

# Decarbonizing in a time of growth

Chad Worth - 4/26/2024



**CAL POLY**

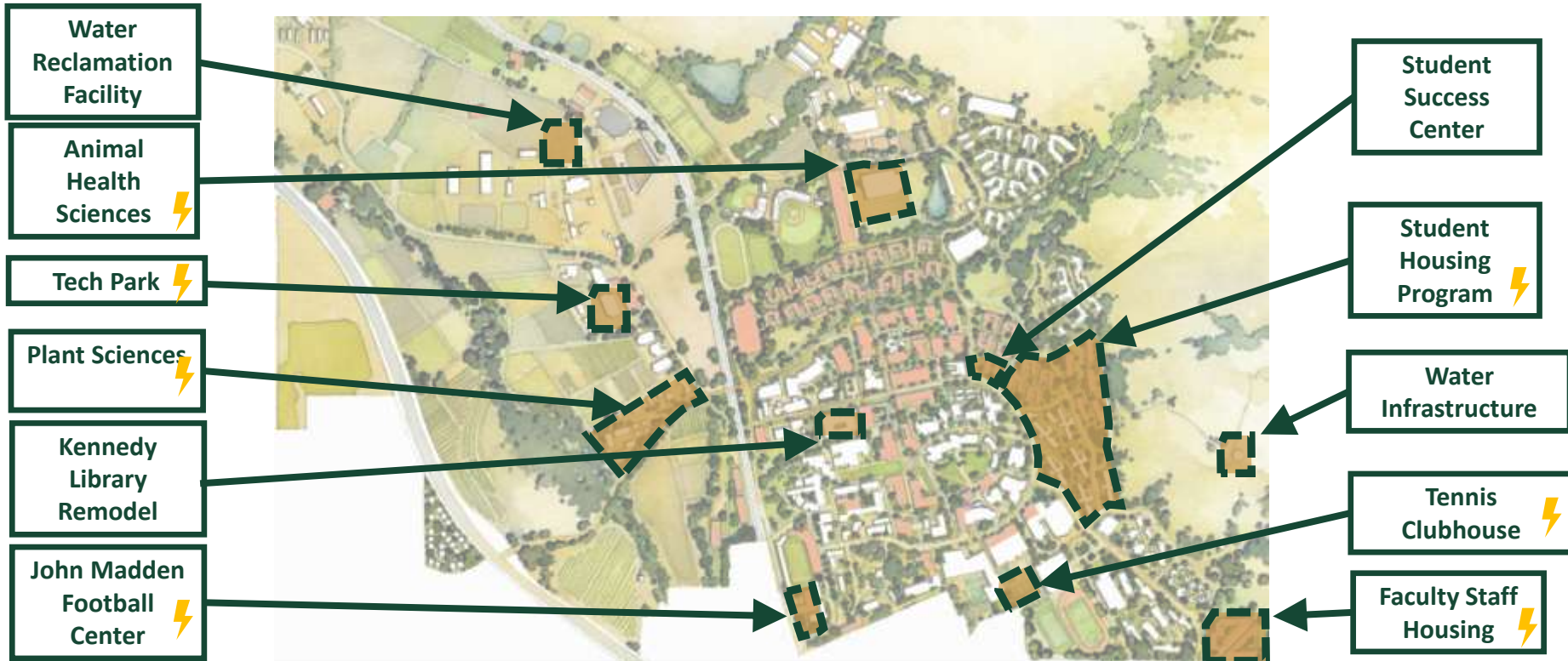
# California Polytechnic State University

- Established in 1901
- Know “Learn by Doing” approach
- Enrollment: 22,279
- On-campus residents: ~8,800
- Over 200 buildings (6.5 million sq-ft)
- 9,178 acres (~3,000 campus core)
- “Best in the West”
  - 2023 U.S. News & World Report
- Increasingly competitive:
  - 79,000 applicants for 6,600 spots.



