



# CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16





# Modernizing Utilities while Expanding a Campus



University of  
Pittsburgh

March 2021



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BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

# AGENDA



## University of Pittsburgh

- ▶ Overview
- ▶ Campus Growth
- ▶ Effects of Growth
- ▶ Solutions

# OVERVIEW



## University of Pittsburgh

### ► Oakland Campus

- Enrollment: 28,000 Students
- 3 Chilled Water Plants
- Installed CHW Tonnage
  - 33,000 TOTAL

	PLANT	TONS
PITT	POSVAR	12,800
	PETERSEN	5,200
UPMC	BST	15,000



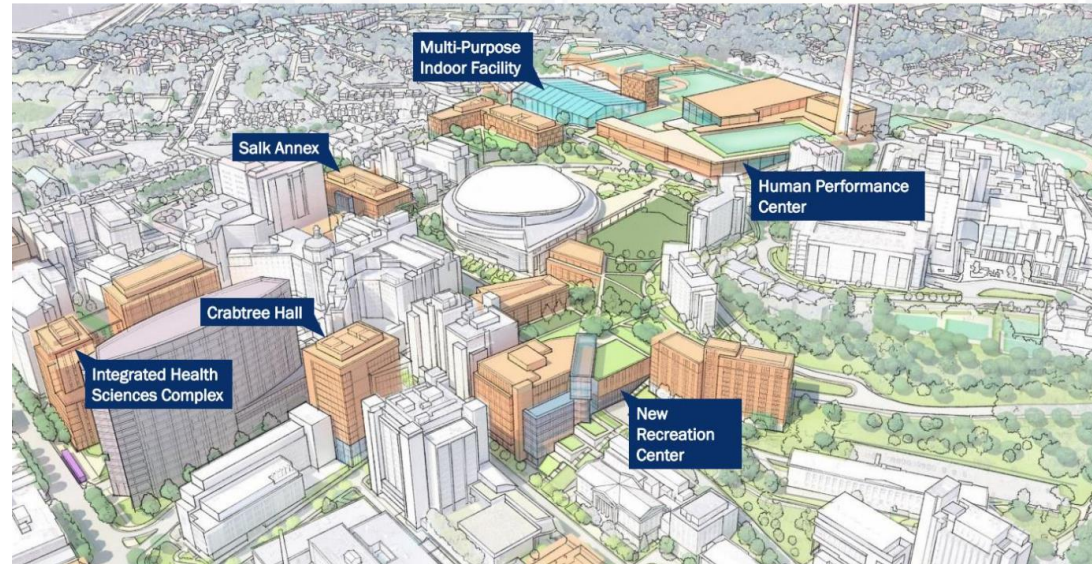
# OVERVIEW



# University of Pittsburgh

## ▶ CHW PROGRAM

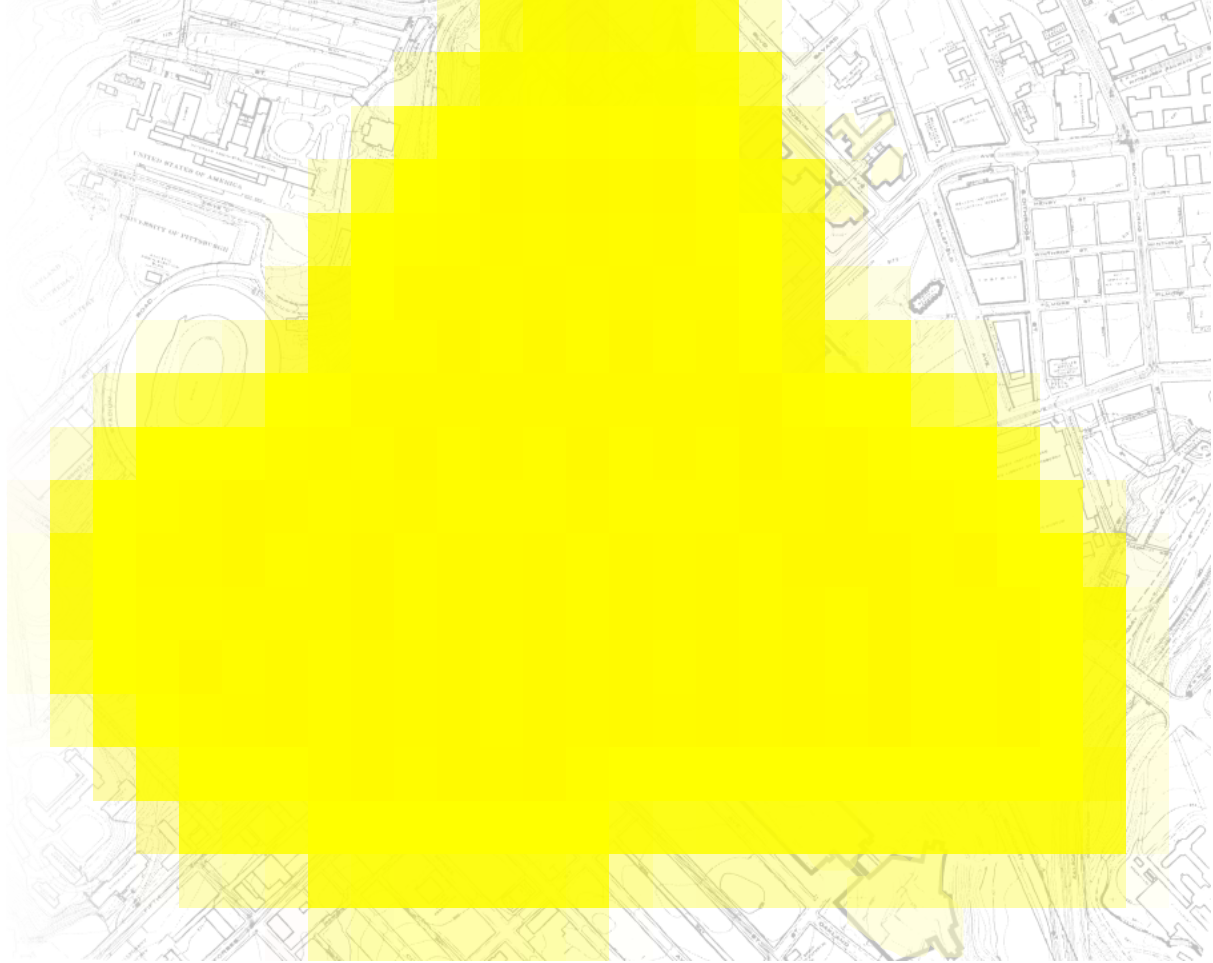
- NEW CHILLED WATER PLANT
  - 15,000 TONS
- RENOVATIONS TO EXISTING CHILLED WATER PLANT
  - OPERATIONAL AND EFFICIENCY IMPROVEMNTS
- EXTENSIVE CHW & RWC
- DISTRIBUTION PIPING



# CAMPUS GROWTH

## ► Original Campus CHW Plan

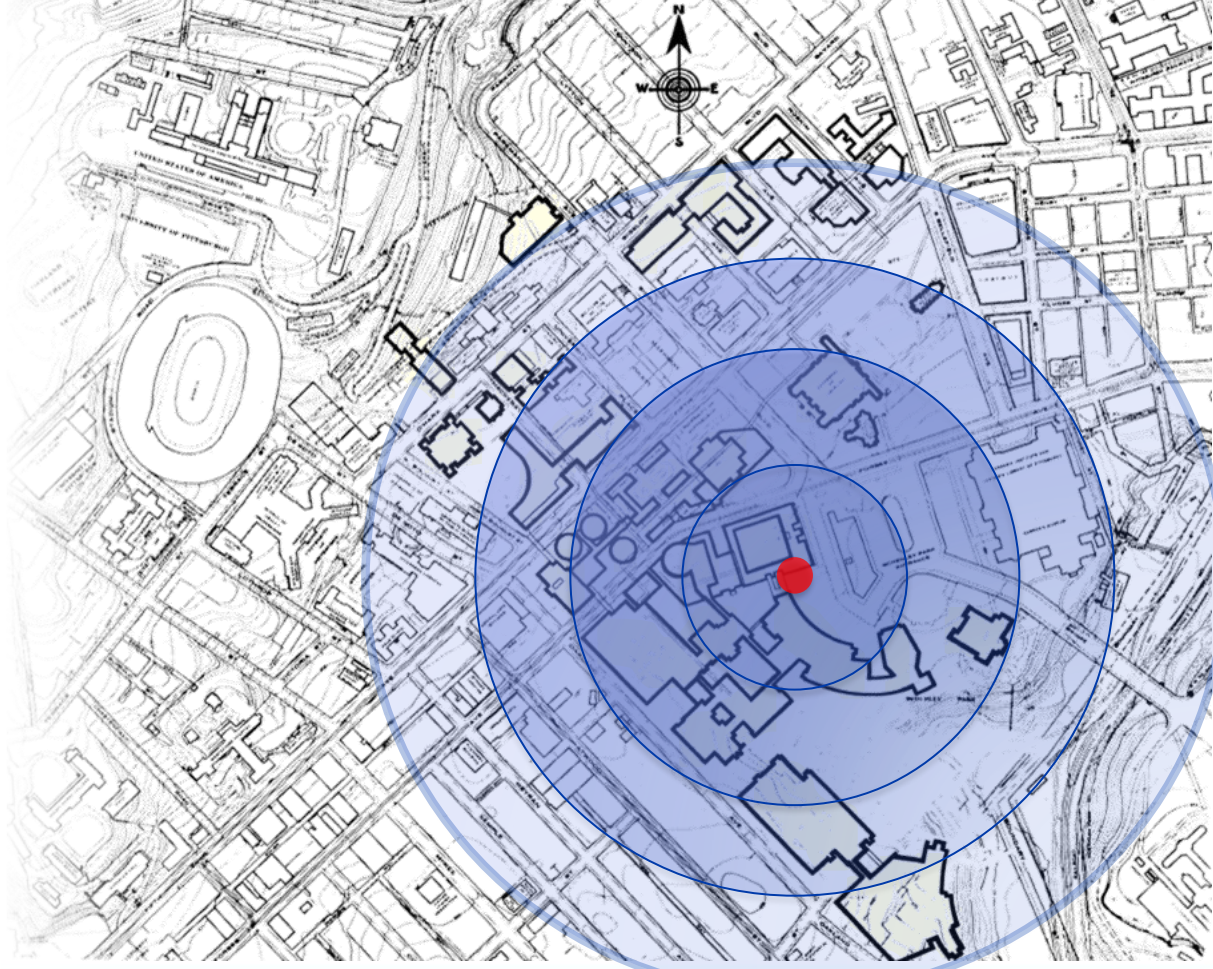
- CHW Plant designed to be in the center of the loads (1962)



