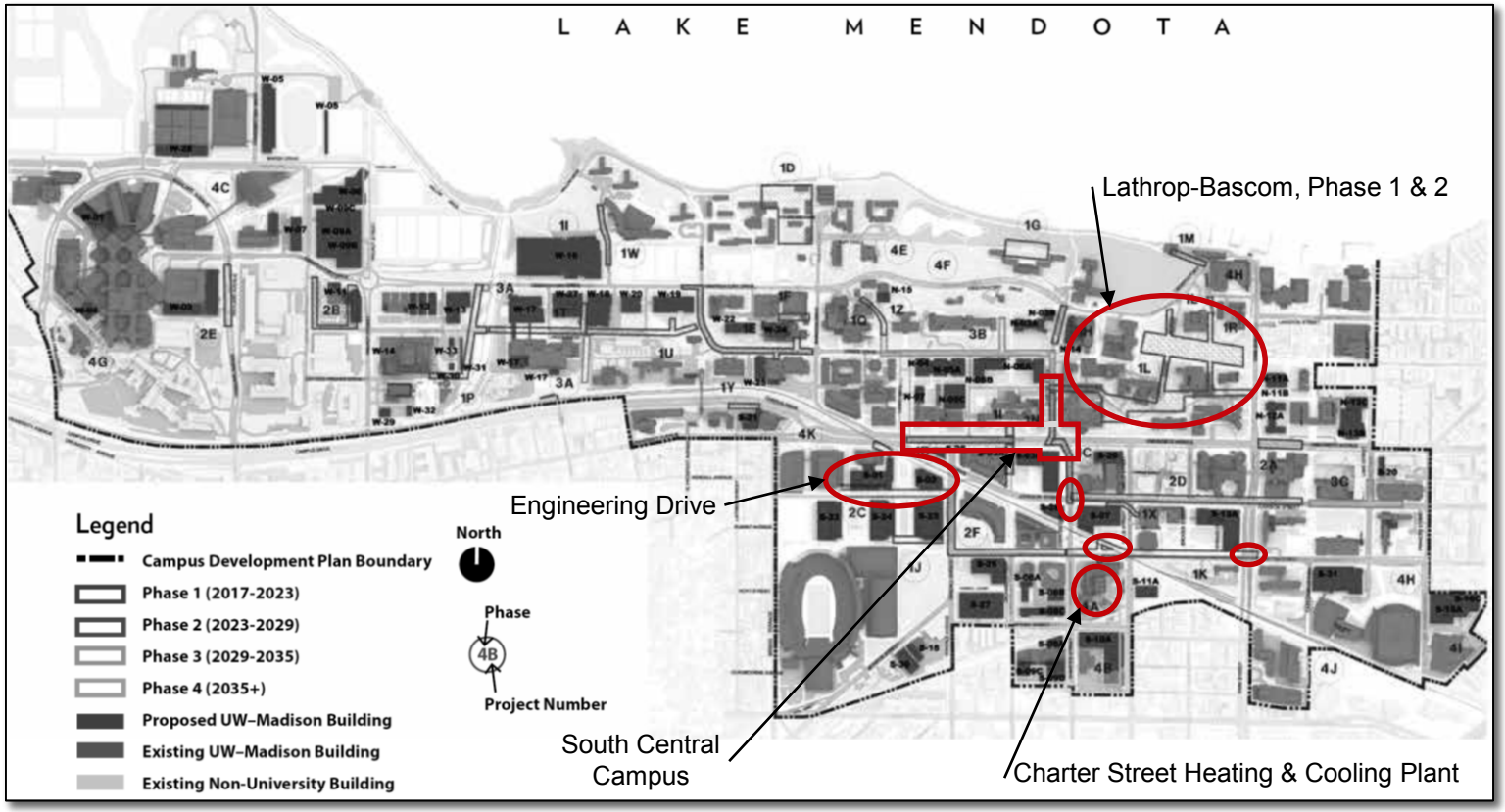
- 2005 Master Plan – Resulting Utility Investment
  - Production $265,000,000.
  - Distribution $90,000,000.
  - Total $355,000,000.



