

WEST CAMPUS ENERGY PLANT

GLHN Architects & Engineers, Inc.

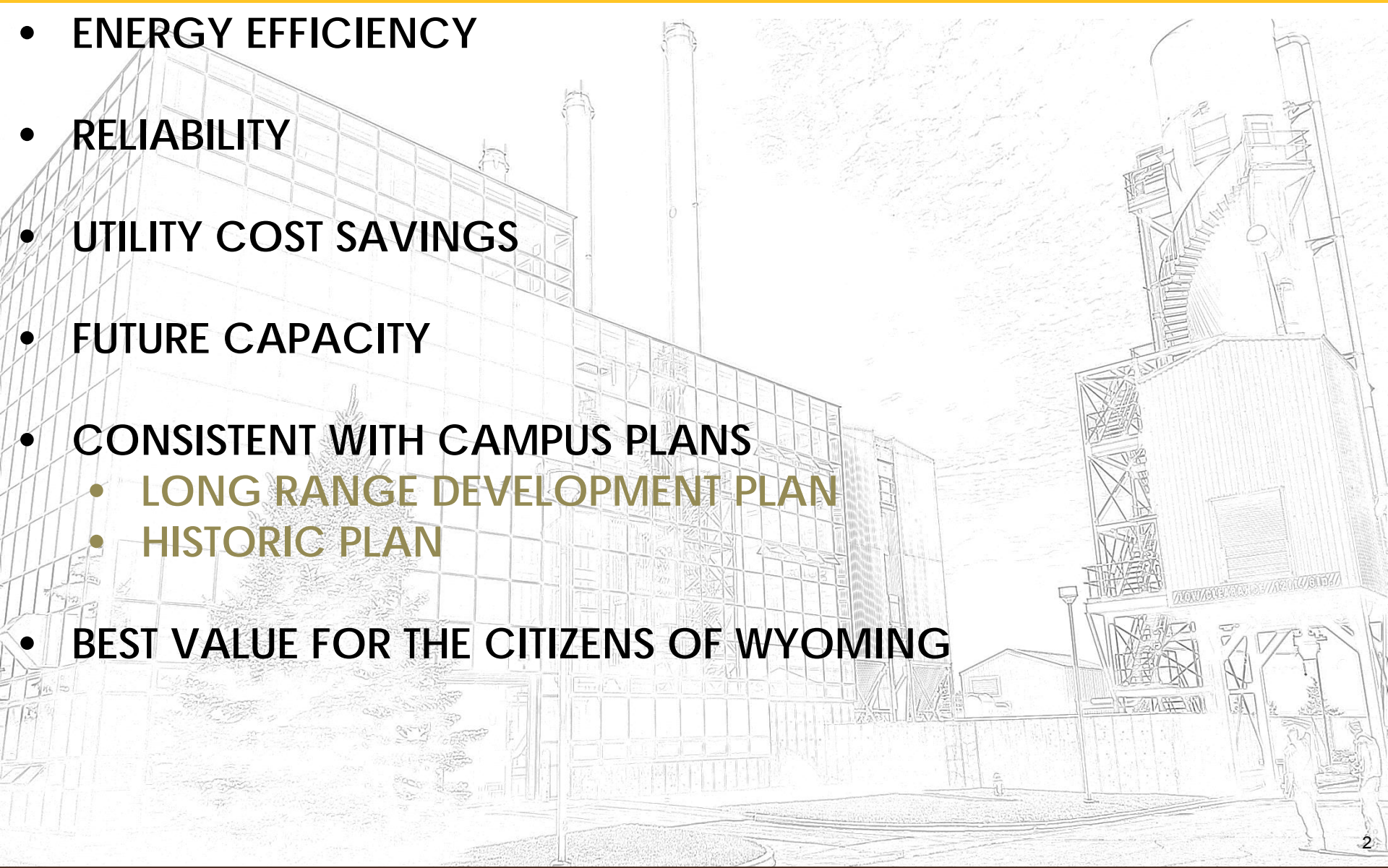


UNIVERSITY OF WYOMING



GUIDING PRINCIPLES

- ENERGY EFFICIENCY
- RELIABILITY
- UTILITY COST SAVINGS
- FUTURE CAPACITY
- CONSISTENT WITH CAMPUS PLANS
 - LONG RANGE DEVELOPMENT PLAN
 - HISTORIC PLAN
- BEST VALUE FOR THE CITIZENS OF WYOMING



CRITICAL ISSUES AT HAND

- **MEETING NEEDS OF THE NEAR TERM FUTURE BUILDINGS**
 - **ENGINEERING EDUCATION AND RESEARCH BUILDING (HW/CW)**
 - **SCIENCE INITIATIVE (HW/CW)**
 - **HIGH BAY RESEARCH FACILITY (ST/CW)**
- **MEET LONG TERM CAMPUS HEATING AND COOLING NEEDS**
 - **LRDP/UMP ESTIMATE 1-3% GROWTH PER YEAR**
 - **EXCEEDING CURRENT CAPACITY**
 - **EFFICIENT EQUIPMENT OPERATION**
 - **SECURING LONG TERM HEATING FUEL SOURCES (COAL/GAS)**
- **AGING INFRASTRUCTURE**

OVERALL PROCESS

- ✓ ANALYSIS OF FUTURE HEATING AND COOLING LOAD GROWTH
- ✓ DETERMINATION OF EXISTING CEP AND CAMPUS INFRASTRUCTURE CONDITION
- ✓ DETERMINE PLAUSIBLE CONCEPTS TO FULFILL GOALS
- ✓ DEVELOP OVERALL WORK SCOPES AND PROJECT COSTS
- ✓ PERFORM COMPARATIVE ECONOMIC ANALYSIS

TO DATE:

- ❑ IMPLEMENT SELECTED STRATEGY (DESIGN AND CONSTRUCTION)