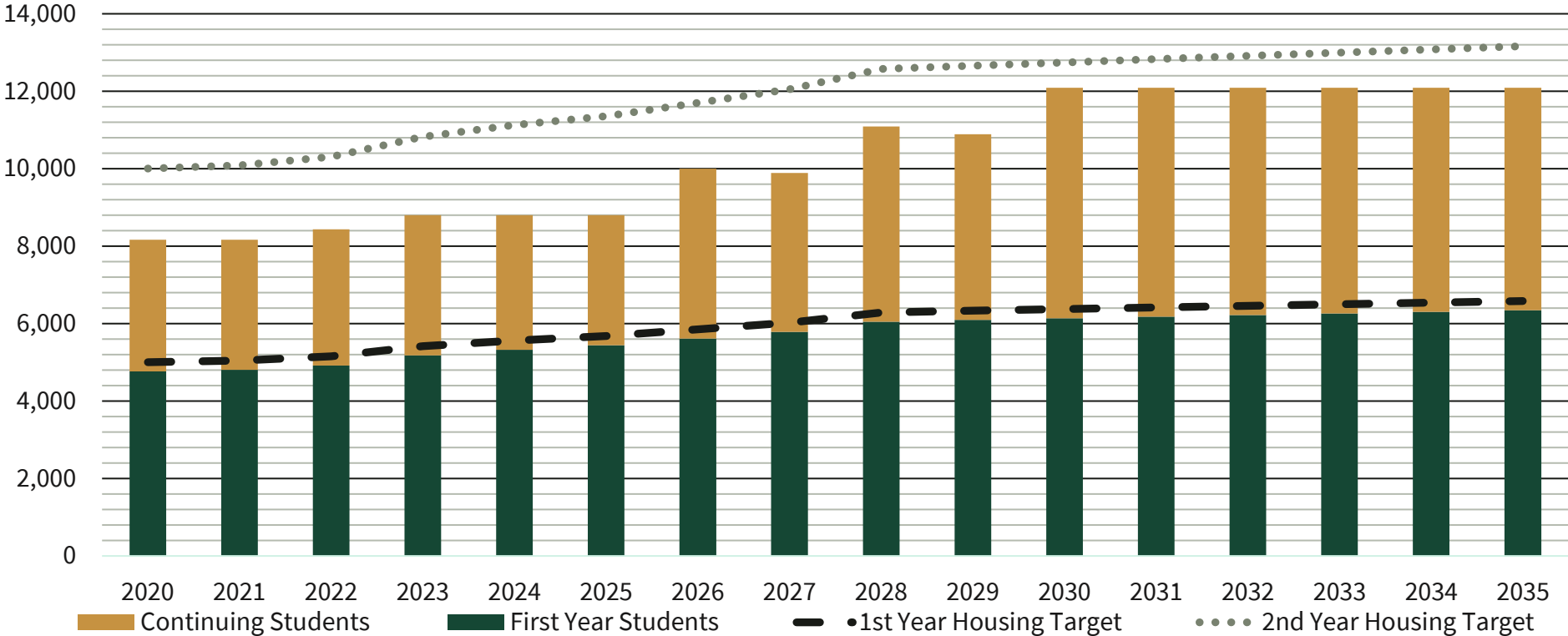
# Accelerating the Master Plan: \$1.8B in active projects