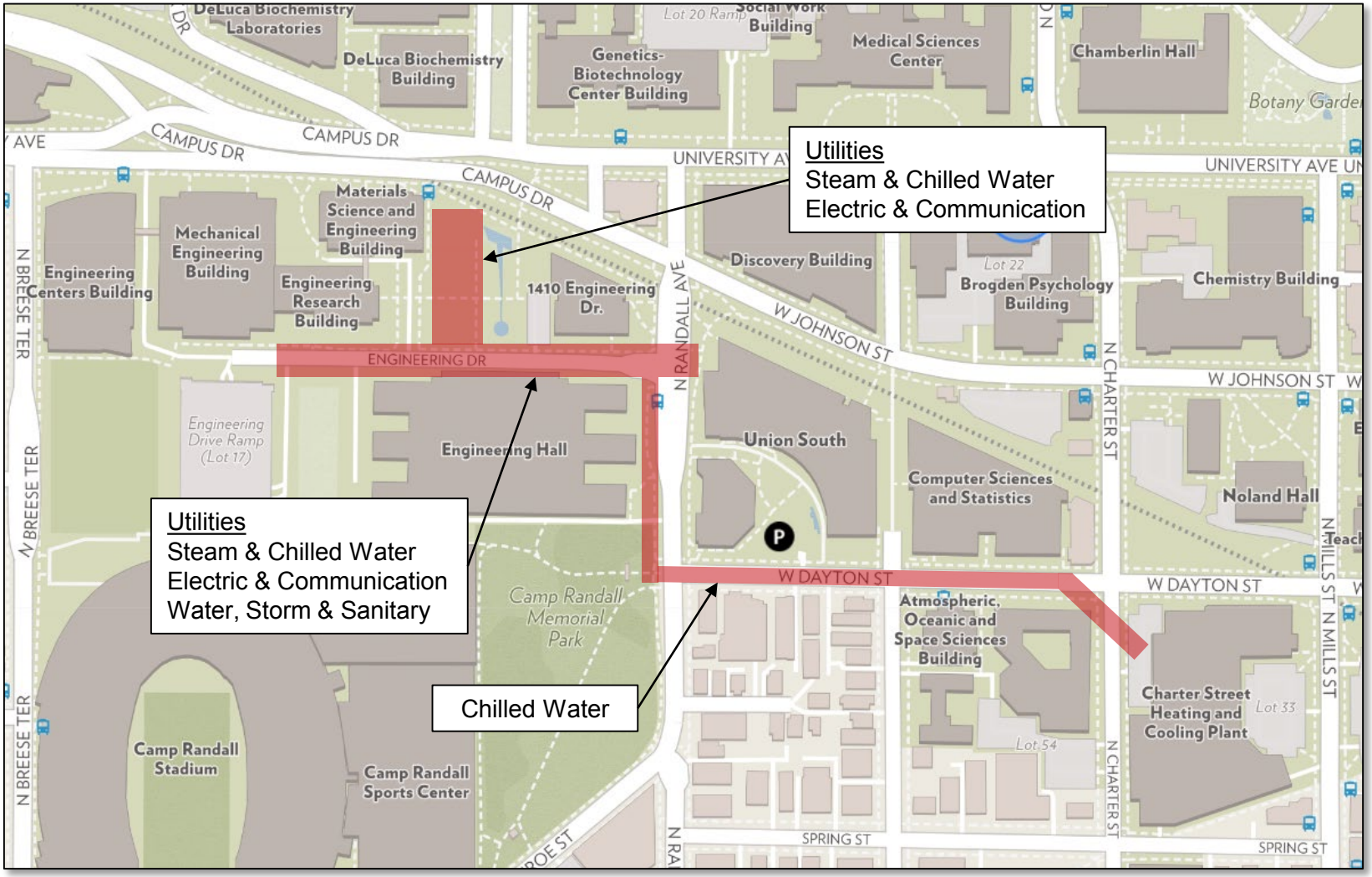
UEM Overview

- 2015 Master Plan – Resulting Utility Investment

	2015-2021	2021-2027 (Proposed)
• Production	$ 0.	$54,400,000.
• Distribution	$53,000,000.	$84,400,000.
• Total	$53,000,000.	$138,800,000.