CEP BOILER EQUIPMENT

- SURVEY OF EXISTING EQUIPMENT CONDITION
 - FINDINGS:
 - ✓ **WELL MAINTAINED**
 - ✓ **GREAT CONDITION** FOR BEING 36 YEARS OLD
 - ✓ UW **NOT IMPACTED** BY THE EPA'S CLEAN POWER PLAN



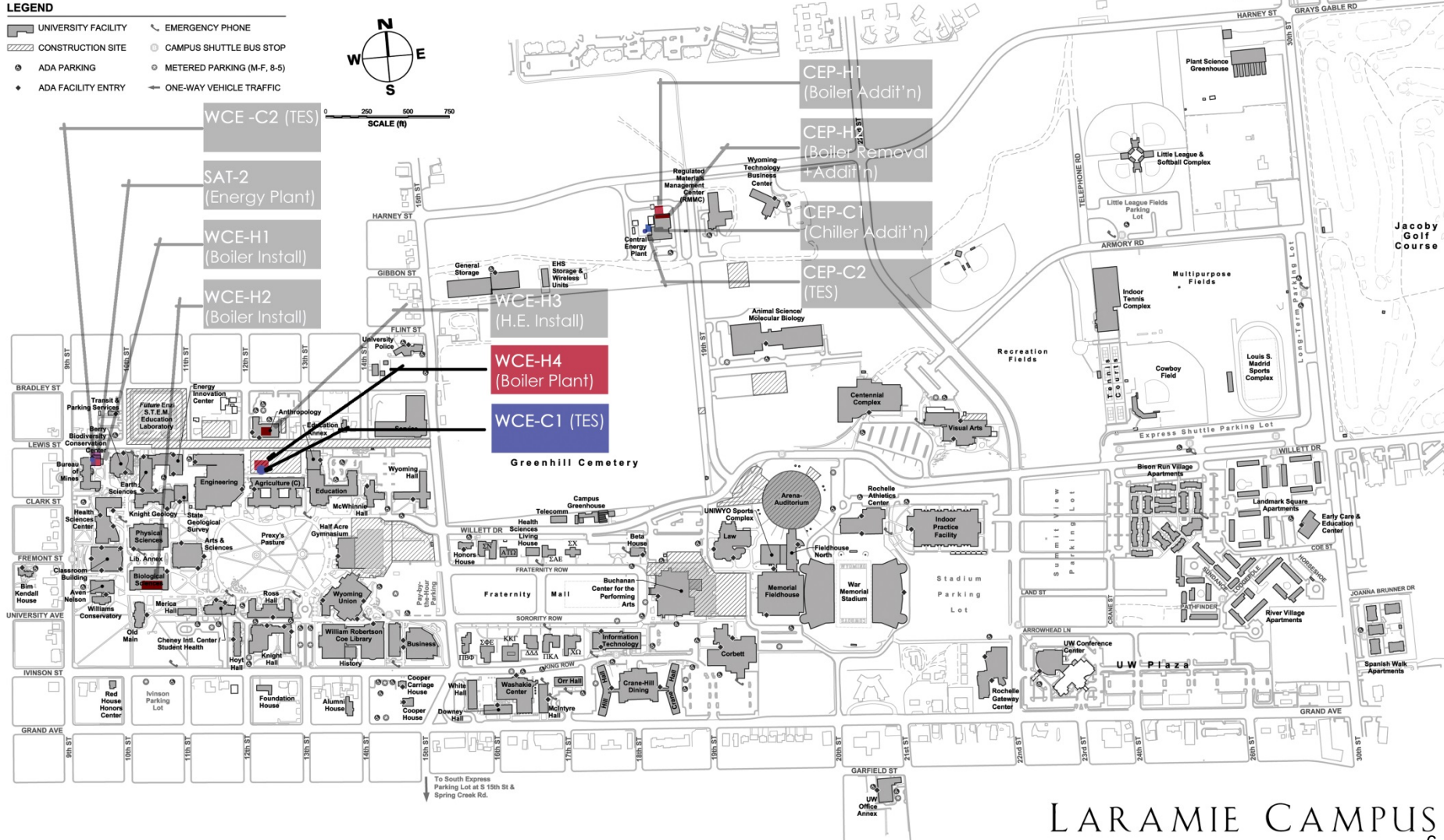
OPTION ANALYSIS

LEGEND

-  UNIVERSITY FACILITY
-  EMERGENCY PHONE
-  CONSTRUCTION SITE
-  CAMPUS SHUTTLE BUS STOP
-  ADA PARKING
-  METERED PARKING (M-F, 8-5)
-  ADA FACILITY ENTRY
-  ONE-WAY VEHICLE TRAFFIC



0 250 500 750
SCALE (ft)