# CAMPUS GROWTH

## ► Original Campus CHW Plan

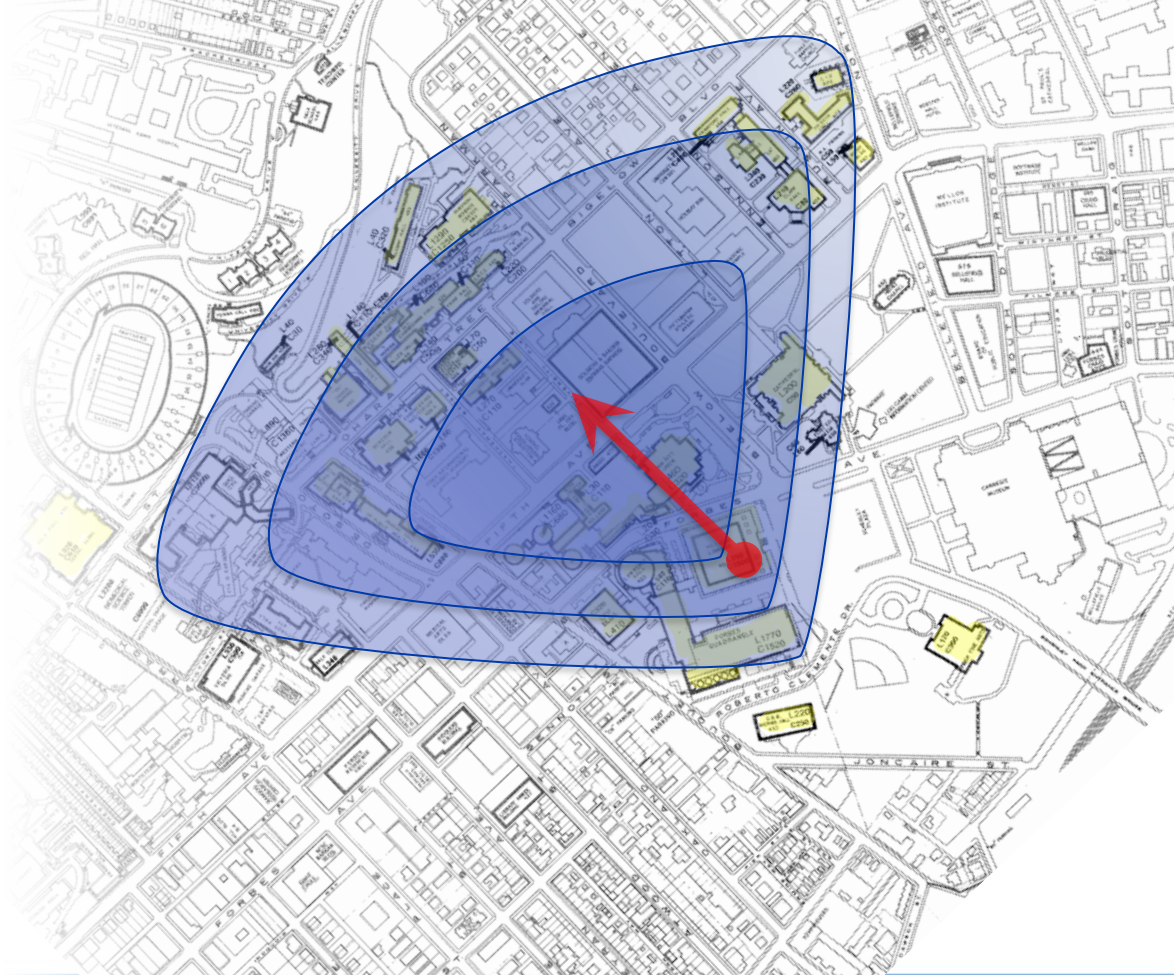
- CHW Plant designed to be in the center of the loads (1962)





# CAMPUS GROWTH

- ▶ Original Campus CHW Plan
  - CHW Plant designed to be in the center of the loads (1962)
- ▶ 1992 Plan
  - CHW density shifted North and East
- ▶ Now & Future
  - More Growth toward the North and East