Engineering Drive Utilities



Engineering Drive Utilities

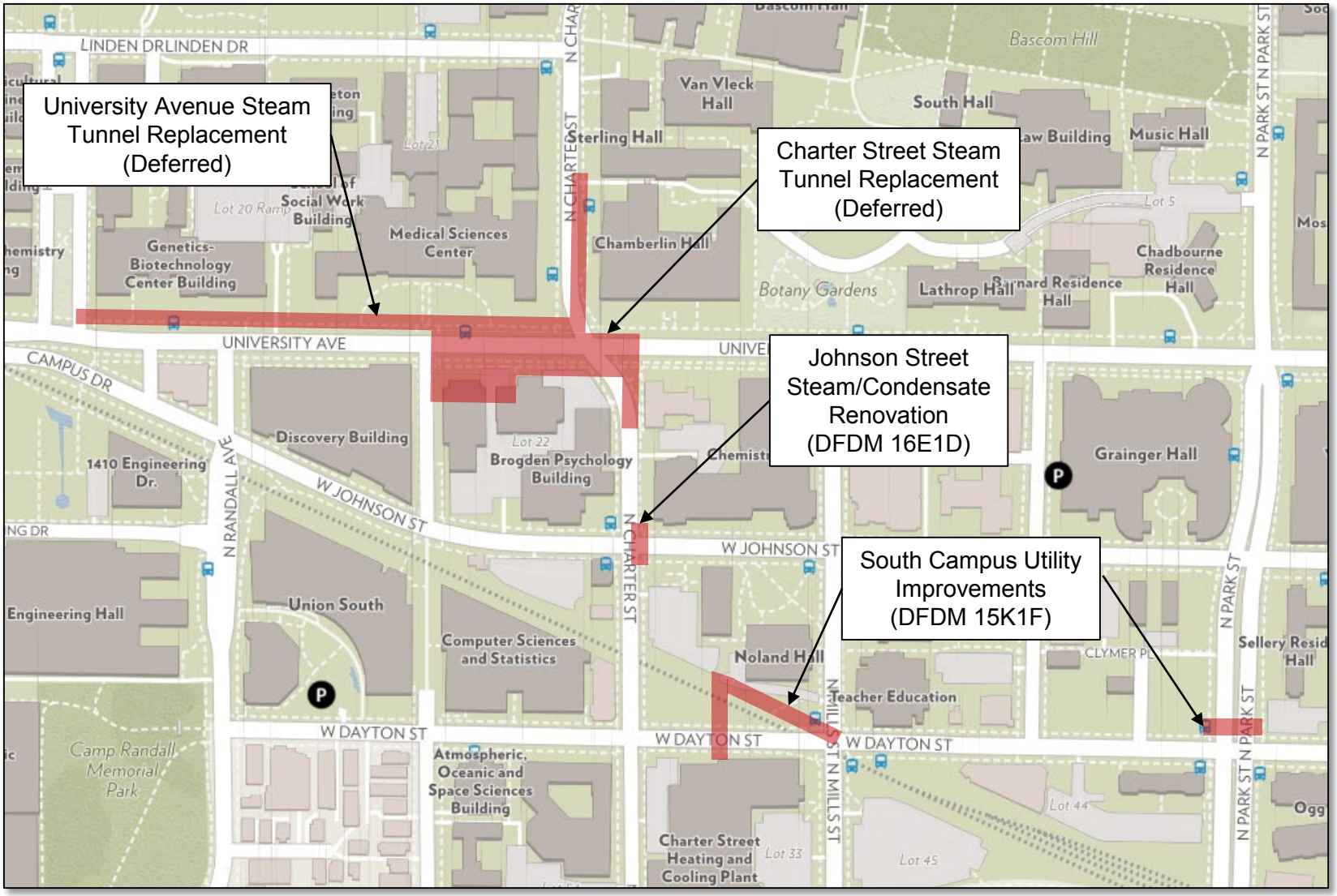
Proposed Biennium (2021-23) $29,764,000, $20,537,000 GSFB and $9,227,000 PRSB