CAMPUS HEATING ANALYSIS

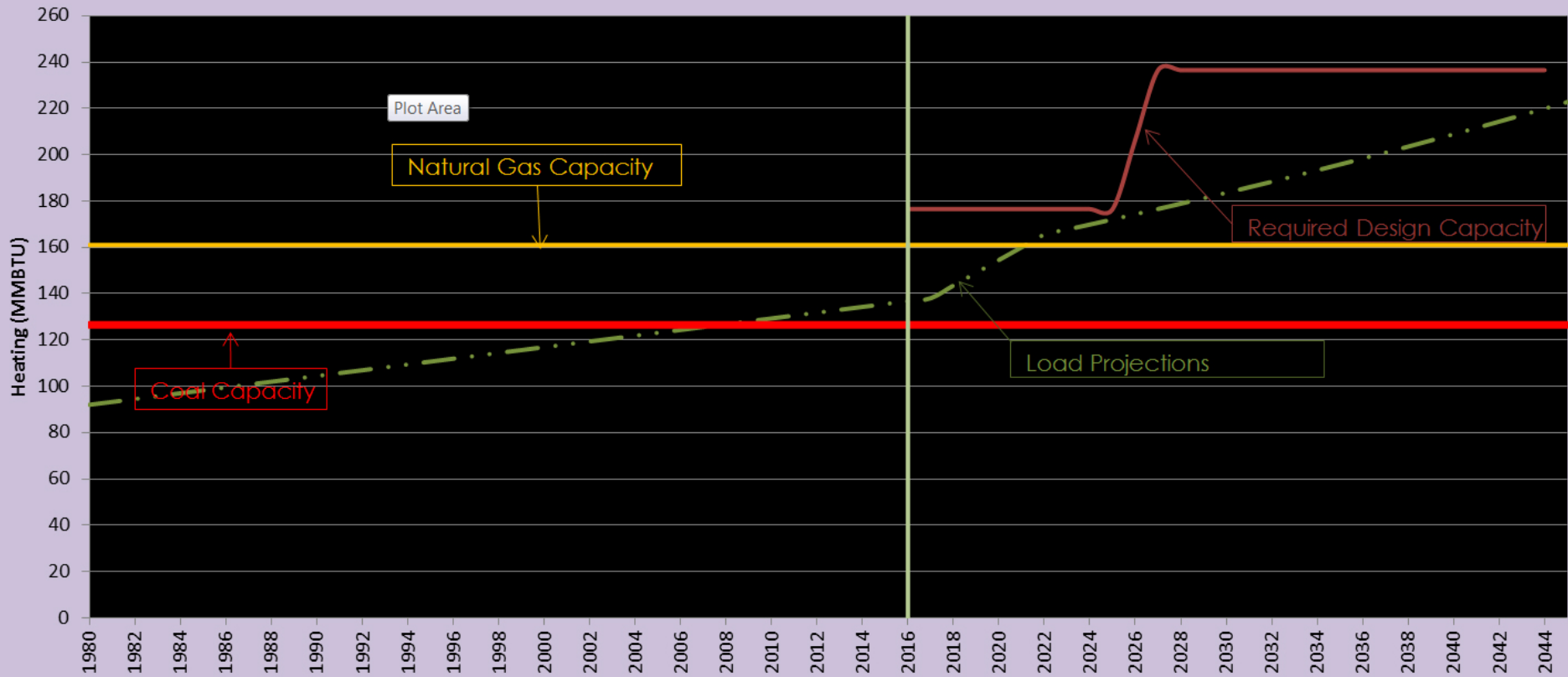
- HEATING DEMAND HAS REACHED **85%** OF DESIGN CAPACITY
- **QUALITY** COAL SUPPLY IS **UNRELIABLE**
- SIGNIFICANT **LOSSES** WITHIN WEST CAMPUS DISTRIBUTION SYSTEM
 - ~12% OF DESIGN CAPACITY
 - **~\$700K/YEAR LOSS**
- UNDERGROUND TUNNEL SYSTEM **DETERIORATING**
- **URGENCY TO ADDRESS**