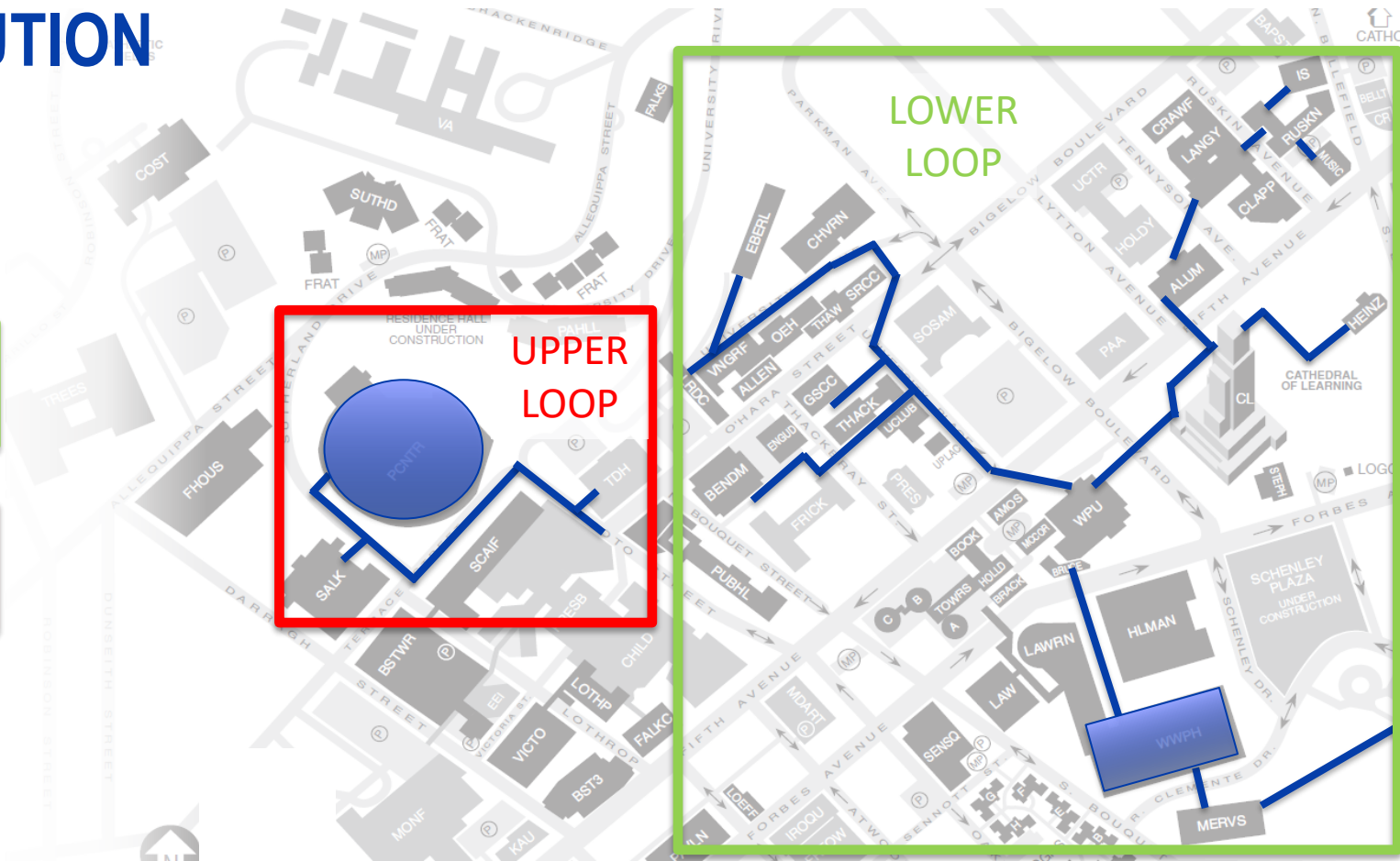




# DISTRIBUTION

## EXISTING

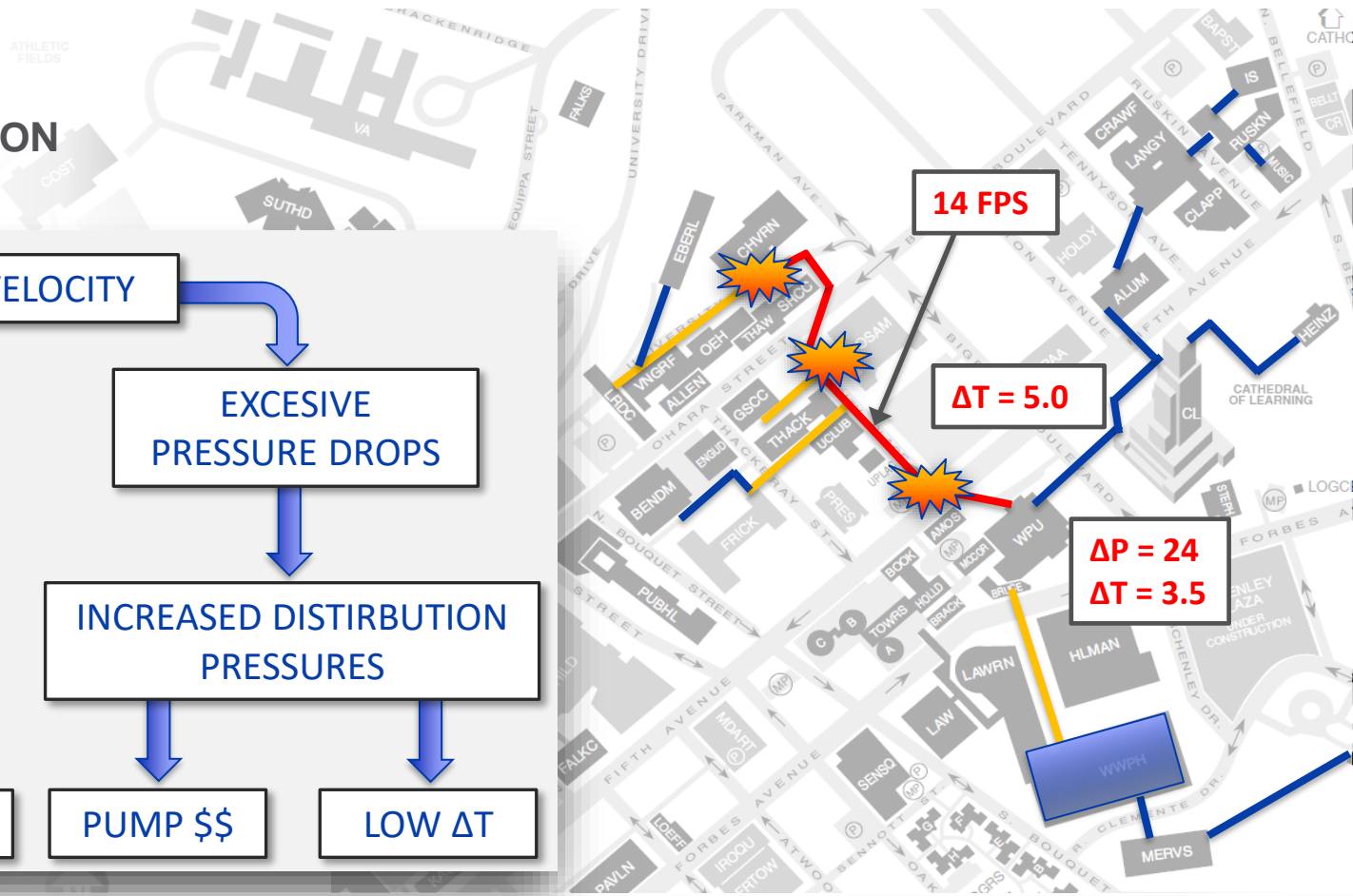
- POSVAR
- PETERSEN



## EXISTING DISTRIBUTION SYSTEM







## PHASING DISTRIBUTION PIPING



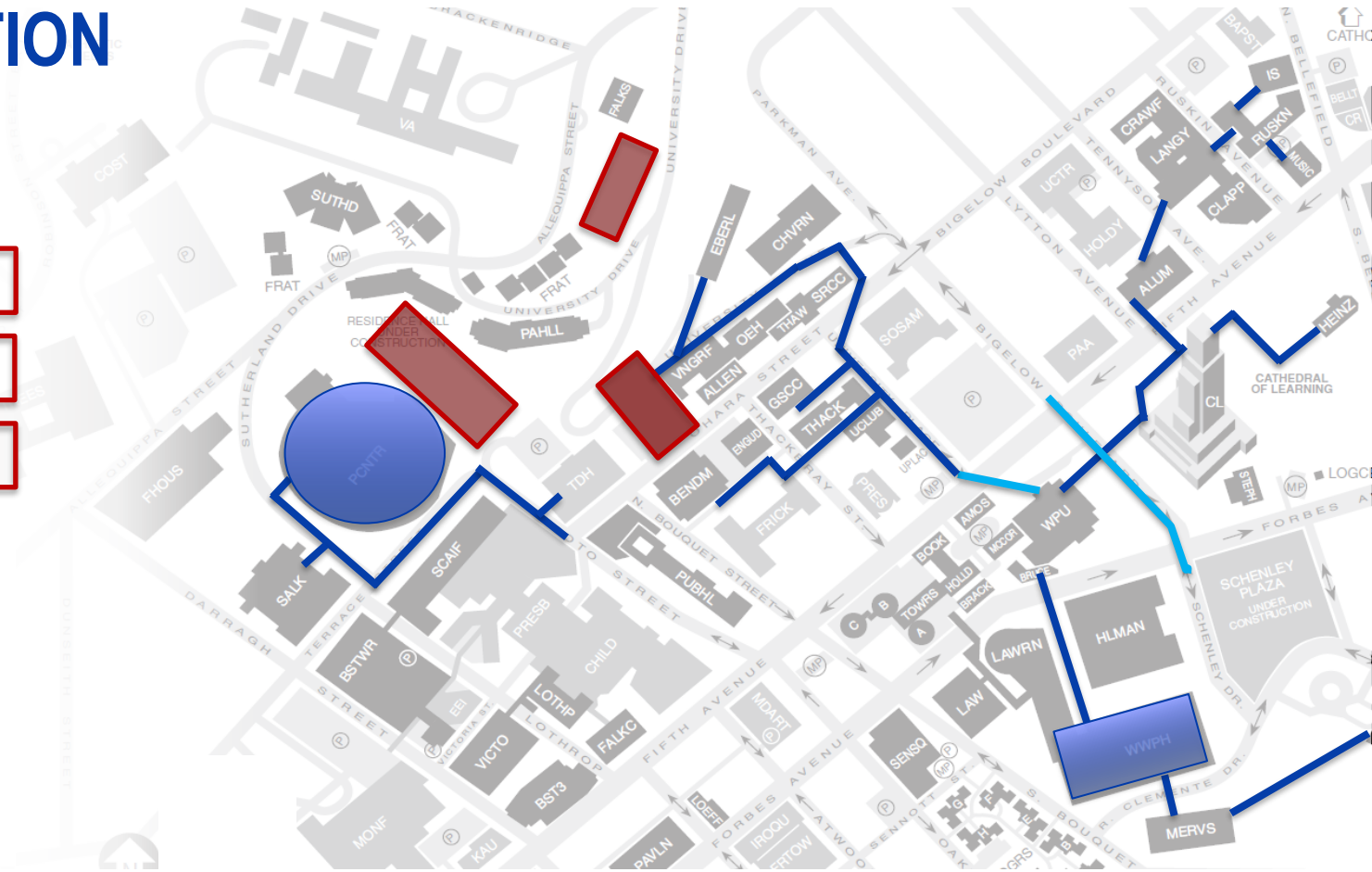
# DISTRIBUTION

FUTURE

NEW REC CENTER

NEW ARENA

HOUSING





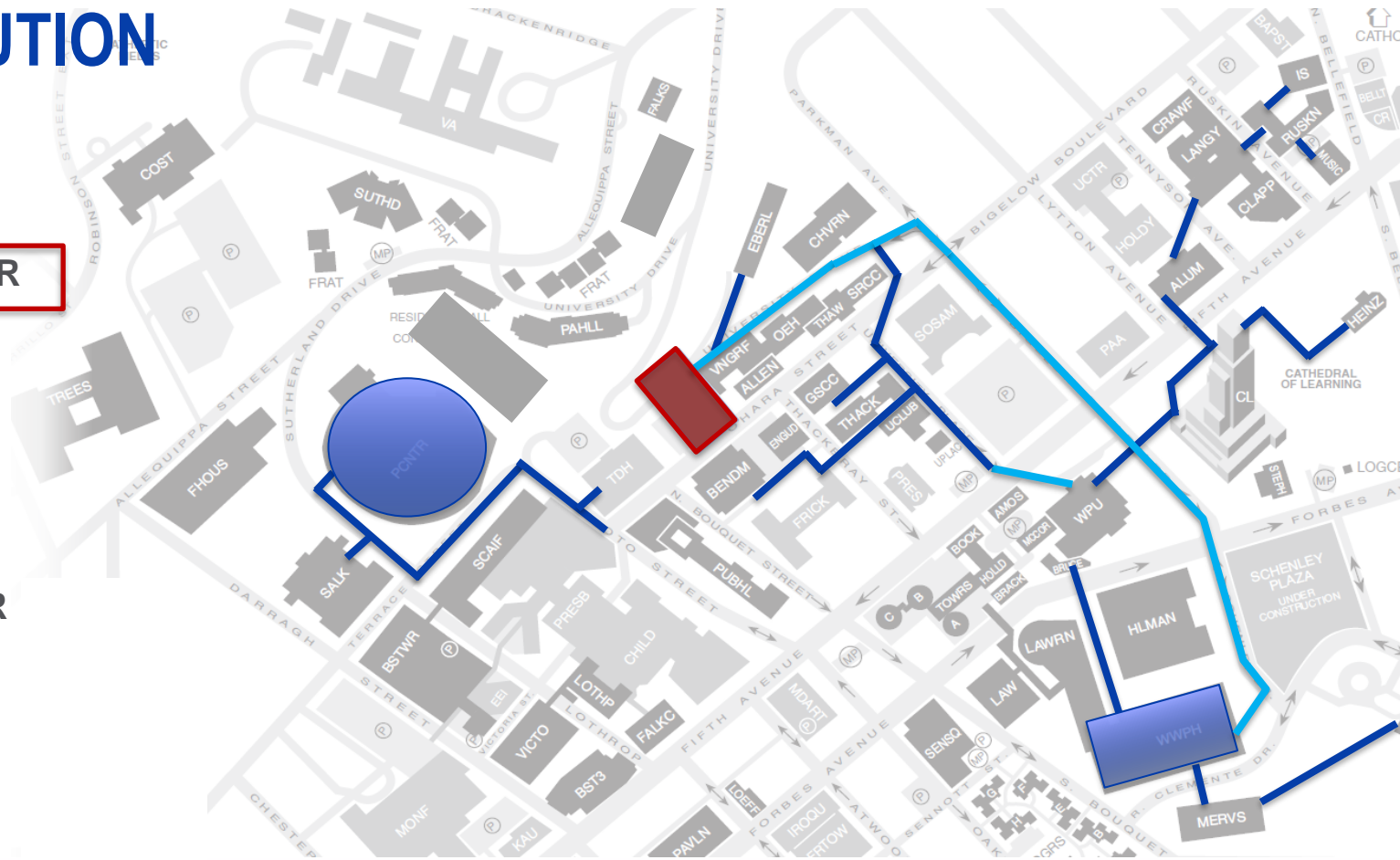
# DISTRIBUTION

FUTURE

NEW REC CENTER

NEW ARENA

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC



# DISTRIBUTION

FUTURE

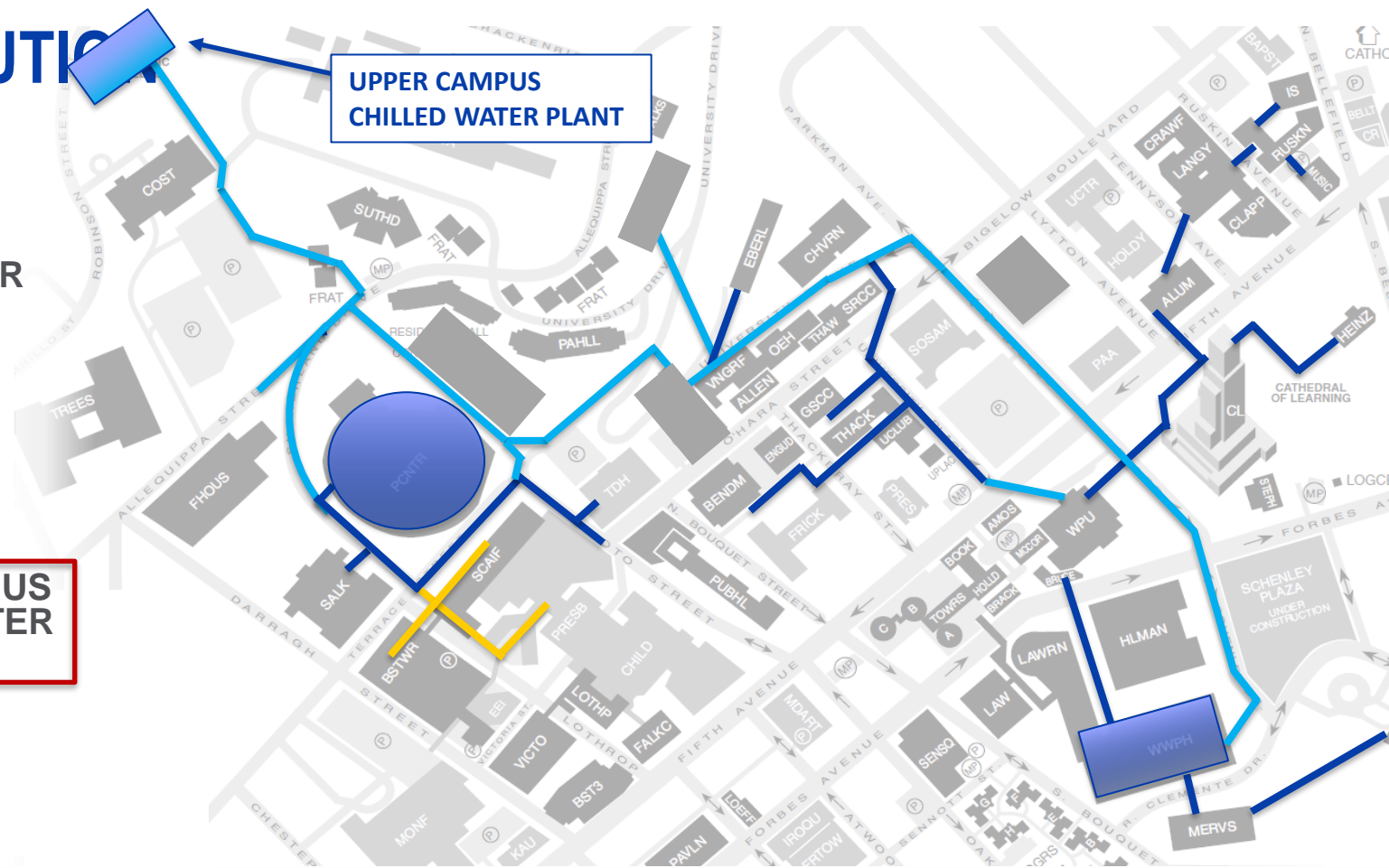
NEW REC CENTER

- POSVAR

- PETERSEN

- UPPER CAMPUS  
CHILLED WATER  
PLANT

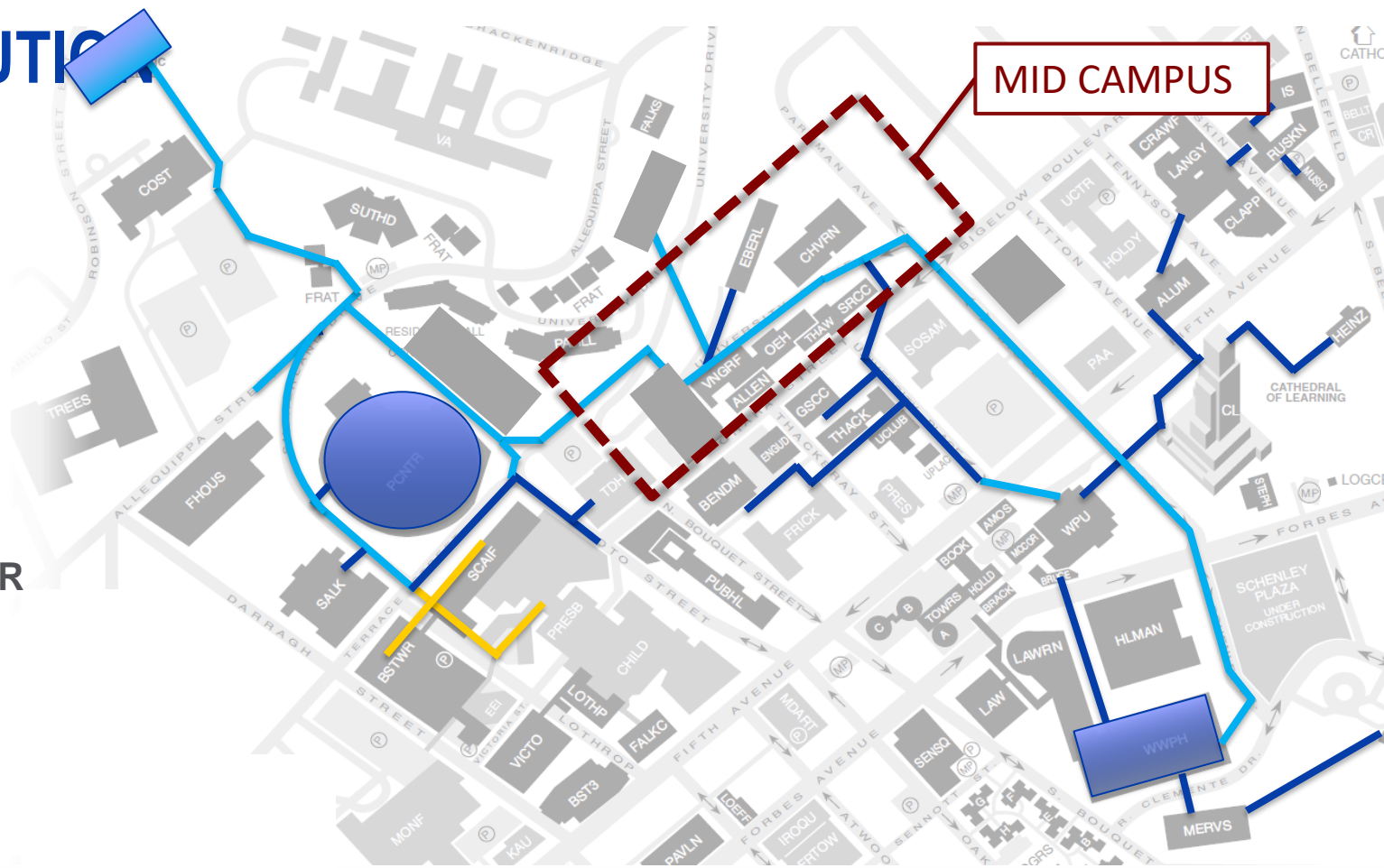
- UPMC



# DISTRIBUTION

## FUTURE

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC



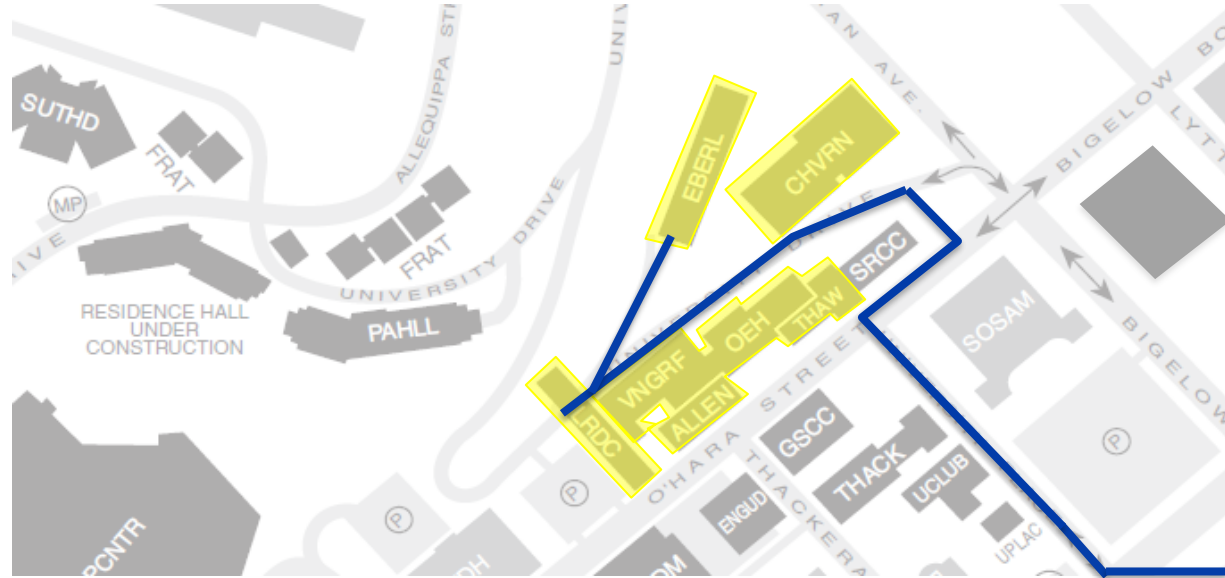


# DISTRIBUTION

- MID CAMPUS

## EXISTING

- ACCESS VIA UNIVERSITY DR.

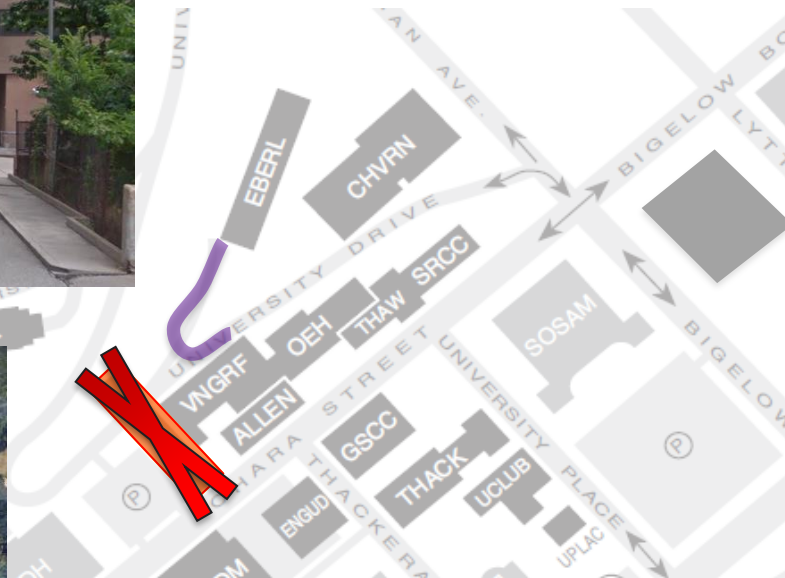
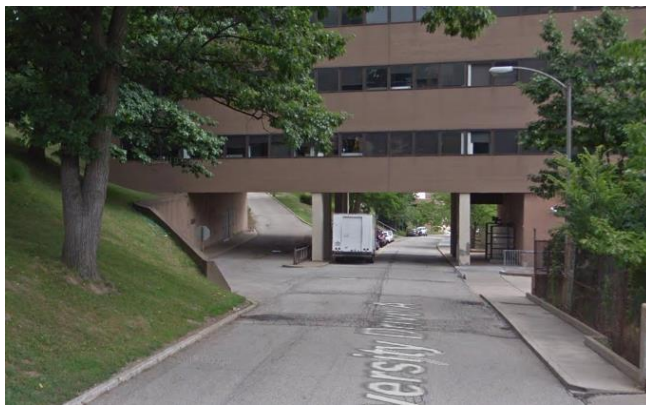