2035 Master Plan: 25,000 students, 1.3M SF new const., 7,200 beds, 174 parking spots



# Accelerating the Master Plan: Enabling Growth

## Increasing on-campus housing is critical to enrollment growth



# Campus Utilities



## Electrical- PG&E

- 99%- Mustang Sub
- 1%- 25 small accounts

**Approaching Capacity**



## Gas- SoCal Gas

- 8 interconnections



## Central Plants

### Main Central Plant

- Chilled/ Hot water

### Two satellite plants at Housing

- Hot water

**At Capacity**

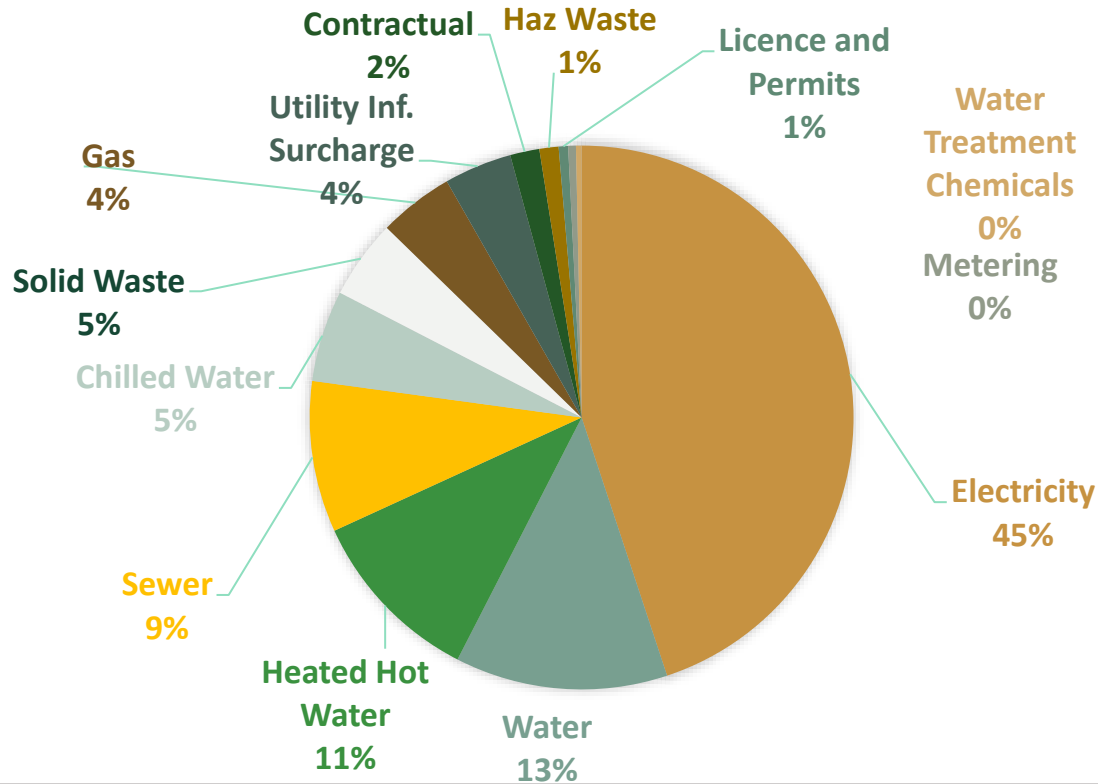


## Water/ Sewer- City of SLO

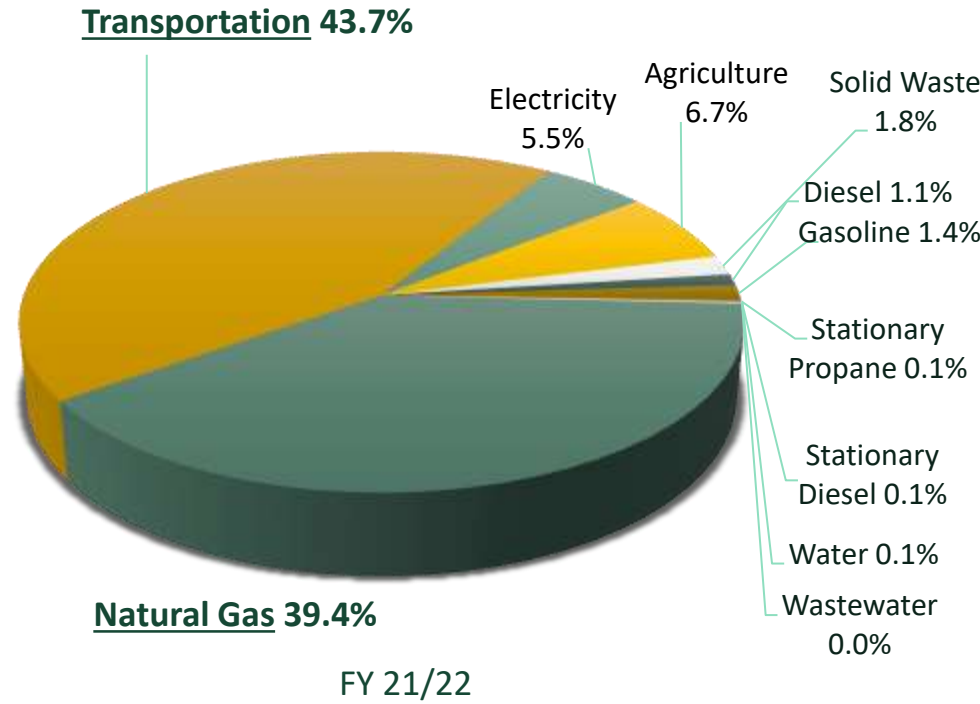
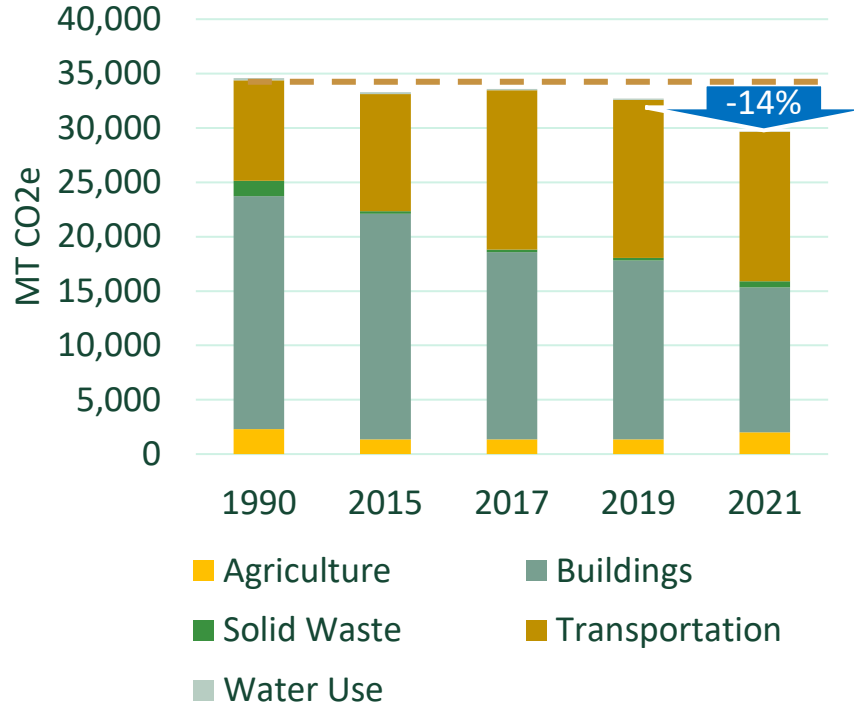
- Own 33% of Whale Rock Reservoir in Cayucos
- Own 9% of Water and Sewer Treatment plants