HEATING ANALYSIS

MEETING FUTURE HEATING CAPACITY

CAMPUS HEATING LOAD



CHILLED WATER ANALYSIS

MEETING FUTURE CHILLED WATER CAPACITY

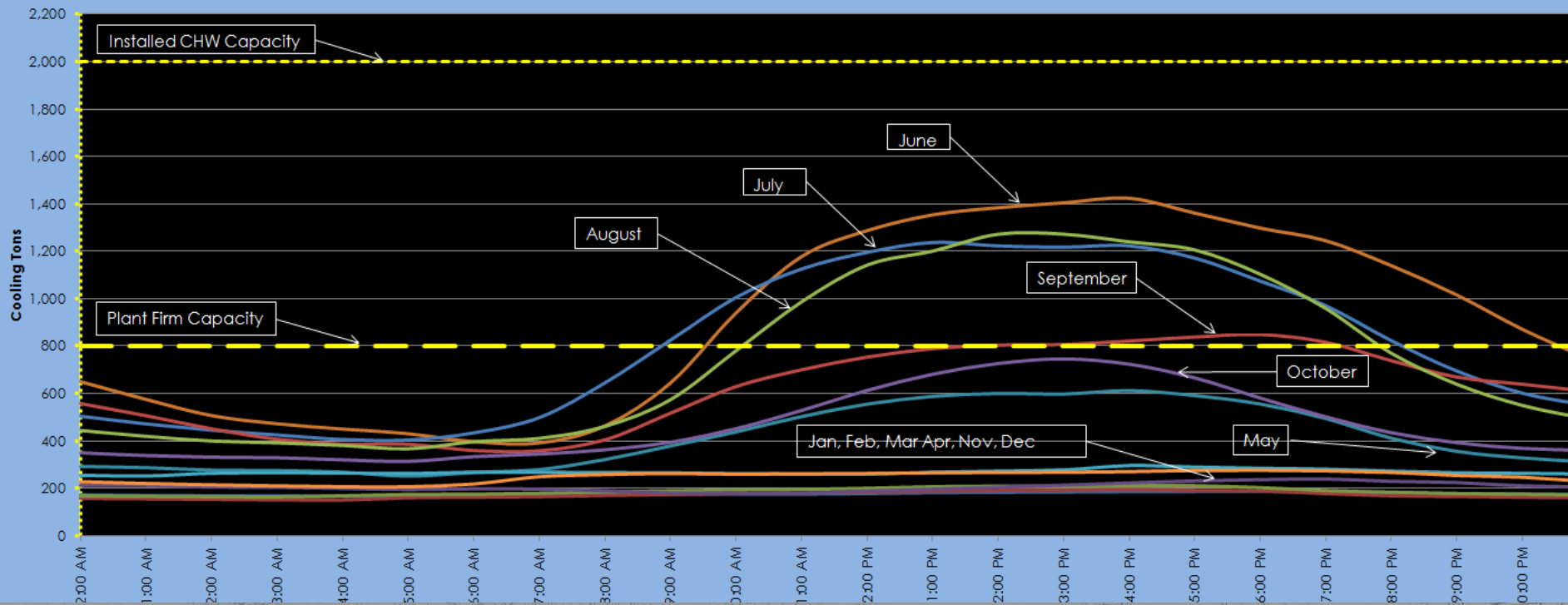
CHILLED WATER LOADS



THERMAL ENERGY STORAGE

- THERMAL ENERGY STORAGE (TES) OPTION
 - ADDITION OF A THERMAL ENERGY STORAGE TANK AND PUMPS
 - OFF PEAK LOAD SHEDDING

EXISTING AVERAGE CHILLED WATER LOAD BY MONTH



CONCEPT SELECTION

RECOMMENDATIONS FOR THE UNIVERSITY

- RETROFIT COAL BOILERS TO ACCEPT A **WIDER VARIETY OF COAL** SUPPLY (UNDERTHROW)
- TRANSITION TO A **HIGHLY EFFICIENT HOT WATER SYSTEM** WITH STEAM BACKUP
- **WEST CAMPUS HEATING/COOLING PLANT** (NORTH OF THE AGRICULTURE BUILDING)
- IMPLEMENTATION OF A CHILLED WATER **THERMAL ENERGY STORAGE (TES)** SYSTEM
- REMOVAL OF **POOR SECTIONS** OF STEAM PIPING/TUNNEL



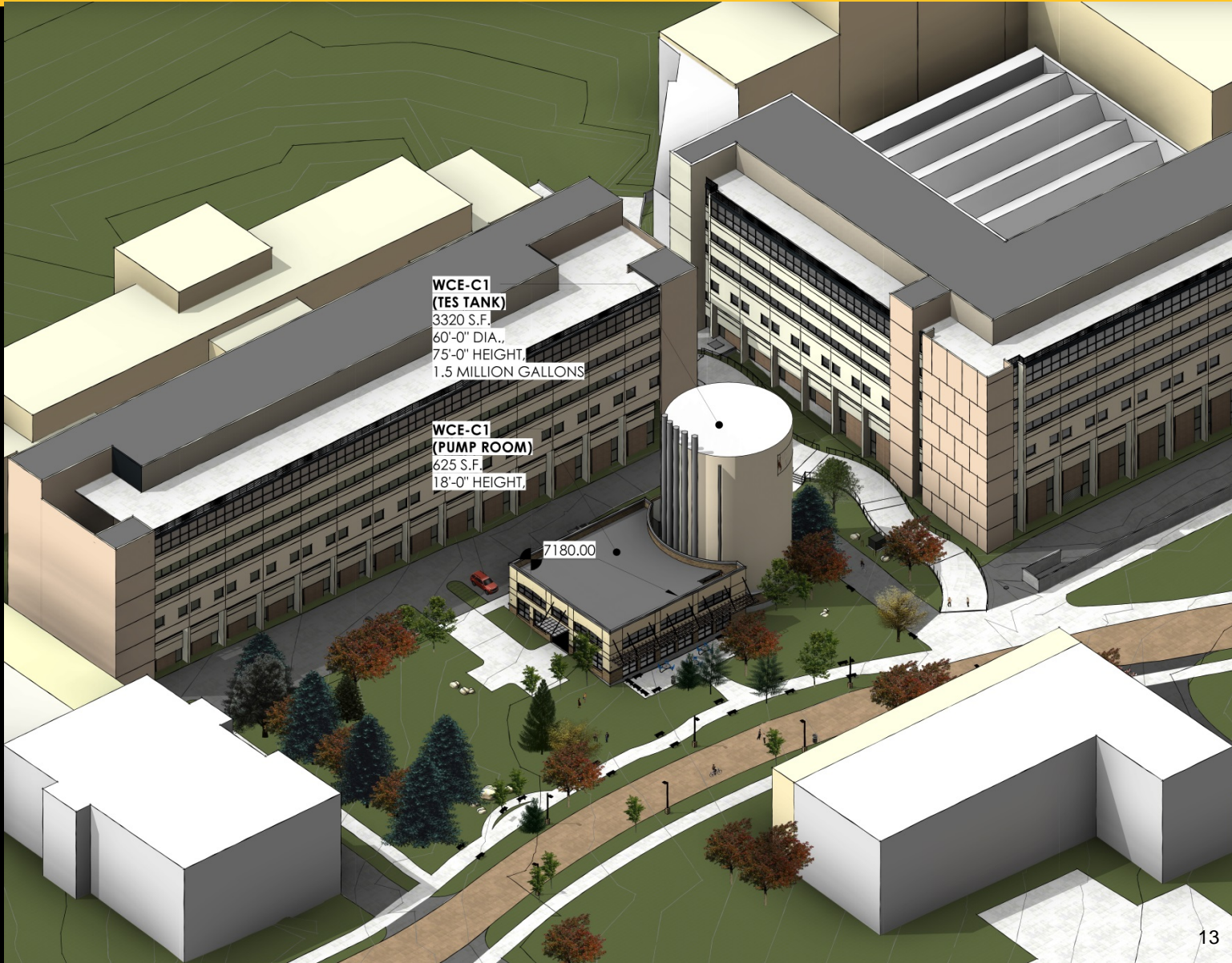
NEW WEST CAMPUS PLANT

WEST CAMPUS HEATING/COOLING PLANT. A GREAT POTENTIAL FOR **STUDENT INTERACTION AND LEARNING**

- CLOSE PROXIMITY TO ENGINEERING FACILITIES
- CAN IMPLEMENT A LARGE DASHBOARD WITH **REAL TIME OPERATION DATA**
- WINDOW WALL FOR VIEWING PURPOSES
- **STUDENT TOURS**