# DISTRIBUTION

- MID CAMPUS

## NEW REC CENTER

- CONSTRUCTION/  
DEMOLITION
- LIMITED  
ACCESS
- NEW ROAD  
DESIGN







# DISTRIBUTION

- MID CAMPUS

## EXISTING

## SERVED BY

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC



# DISTRIBUTION

- MID CAMPUS

## NEW REC CENTER

### SERVED BY

- POSVAR
- PETERSEN
- UPPER CAMPUS  
CHILLED WATER  
PLANT
- UPMC



# DISTRIBUTION

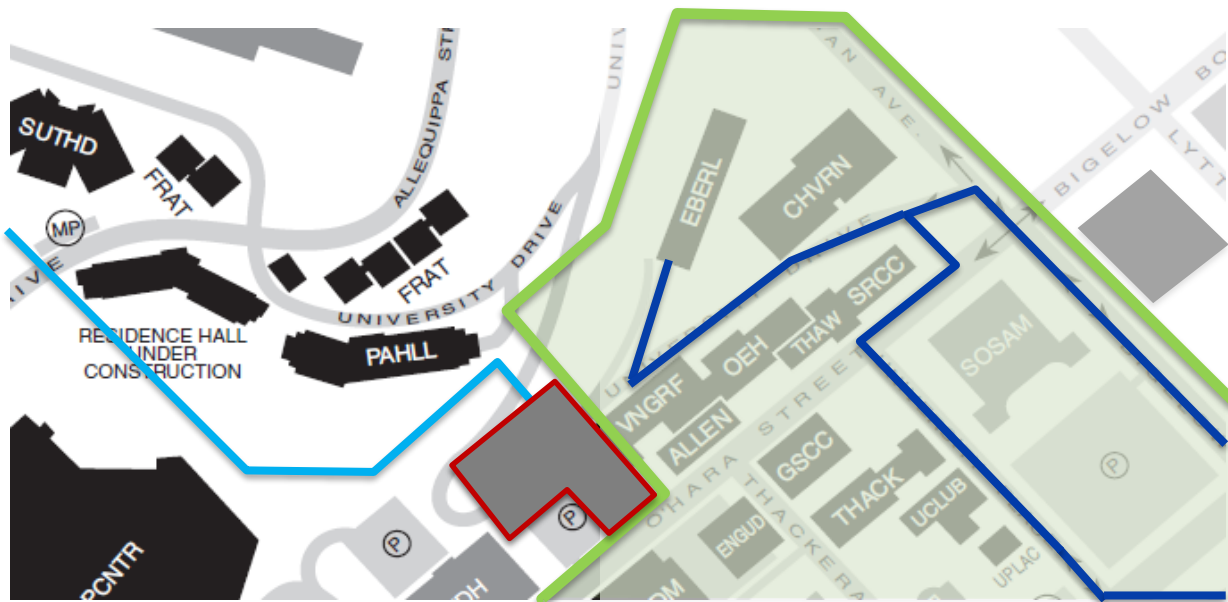
- MID CAMPUS

## NEW REC CENTER

### SERVED BY

- POSVAR

- PETERSEN
- UPPER CAMPUS  
CHILLED WATER  
PLANT
- UPMC











# DISTRIBUTION

- MID CAMPUS

FUTURE

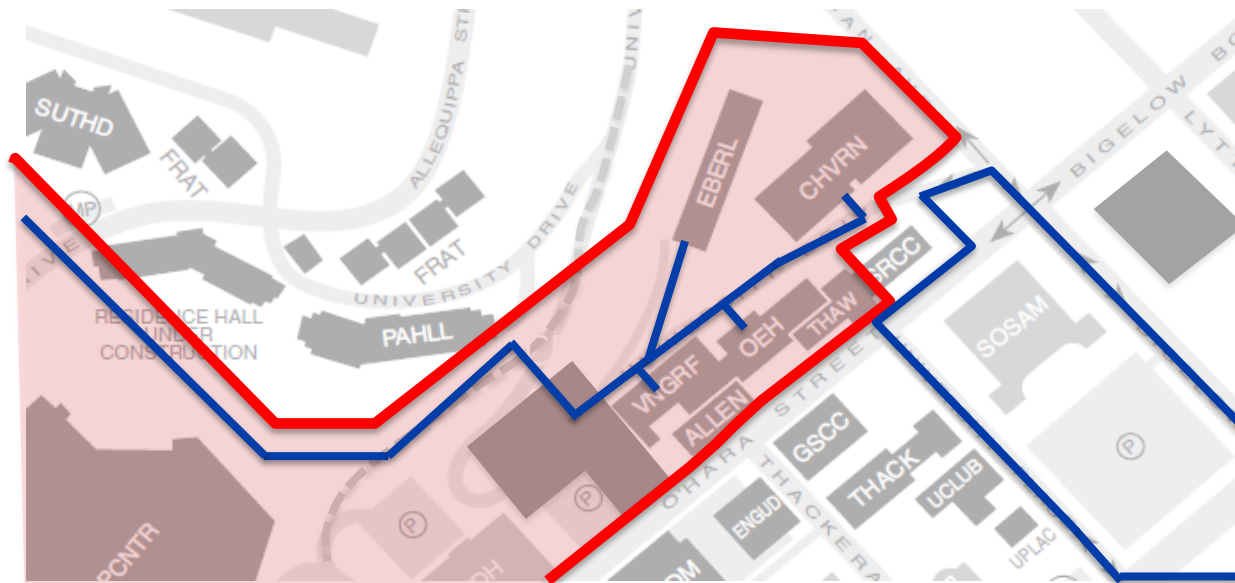
SERVED BY

- POSVAR

- PETERSEN

- UPPER CAMPUS  