**At Capacity**

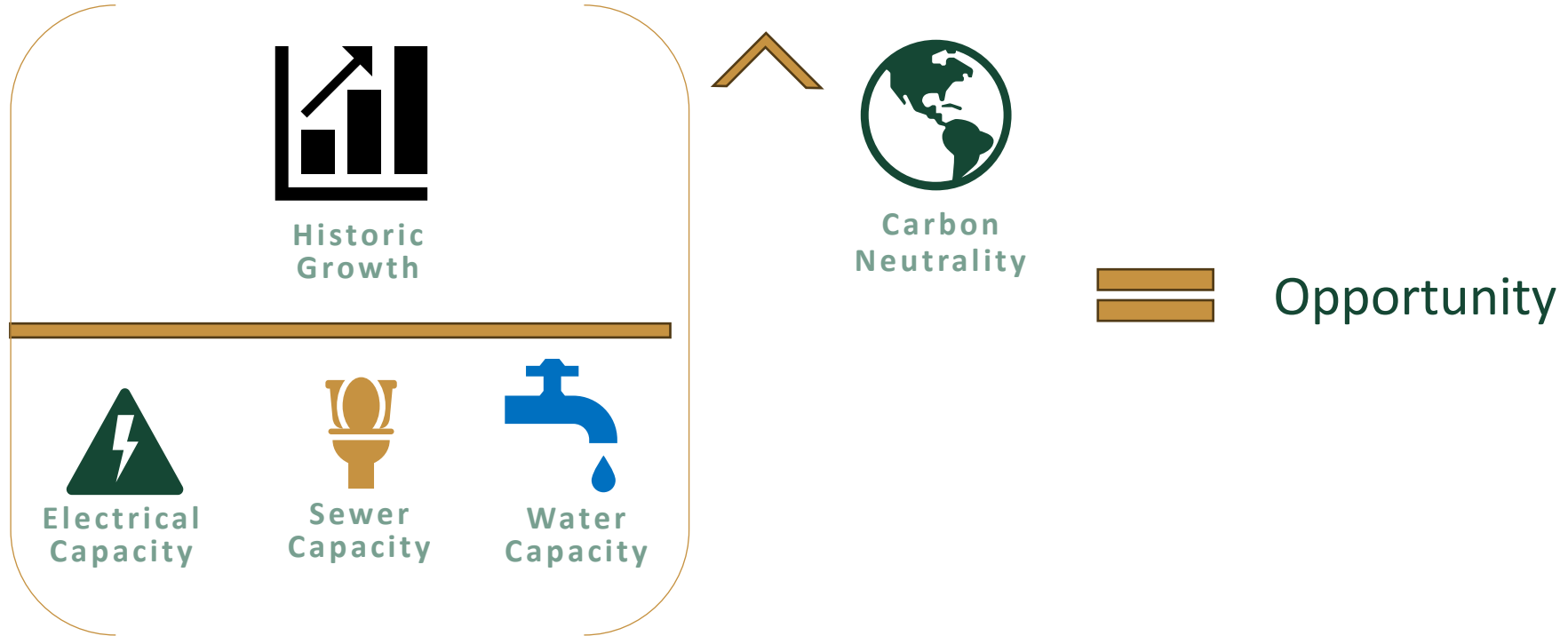
# Fy24/25 utility budget: \$20.8 million