PROPOSED SOLUTION



PROPOSED SOLUTION



PROPOSED SOLUTION



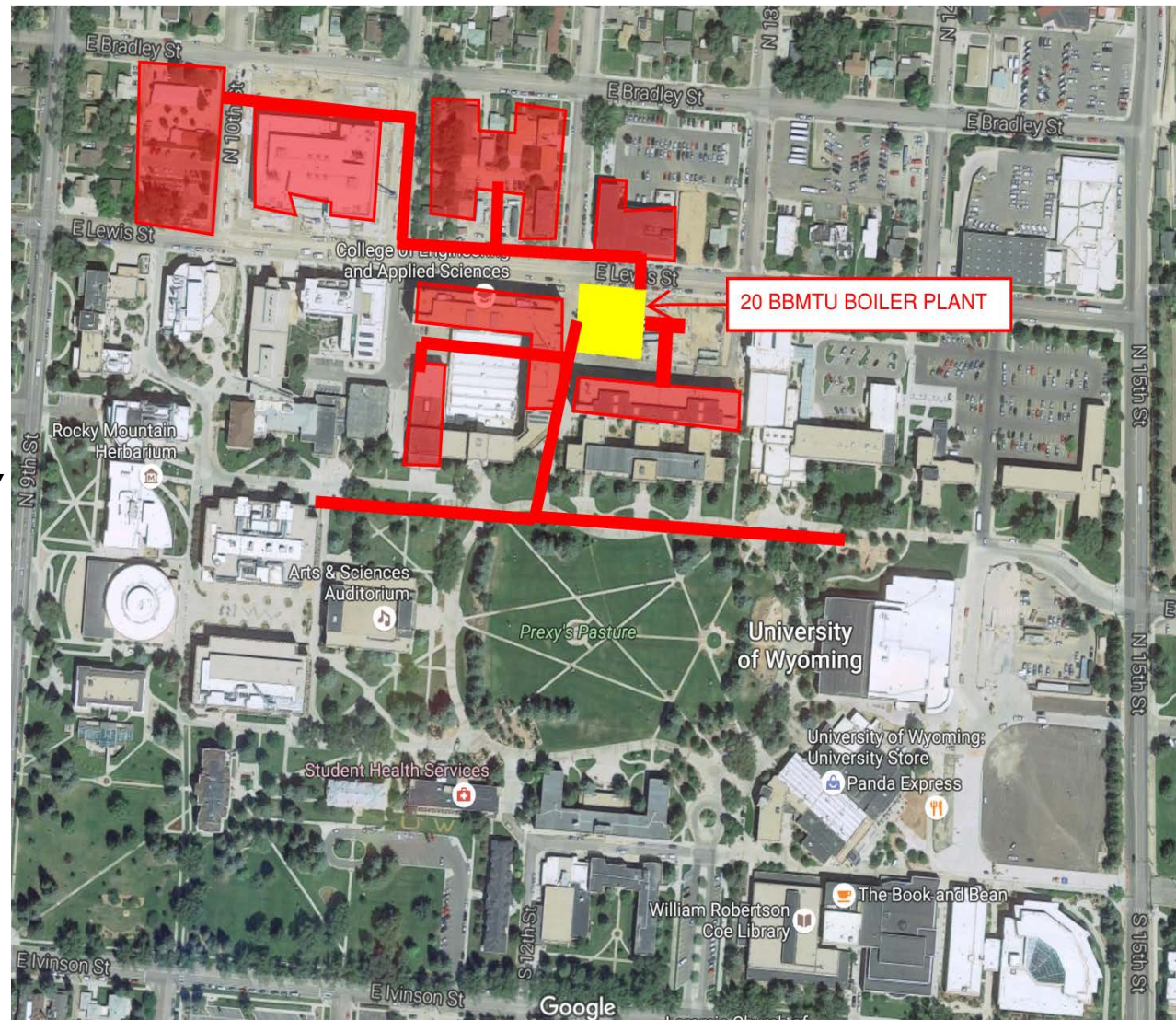
PROPOSED SOLUTION



WEST CAMPUS-HW DISTRIBUTION-BASE

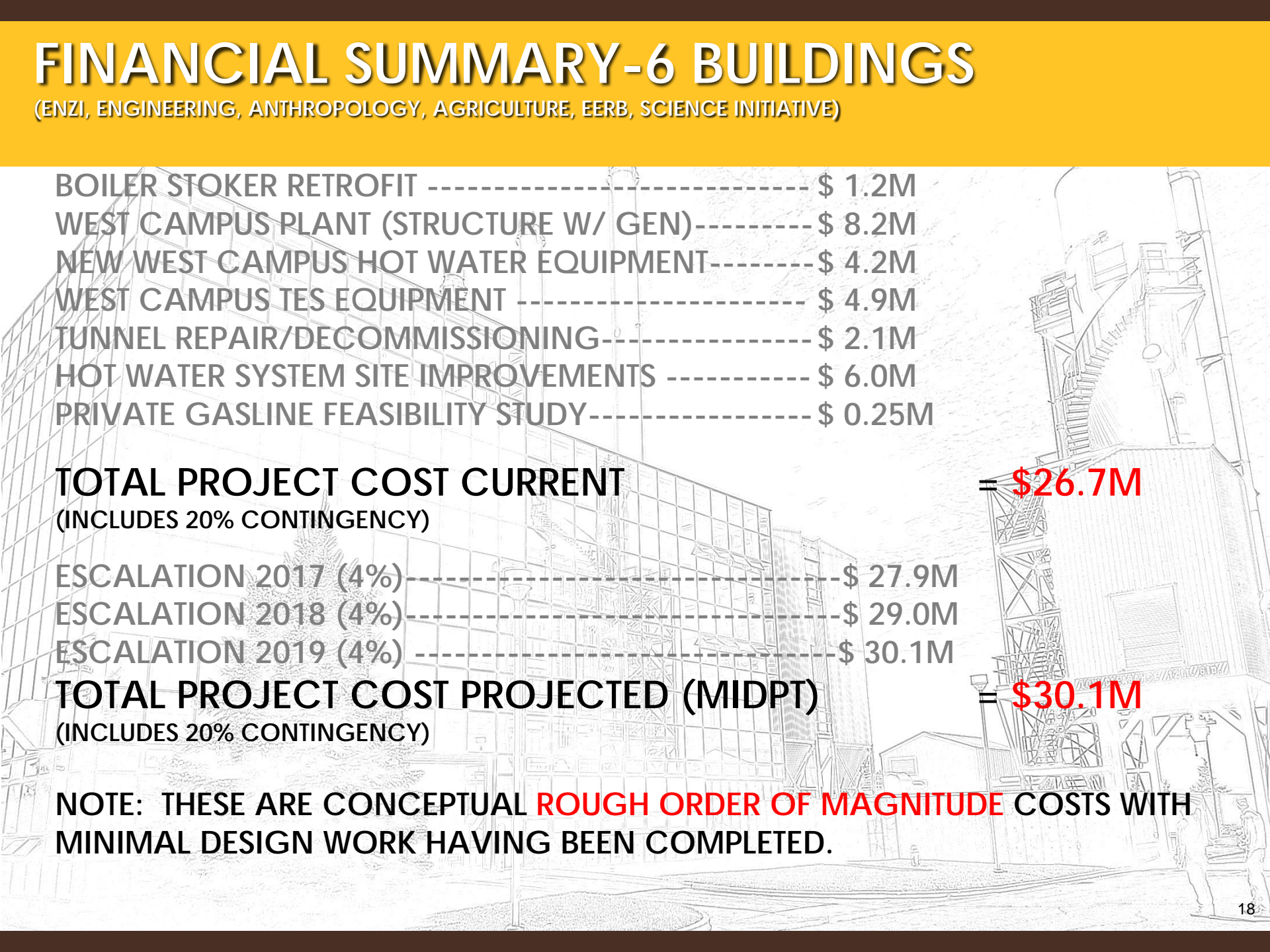
BASE BUILDINGS:

- SCIENCE INITIATIVE
- ENZI S.T.E.M.
- EERB
- ANTHROPOLOGY
- ENGINEERING ADDITION & PETROLEUM WING
- AG C ADDITION



FINANCIAL SUMMARY-6 BUILDINGS

(ENZI, ENGINEERING, ANTHROPOLOGY, AGRICULTURE, EERB, SCIENCE INITIATIVE)



BOILER STOKER RETROFIT -----	\$ 1.2M
WEST CAMPUS PLANT (STRUCTURE W/ GEN)-----	\$ 8.2M
NEW WEST CAMPUS HOT WATER EQUIPMENT-----	\$ 4.2M
WEST CAMPUS TES EQUIPMENT -----	\$ 4.9M
TUNNEL REPAIR/DECOMMISSIONING-----	\$ 2.1M
HOT WATER SYSTEM SITE IMPROVEMENTS -----	\$ 6.0M
PRIVATE GASLINE FEASIBILITY STUDY-----	\$ 0.25M

TOTAL PROJECT COST CURRENT

(INCLUDES 20% CONTINGENCY)

= **\$26.7M**

ESCALATION 2017 (4%)-----	\$ 27.9M
ESCALATION 2018 (4%)-----	\$ 29.0M
ESCALATION 2019 (4%)-----	\$ 30.1M

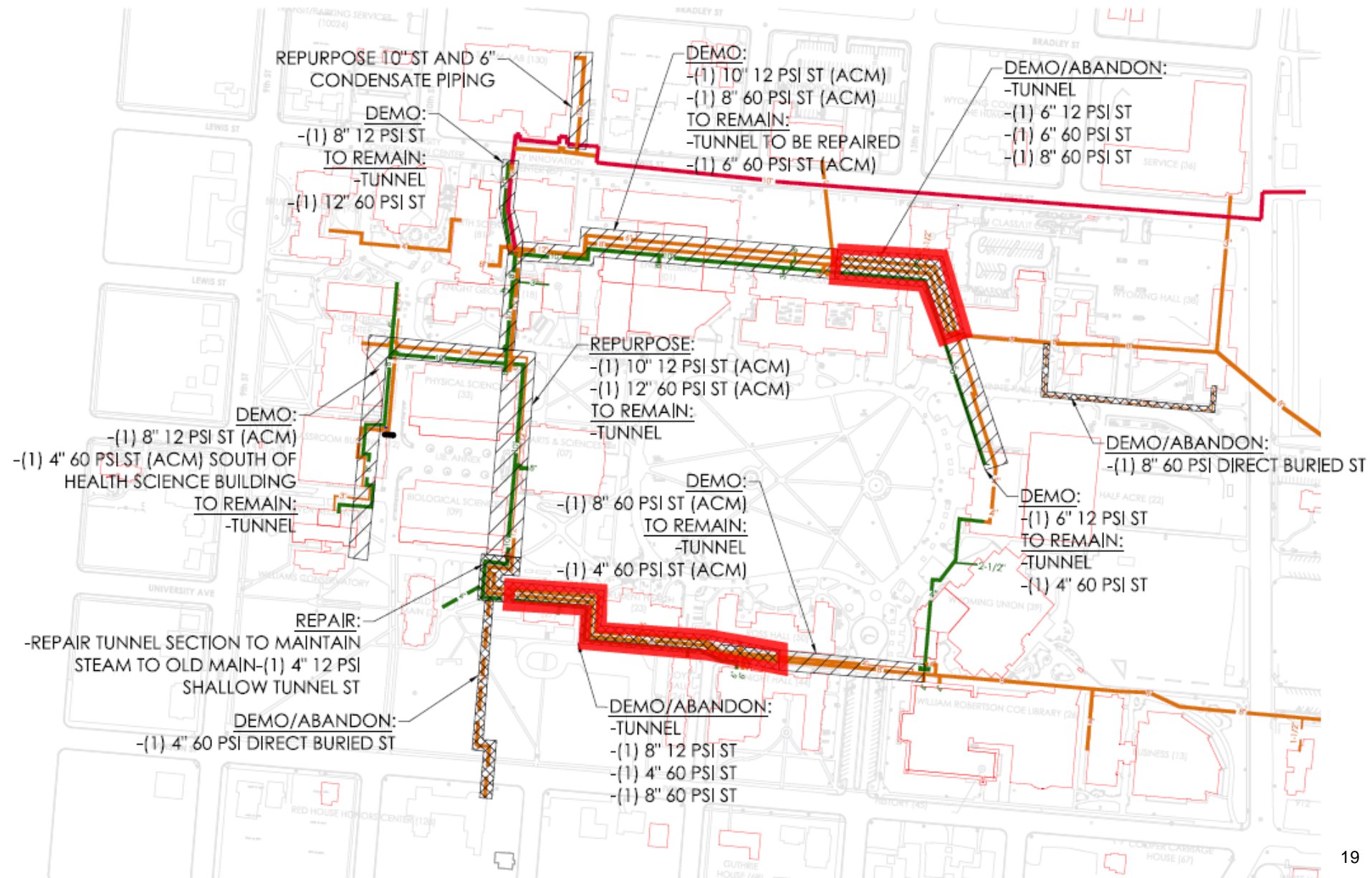
TOTAL PROJECT COST PROJECTED (MIDPT)

(INCLUDES 20% CONTINGENCY)

= **\$30.1M**

NOTE: THESE ARE CONCEPTUAL **ROUGH ORDER OF MAGNITUDE** COSTS WITH MINIMAL DESIGN WORK HAVING BEEN COMPLETED.