CHILLED WATER  
PLANT

- UPMC



# DISTRIBUTION

- MID CAMPUS

FUTURE

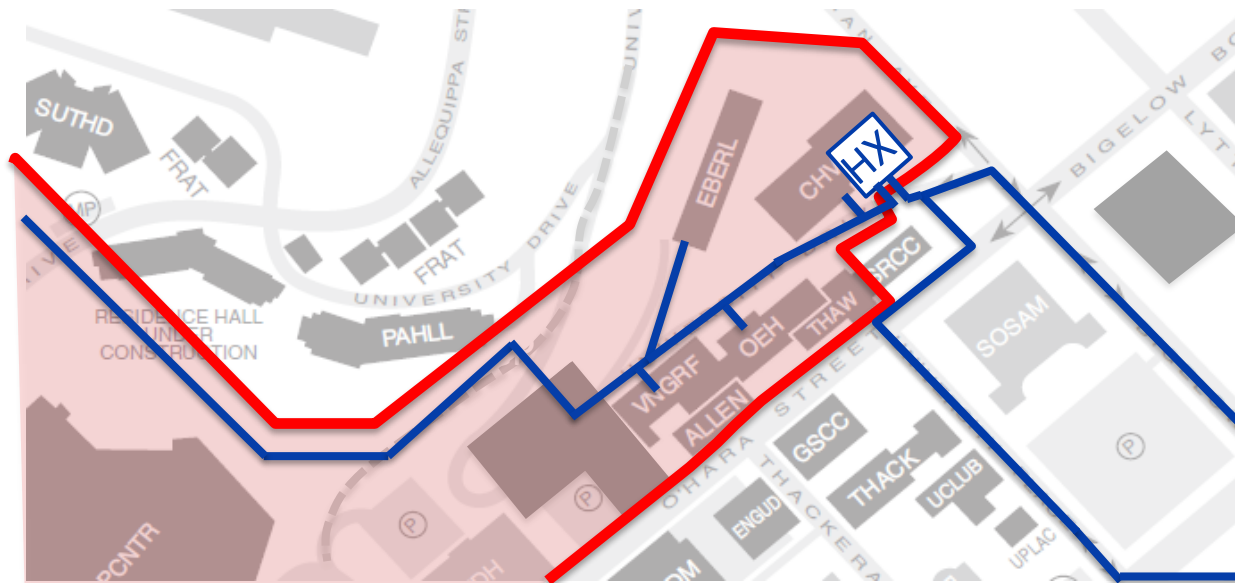
SERVED BY

- POSVAR

- PETERSEN

- UPPER CAMPUS  
CHILLED WATER  
PLANT

- UPMC





# DISTRIBUTION

- MID CAMPUS

FUTURE

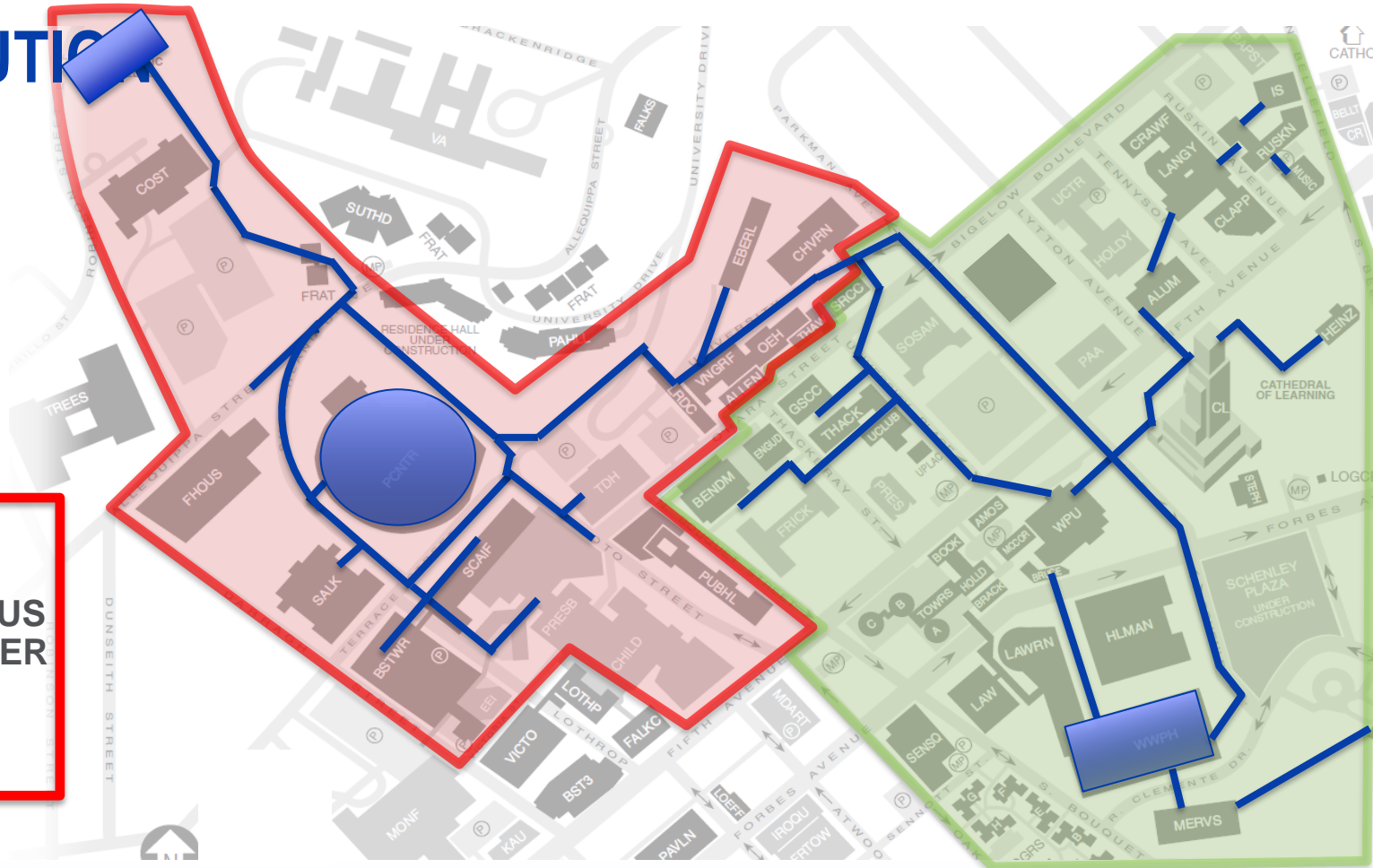
SERVED BY

- POSVAR

- PETERSEN

- UPPER CAMPUS  
CHILLED WATER  
PLANT

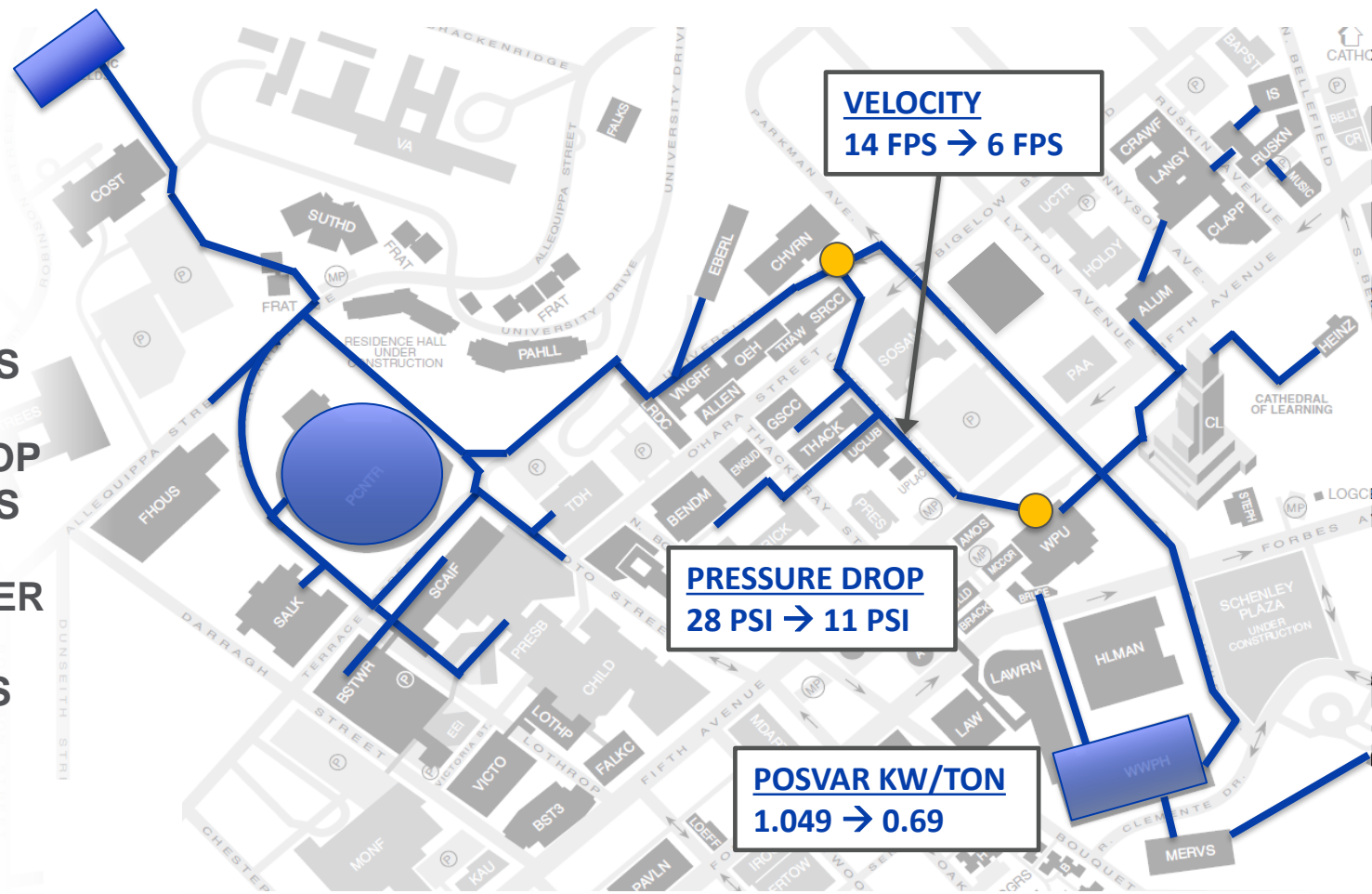
- UPMC



# RESULTS

## MODELED

- VELOCITY IMPROVEMENTS
- PRESSURE DROP IMPROVEMENTS
- POSVAR CHILLER PLANT MODIFICATIONS



# ADDED CAPACITIES

- ▶ UPPER CAMPUS CHILLED WATER PLANT



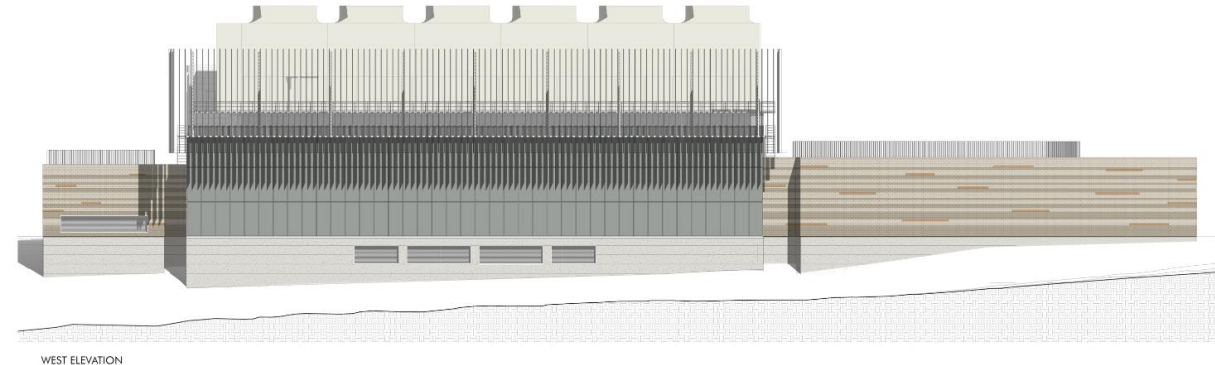
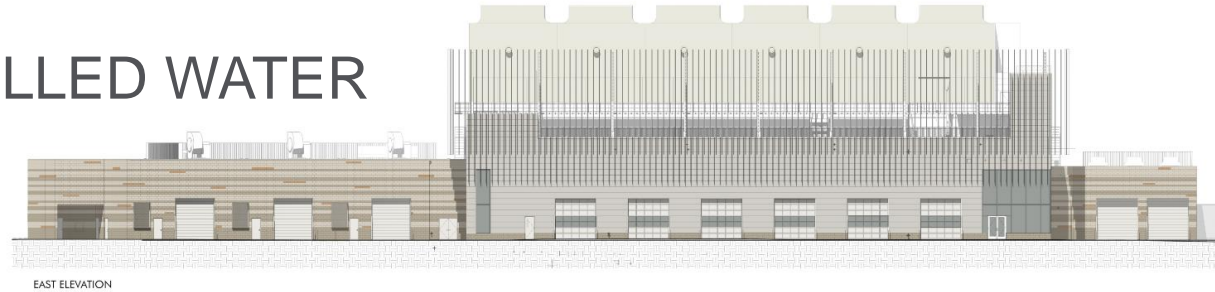
# ADDED CAPACITIES