# CARBON NEUTRALITY by 2045



# Goals -> <- Constraints





# 1. High Performance Buildings



# 2. DEEP Energy Retrofits



# 3. Cleaner central plants



# 4. Solar and Storage



# 5. Carbon Farming



# 6. Agriculture



# 6. Transportation



# 8. Water!

# 1. HIGH PERFORMANCE BUILDINGS



## DRIVERS

- Design for 50 years, operate for 100 years

## SOLUTIONS

- High Performance Building Policy
  - Exceed T24 by 10%
  - LEED Gold Certified
  - All-electric if not connected to Central Plant
- Invest in Staff Training

**TIMELINE:** Ongoing

**BUDGET:** Staff training, other costs in project budget



*Cal Poly's LEED Gold Frost Building Opened in 2023*

*Source: Cal Poly*

# 2. DEEP Energy Project

## DRIVERS

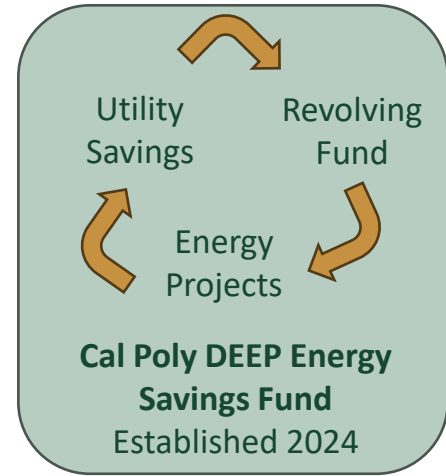
- Save energy, cost from existing buildings
- Address deferred maintenance
- ~80% of campus with fluorescent lighting
- Significant pneumatic controls

## SOLUTIONS

- LED lighting, expand building controls
- RCx of existing buildings, smart electrification
- Enrolled in new Higher Ed Efficiency Program

**TIMELINE:** Launch Summer 2024, ongoing

**BUDGET:** \$5 million seed funding -> revolving fund



*Cal Poly's Thermal Energy Storage Tank  
Source: Cal Poly*

# 3. Central Plant

## DRIVERS

- Central plant is 28 years old and at capacity
- 25% of campus total emissions from 3 boilers
- Drive to add A/C across campus
- Replace 4 x R22 old chillers

## SOLUTIONS

- Heat recovery chiller technology
- Coil replacement 180F -> 130F at 100+ buildings
- Decouple domestic water heating

**TIMELINE:** 5-10 years

**BUDGET:** ~\$100 million+ (unfunded)



*Cal Poly's Central Plant  
Source: Chad Worth*

# 4. Solar + Storage

## DRIVERS

- T24 -> 3 MW of solar and a 1 MW / 4 MWh battery
- Rising rates, power shut offs
- Limited electrical capacity

## SOLUTION

- Build 3-7 MW of solar + 1-4 MW of storage
- Lay groundwork for a microgrid

**TIMELINE:** RFP Summer 2024

**BUDGET:** PPA



*Preliminary Solar Siting Analysis*



*Cal Poly's 4.5 MW Gold Tree Solar Farm*

# 5. Carbon Farming

## DRIVERS

- Final 10-20% of emissions hard to eliminate
- Cal Poly has 9,000+ acres
- Animal welfare

## SOLUTIONS

- Cheda Ranch Carbon Farming pilot
- Plant ~250 Oaks, Sycamores, Cottonwoods, etc.