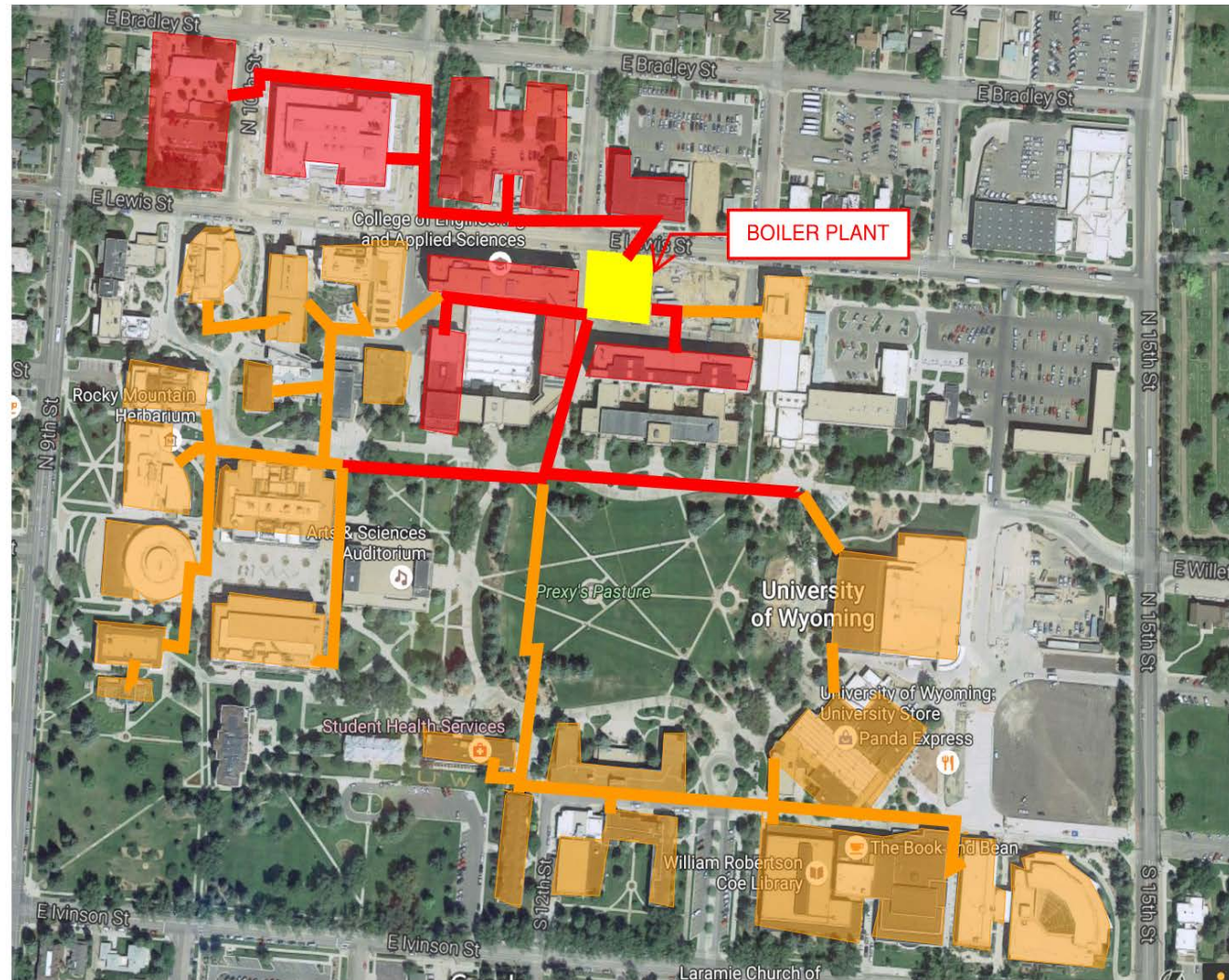
TUNNEL CONDITION



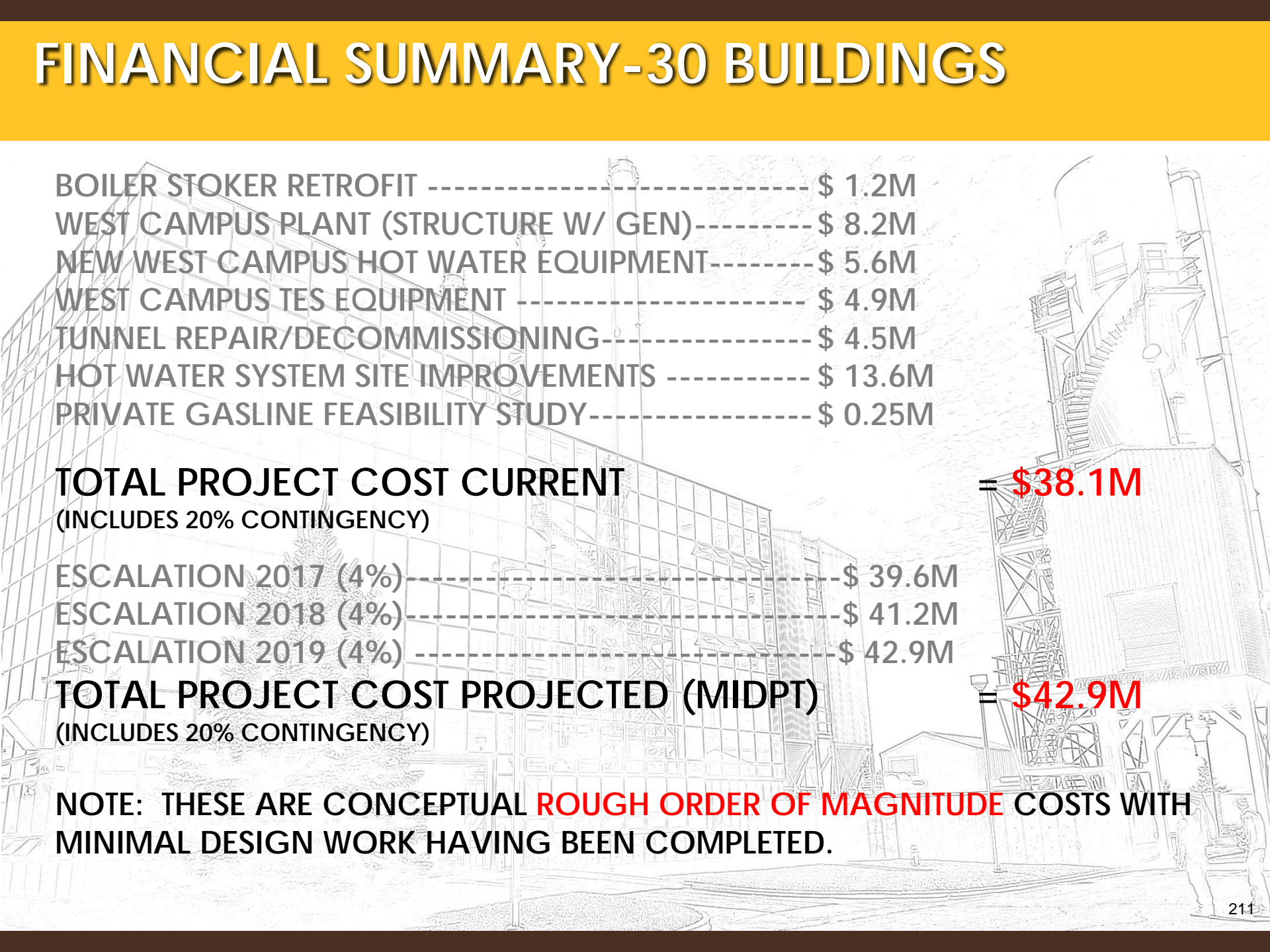
WEST CAMPUS-HW DISTRIBUTION-30 BUILDINGS

24 ADDITIONAL BUILDINGS:

- EIC
- BERRY
- EARTH SCIENCES
- OLD GEOLOGY (partial)
- PHARMACY
- HEALTH SCIENCES
- CLASSROOM
- AVEN NELSON
- CONSERVATORY
- PHYSICAL SCIENCES
- BIO SCIENCES
- GEO SURVEY
- HALF ACRE
- STUDENT UNION (partial)
- BUSINESS(2)
- ILLC (3)
- ROSS
- KNIGHT HALL (partial)
- HOYT
- STUDENT HEALTH
- ED ANNEX



FINANCIAL SUMMARY-30 BUILDINGS



BOILER STOKER RETROFIT -----	\$ 1.2M
WEST CAMPUS PLANT (STRUCTURE W/ GEN)-----	\$ 8.2M
NEW WEST CAMPUS HOT WATER EQUIPMENT-----	\$ 5.6M
WEST CAMPUS TES EQUIPMENT -----	\$ 4.9M
TUNNEL REPAIR/DECOMMISSIONING-----	\$ 4.5M
HOT WATER SYSTEM SITE IMPROVEMENTS -----	\$ 13.6M
PRIVATE GASLINE FEASIBILITY STUDY-----	\$ 0.25M

TOTAL PROJECT COST CURRENT

(INCLUDES 20% CONTINGENCY)

= **\$38.1M**

ESCALATION 2017 (4%)-----

\$ 39.6M

ESCALATION 2018 (4%)-----

\$ 41.2M

ESCALATION 2019 (4%)-----

\$ 42.9M

TOTAL PROJECT COST PROJECTED (MIDPT)