## ▶ UPPER CAMPUS CHILLED WATER PLANT

- 15,000 Tons Total
- Variable Primary
- 5 kV Substation

## ▶ PLANT AVG KW/TON

- 0.557





# PROGRESS

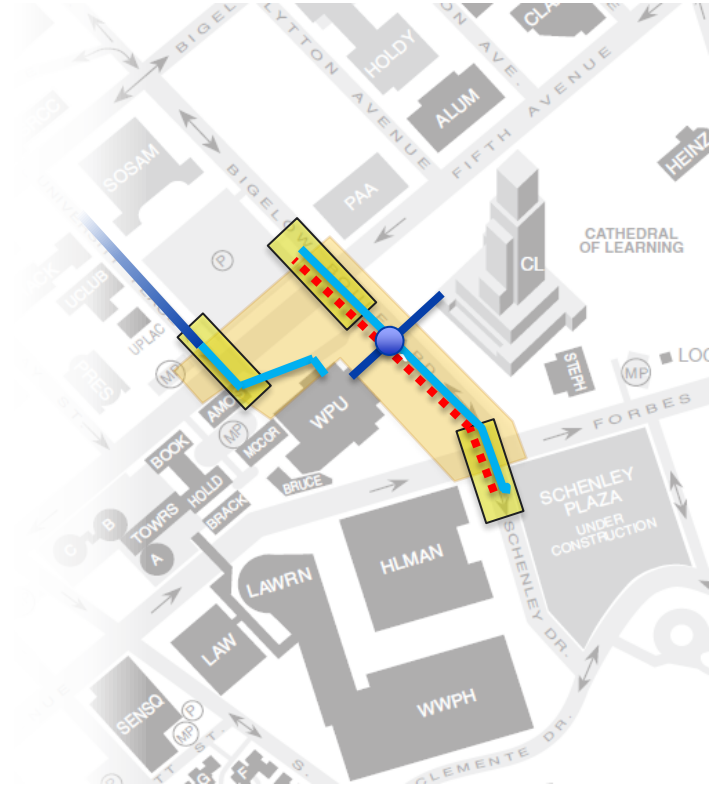
## ► BIGELOW DISTRIBUTION



# PROGRESS

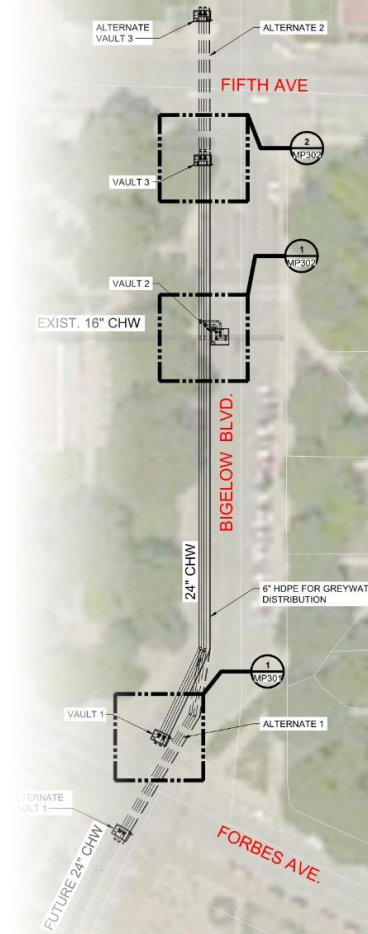
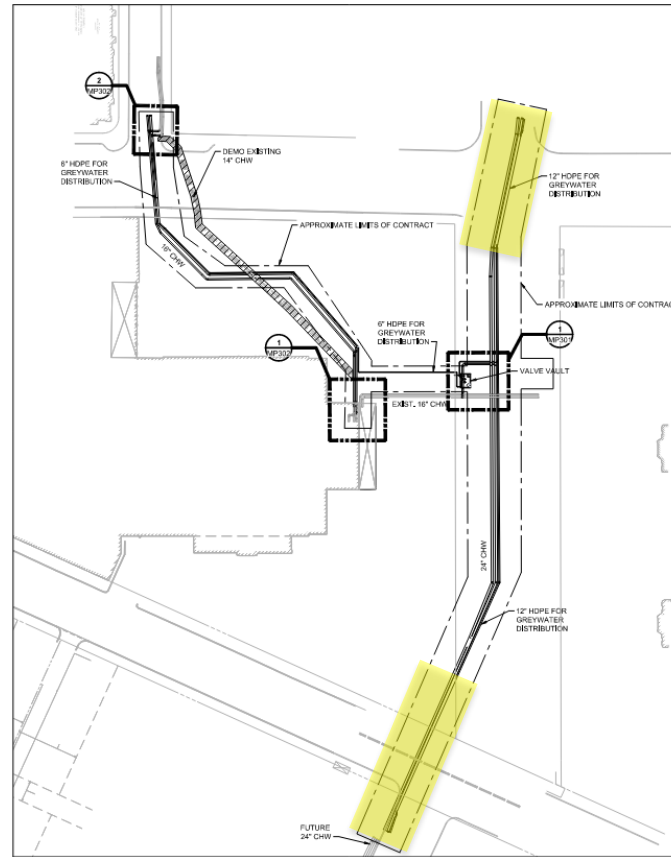
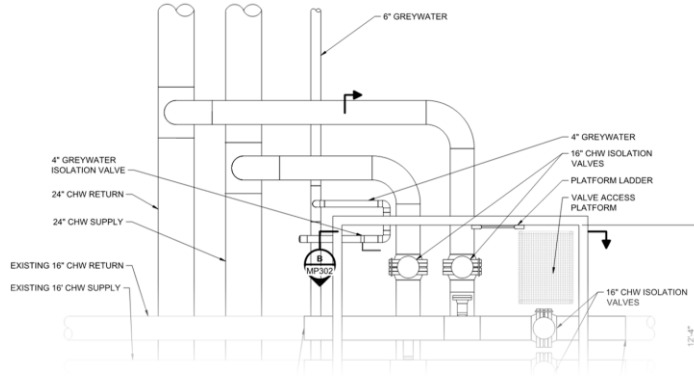
## ► BIGELOW DISTRIBUTION

- Chilled Water & Greywater Collection
- 5KV Ductbank
- Bores under streets
- CHW Vault



# PROGRESS

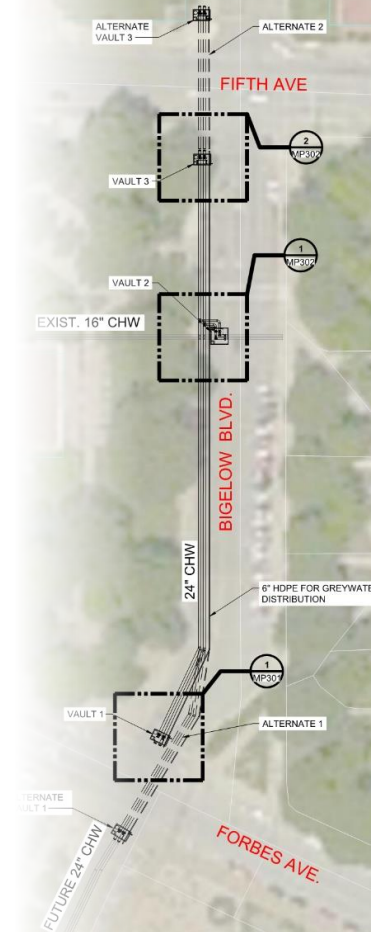
## ► BIGELOW DISTRIBUTION





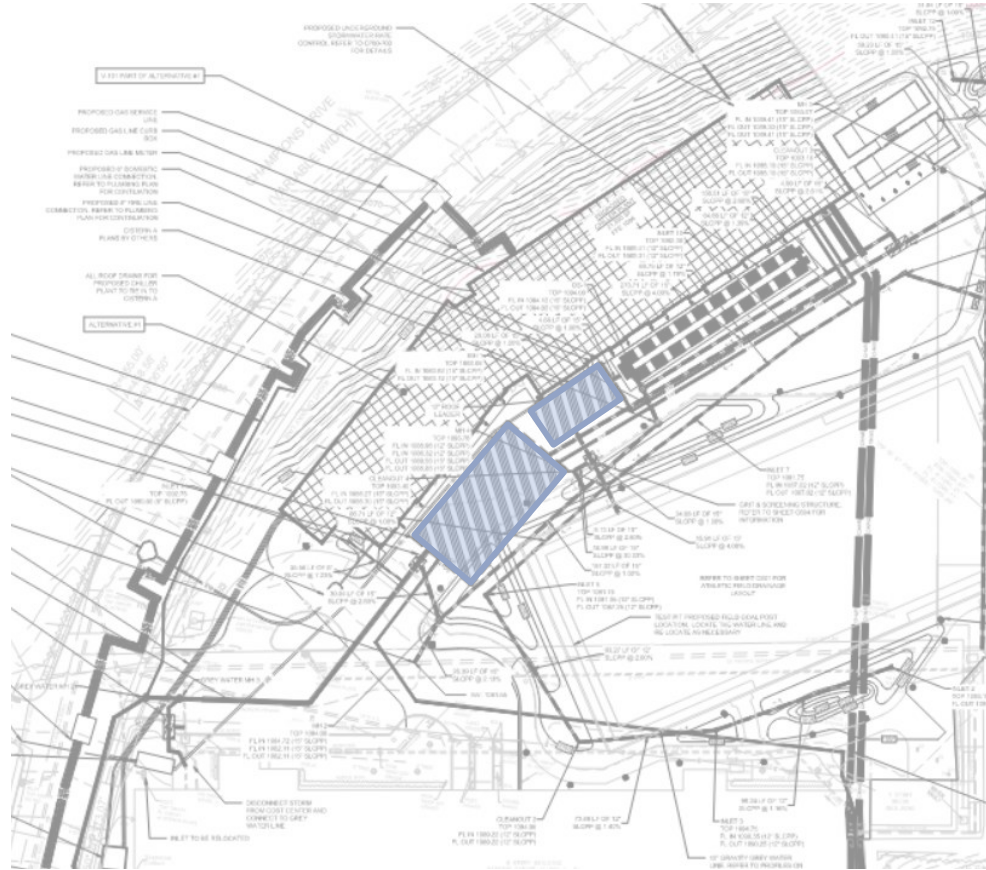
# PROGRESS

## ► BIGELOW DISTRIBUTION





## ► GREYWATER COLLECTION



# SUSTAINABILITY

## ► Key Targets from Pitt's **Sustainability Plan**:

- Reduce greenhouse gas (GHG) emissions by 50%
- Produce or procure at least 50% of campus electric energy from renewable sources
- Achieve an **energy use intensity** that is at least 50% below the national average - 120
- Achieve water use intensity that is 50% below the district average

*STEWARDSHIP*

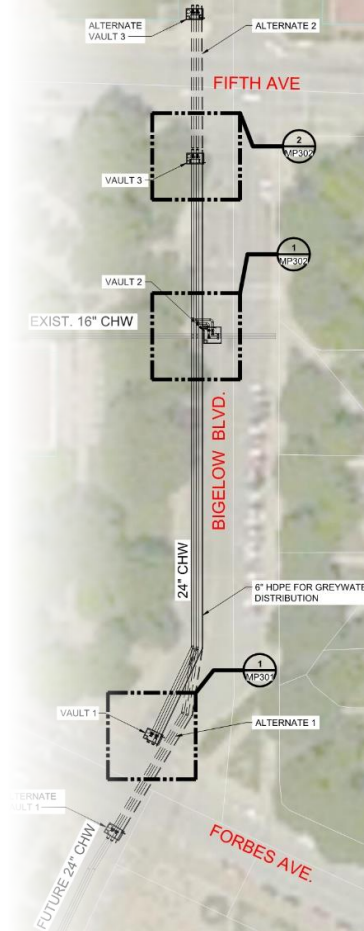
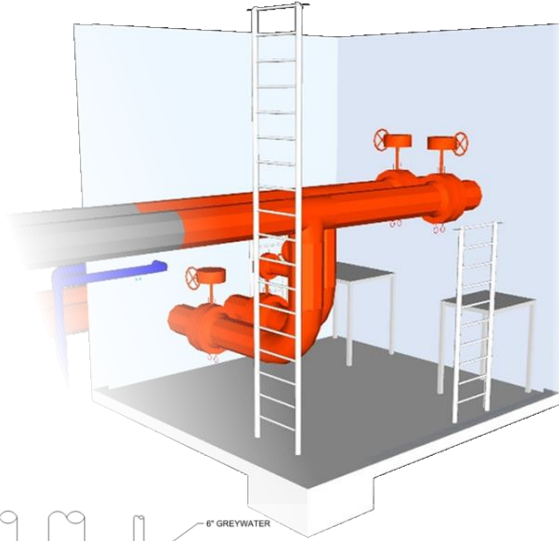
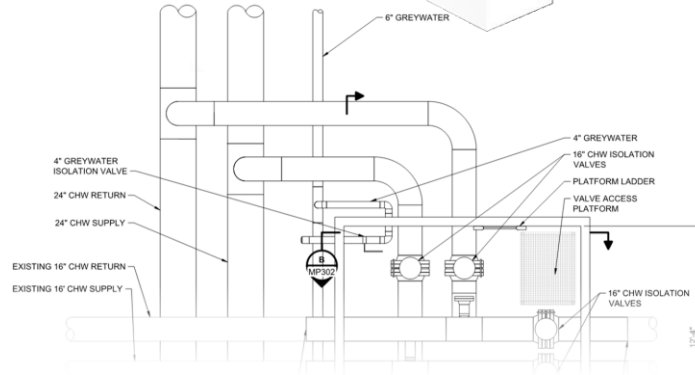
*EXPLORATION*