**TIMELINE:** Fall 2025

**BUDGET:** \$15-20k for pilot



*Draft Cheda Ranch Carbon Farming Map  
Source: Lindsay Noel Ringer*

# 6. Agriculture Emissions

## DRIVERS

- Dairy/ swine waste in open lagoons
- Anaerobic digestion = methane
- Water quality challenges

## SOLUTIONS

- Near-term: Herd reduction, move animals to pasture
- Long-term: Exploring pack barn/ robotic milking
- Digester explored, not cost-effective

**TIMELINE:** 2024+

**BUDGET:** TBD



*Cal Poly's Original Dairy Digester in 2003  
Source: Wikipedia Commons*

# 7. Transportation

## DRIVERS

- Fleet: Reduce cost and maintenance
- Commuters: Ability to charge EV's on campus
- Students/ Faculty: Can't grow parking spots

## SOLUTIONS

- Fleet: EVs as default
- Commuters: EV charging at all levels
- Students/ Faculty: **Housing**

**TIMELINE:** Phase 1- Fall 2026

**BUDGET:** \$1 billion+



*Draft 4,000 Bed Housing Complex (top)  
Ford E-Transits/ Level 1 Charging (bottom)  
Source: Cal Poly/ Plugzio*



# 8. WATER!

## DRIVERS

- Water-> ~90% capacity at Whale Rock
- Sewer-> ~99% capacity at City WRRF
- No water/ sewer = No Housing

## SOLUTIONS

- Conservation
- Build a Water Reclamation Facility (WRF)