- Recommended in both the 2005 and 2015 Utility Master Plans
- Supports the utility requirements identified in the College of Engineering Master Plan
  - Capacity
  - Utility location
- Utilities are 50-110 years old and at the end of their useful life

Impacts if not implemented:

- Reliability of service to the Engineering Campus and Athletic facilities
- Multiple future projects will be required to accommodate growth
- Continuity of power and communication
- Localize sewer backups will continue and increase with new facilities

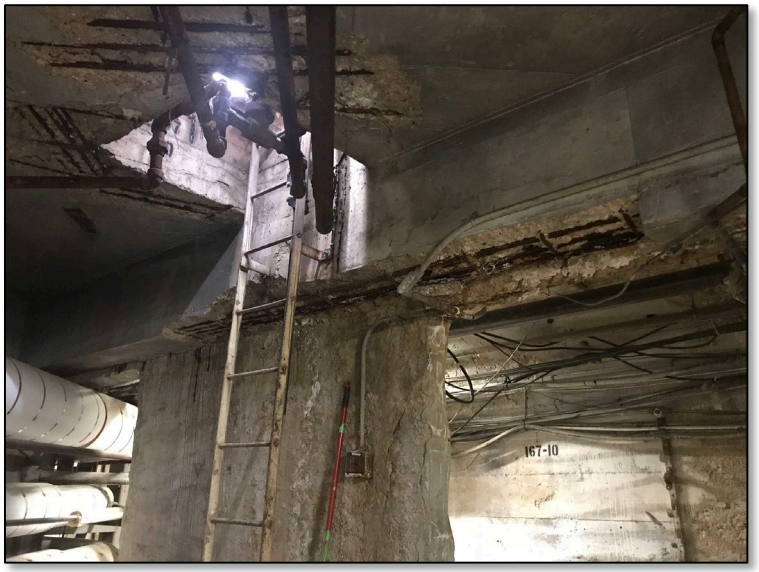
South Central Campus Steam Utility Replacement



South Central Campus Steam Utility Replacement

Proposed Biennium (2021-23) $54,589,000, $37,666,000 GSFB and $16,923,000 PRSB

- Recommended in both the 2005 and 2015 Utility Master Plans
- Concrete and rebar degradation along Charter Street and University Avenue
- Significant steam distribution corridor connecting east and west campus
- Utilities are 60-110 years old and at the end of their useful life
- Completes steam utility restoration at three other locations deferred due to funding limitations



Impacts if not implemented:

- Safety of tunnels for university staff
- Reliability and resiliency of steam distribution from the Charter Street Plant
- Multiple future projects will be required to address deficiencies

Charter Street Black Start and Generation Implementation

Proposed Biennium (2023-25) $54,334,000, GSFB/PRSB Split TBD

- “Black Start” – Ability to restart a utility plant after either a power failure or natural gas outage
- Deficiency identified during UWPD’s May 2018, Operation Dark Sky exercise
- Major components:
  - 5 kV emergency diesel generators
  - Propane backup ignition for boilers
  - Cooling tower addition for steam condensing
  - 20-25 MW of additional power production
- Increased efficiency and energy savings by cogenerating more than 30% of campus electrical needs

Impacts if not implemented:

- Resiliency of utility operations
- Life safety and property damage in a severe emergency
- Lost opportunity to reduce greenhouse gas emissions and energy costs

Connecting Strategic Plan to a Facilities Plan

Strategic Objectives

1. Provide excellence in facilities and services for our university community
2. Safe, reliable and efficient production and distribution of utilities
3. Stewardship
4. Campus Master Plan commitment to conservation, preservation, and sustainability

Major Project Priorities 2021-27

1. Engineering Drive Utilities
- Underground utilities
- $29,746,000
- Proposed Biennium (2021-23)

2. South Central Campus Steam Utility Replacement
- Underground utilities
- $54,589,000
- Proposed Biennium (2023-25)

3. Charter Street Black Start and Generation Implementation
- No new GSF required
- $54,334,000
- Proposed Biennium (2025-27)

Questions?