*COMMUNITY & CULTURE*



# COORDINATION

- ▶ Adjacent Properties
- ▶ Internal Departments
- ▶ Understand Limitations



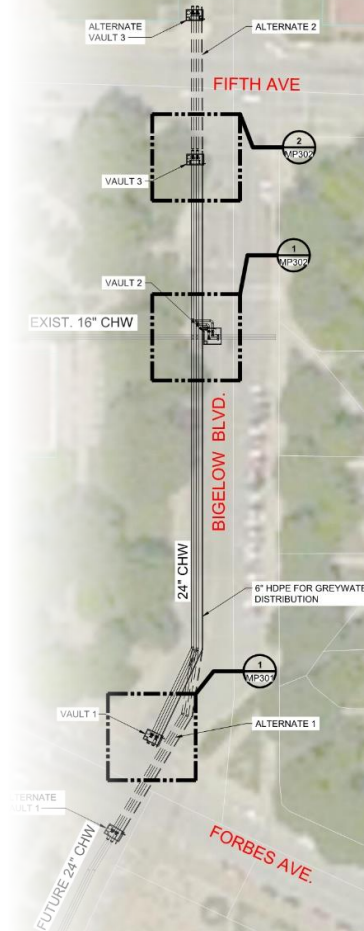
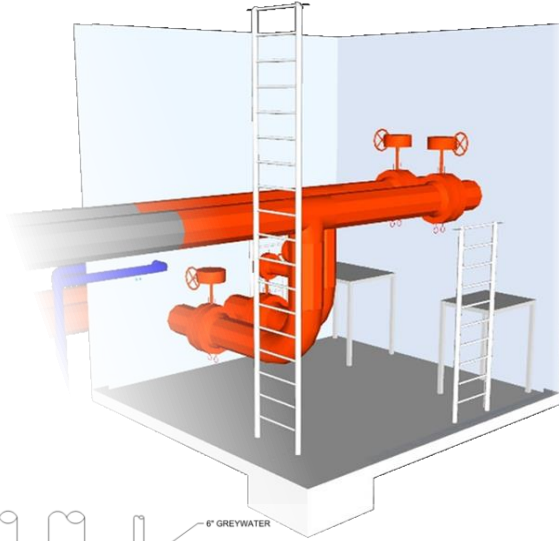
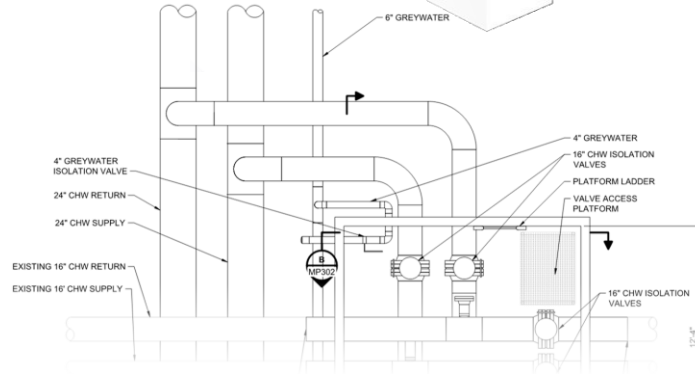
# COORDINATION

## ► Adjacent Properties

- Campus & Health Care
  - UPMC Renovations
  - Capacity Study incorporating both Campuses
  - Share N+1 Equipment
  - Taps for future connection

## ► Internal Departments

## ► Understand Limitations





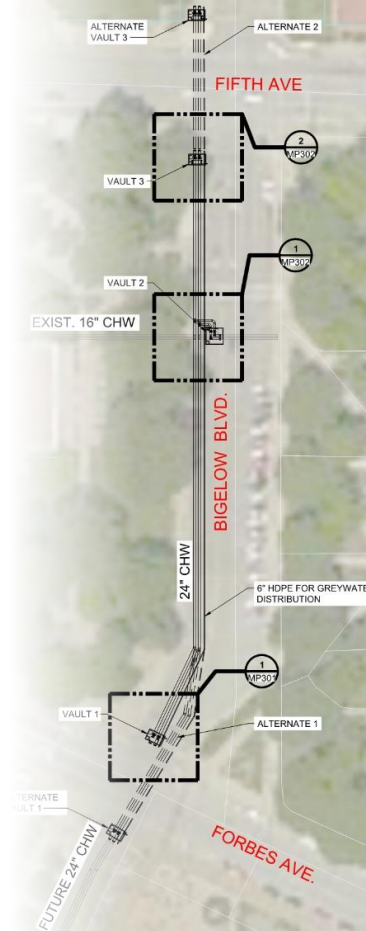
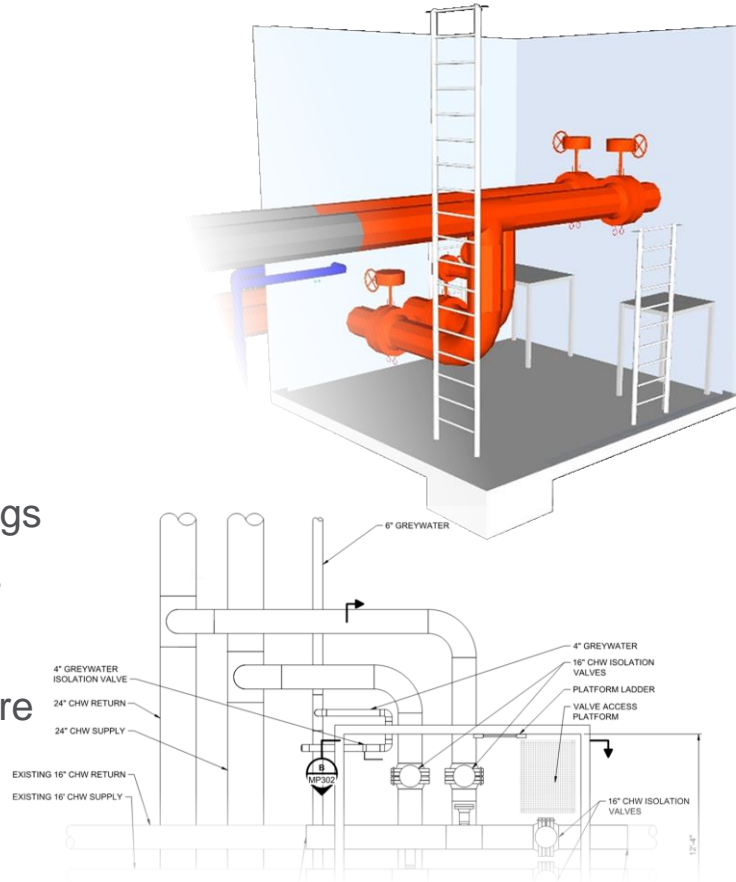
# COORDINATION

## ► Adjacent Properties

## ► Internal Departments

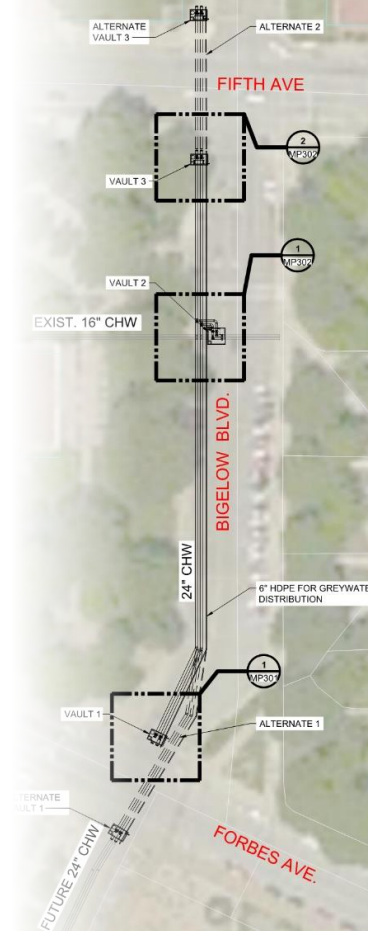
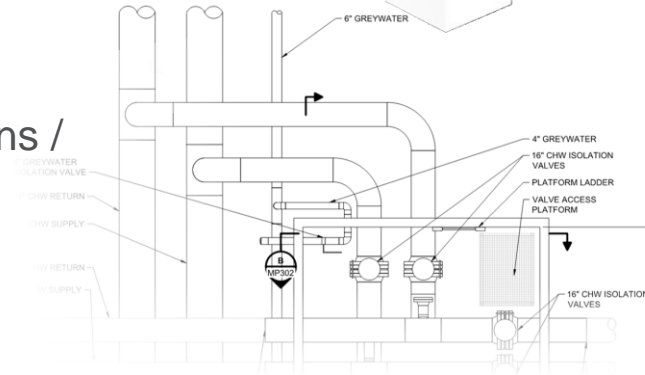
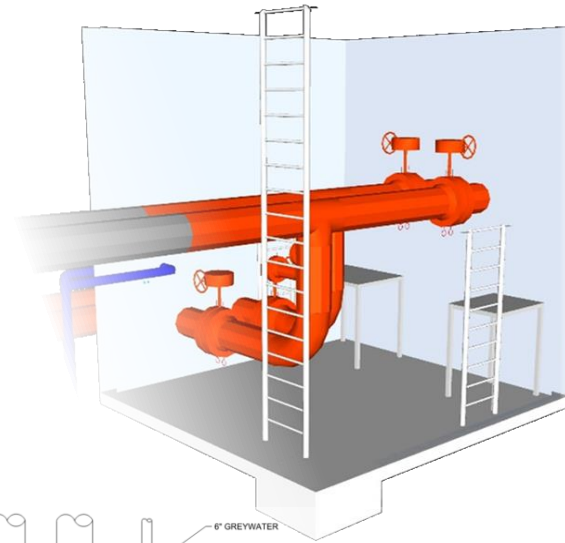
- Campus Development
  - New building loads / locations
  - Resurfacing roads
- Electrical
  - 5kV Distribution for future buildings
  - Redundant feeds for major loads
- Sustainability
  - Rainwater Collection infrastructure
  - EUI, GHG Goals

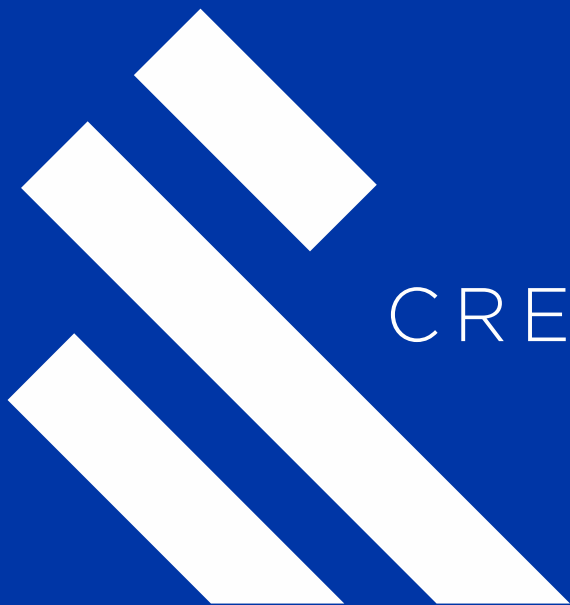
## ► Understand Limitations



# COORDINATION

- ▶ Adjacent Properties
- ▶ Internal Departments
- ▶ Understand Limitations
  - Allowable / Scheduled Outages:
    - Labs
    - Hospitals
    - Plan for loops for future shutdown redundancy
    - Temporary Chiller Connections
  - Fire Department Access





CREATE AMAZING.