(INCLUDES 20% CONTINGENCY)

= **\$42.9M**

NOTE: THESE ARE CONCEPTUAL **ROUGH ORDER OF MAGNITUDE** COSTS WITH MINIMAL DESIGN WORK HAVING BEEN COMPLETED.

MOVING FORWARD

WHAT IS NEEDED TO MOVE FORWARD?

- **CONCEPT CONFIRMATION**
- **UNIVERSITY/BOARD OF TRUSTEES BACKING**
- **PROJECT FUNDING**

ANTICIPATED PROJECT SCHEDULE

- **NEED TO MOVE QUICKLY**

PROPOSED PROJECT PHASING AND PRELIMINARY SCHEDULE

ITEM	YEAR	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5		YEAR 6	
		Jan-17	Jul-17	Jan-18	Jul-18	Jan-19	Jul-19	Jan-20	Jul-20	Jan-21	Jul-21	Jan-22	Jul-22
COMPLETE DESIGN/PERMITTING	2018												
CEP BOILER IMPROVEMENTS (STOKERS)	-												
CONSTRUCTION OF BOILER PLANT	-												
CONSTRUCTION OF TES SYSTEM	-												
TUNNEL IMPROVEMENTS	-												
BASE MINIMUM HW SITE IMPROVEMENTS	-												
HOT WATER SITE IMPROVEMENTS	-												
HOT WATER BUILDING CONVERSIONS	-												
NATURAL GAS SUPPLY	2020												
TES SYSTEM ONLINE	2021												
NEW BOILER PLANT ONLINE	2020												

MOVING FORWARD



END OF PRESENTATION