**TIMELINE:** WRF: 2026

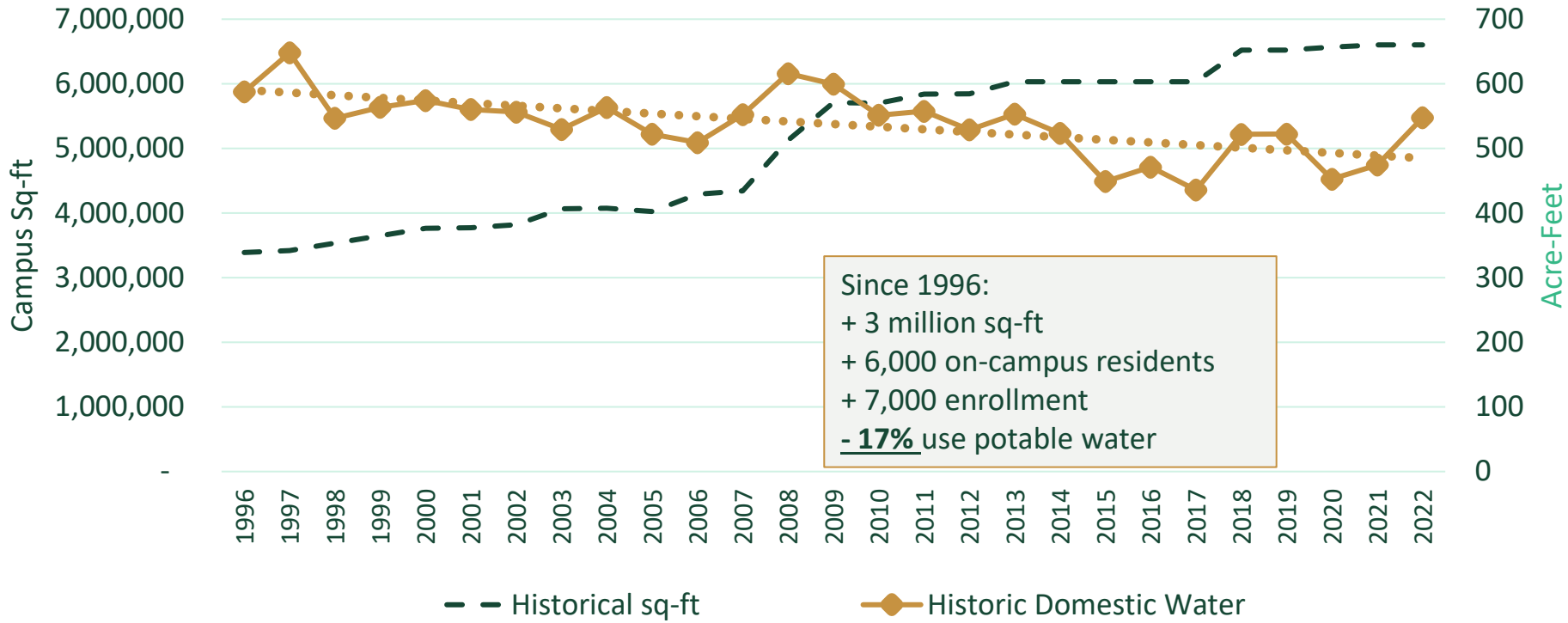
**BUDGET:** WRF \$40 million



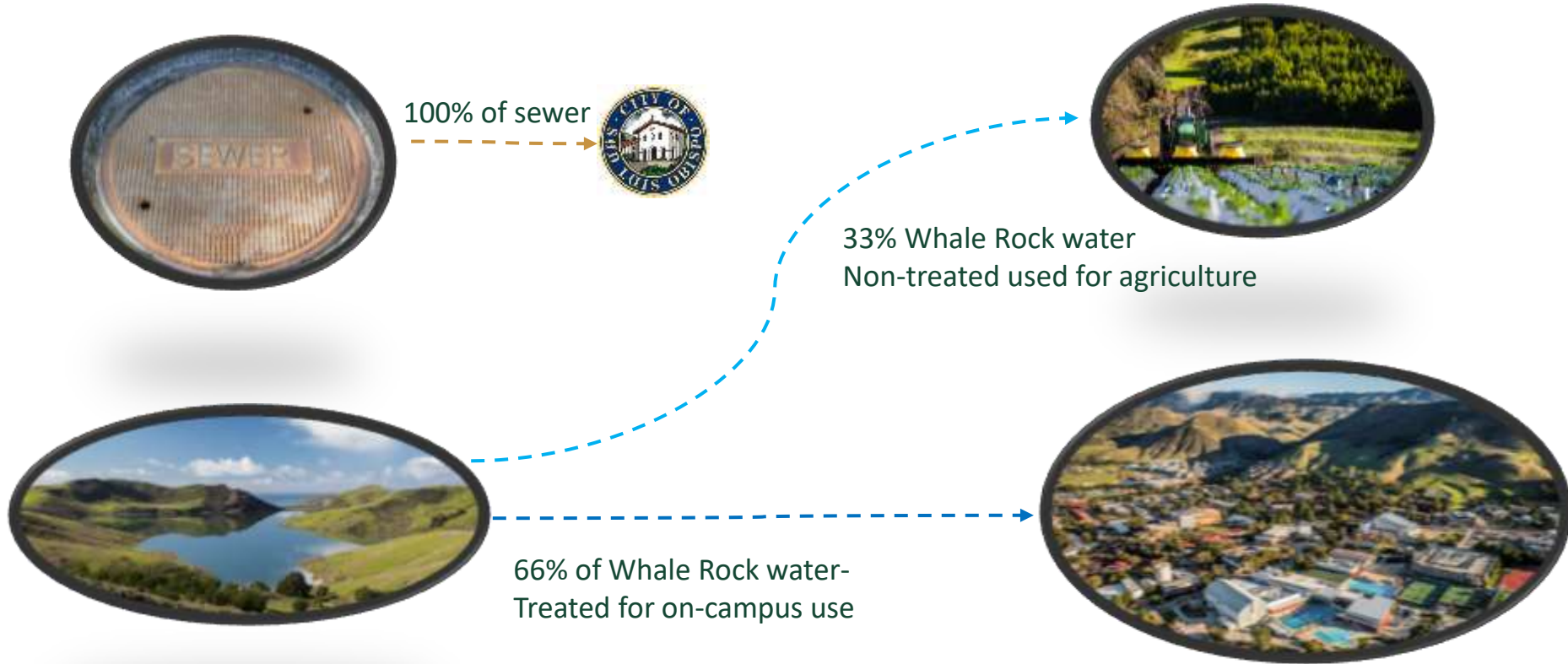
*Packaged MBR Plant to be located north of Dairy Source: Cal Poly*

# History of conservation

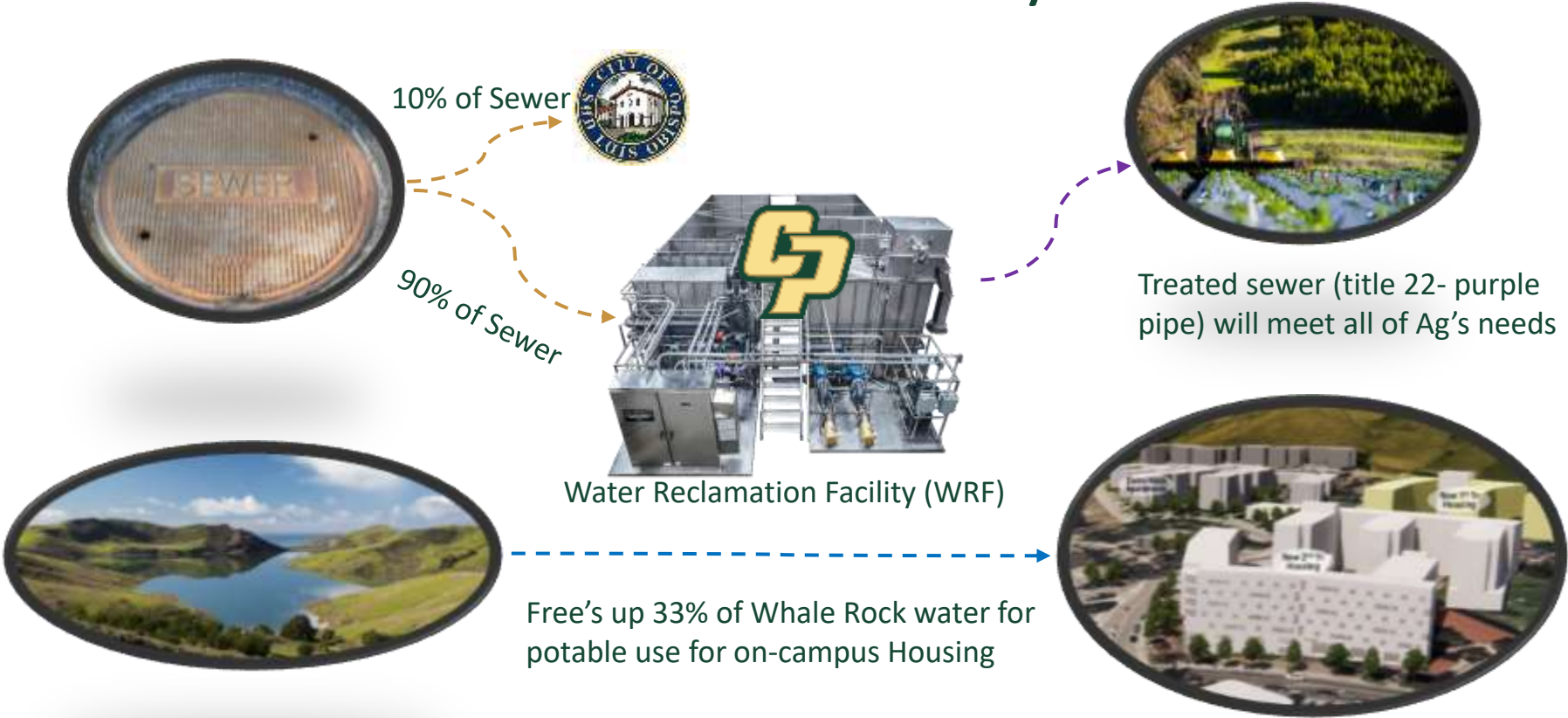
## Cal Poly Historical Domestic Water Use (1996 to 2022)



# Cal Poly's water/ Sewer Today



# The WRF Play



# Growth presents an opportunity



*Source: Cal Poly*

Thank you

NEWS

## Nation Figured Everything Would Run On Some Kind Of Cubes Of Blue Energy By Now

Published November 12, 2015



The blue energy cubes should currently be powering escalators, vending machines, glasses, and "everything else," according to citizens.

Source: *The Onion*