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# Learning Objectives

1. You will identify the best practices award winners for campus sustainable design.
2. You will distinguish how a small campus area was designed for exceeding the state's energy codes with a sustainable design.
3. You will identify the criteria of best practices in new construction for a courtyard in sustainable design.
4. You will identify the criteria of best practices in new construction for an medical education building in sustainable design.

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Best Overall Sustainable Design

Poly Canyon Village

*Sustainable University Housing: Energy Efficiency,*

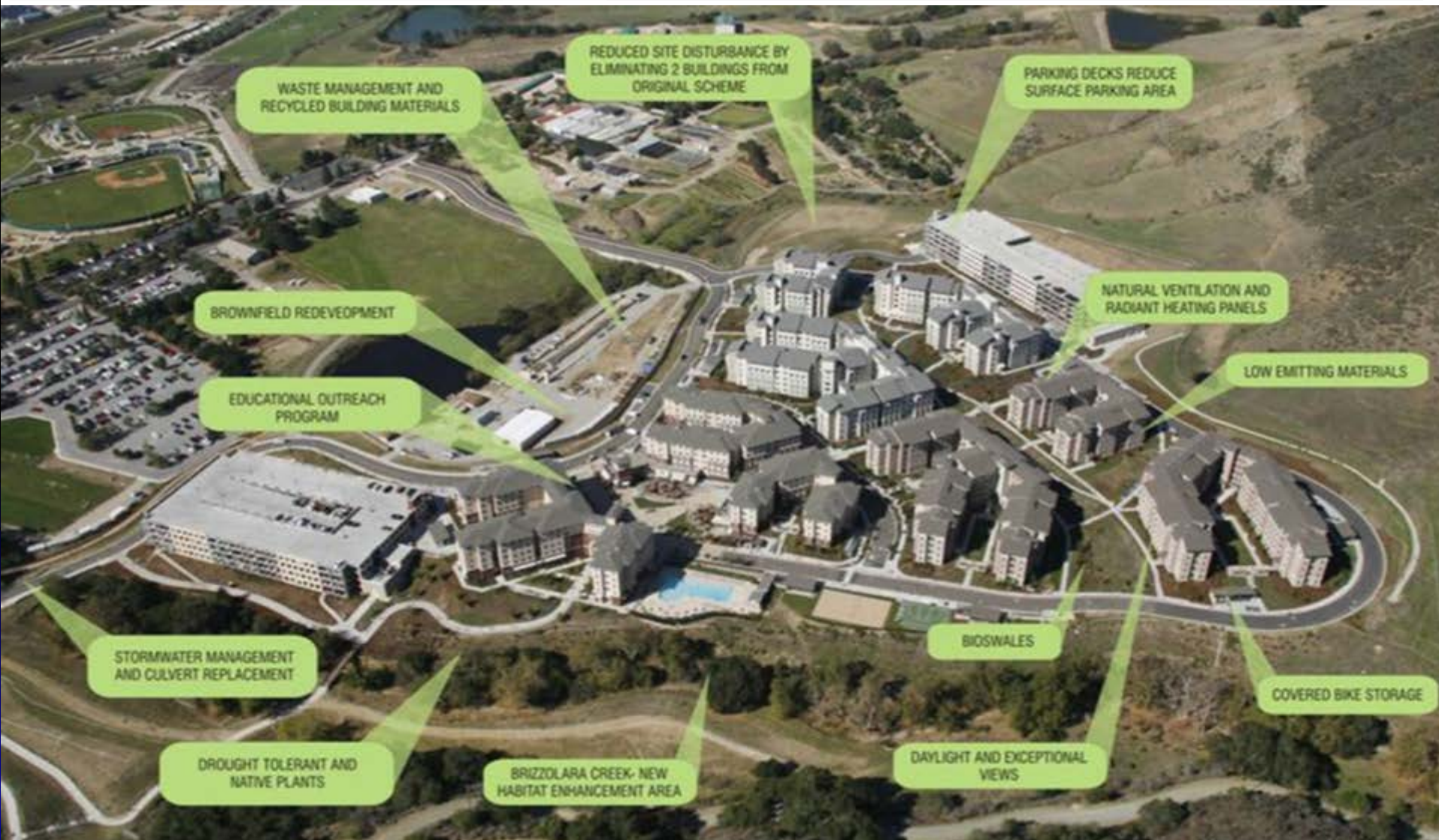
*Water Efficiency, and Transportation Impacts*

# CAL POLY

## Poly Canyon Village



Watercolor Rendering of Poly Canyon Village



Aerial Photograph of Poly Canyon Village

Two Phase  
Delivery Plan

Phase II

Phase I



**Phase I:** six buildings, retail, offices, utilities, amenities, parking structure

**Phase II:** four buildings, offices, parking structure

# Poly Canyon Village



Light gage metal framing from Tecate, Mexico

LEED Credit 5.1/5.2 V-2.1 Local Regional Materials

45.36% fabricated within 500 miles of site

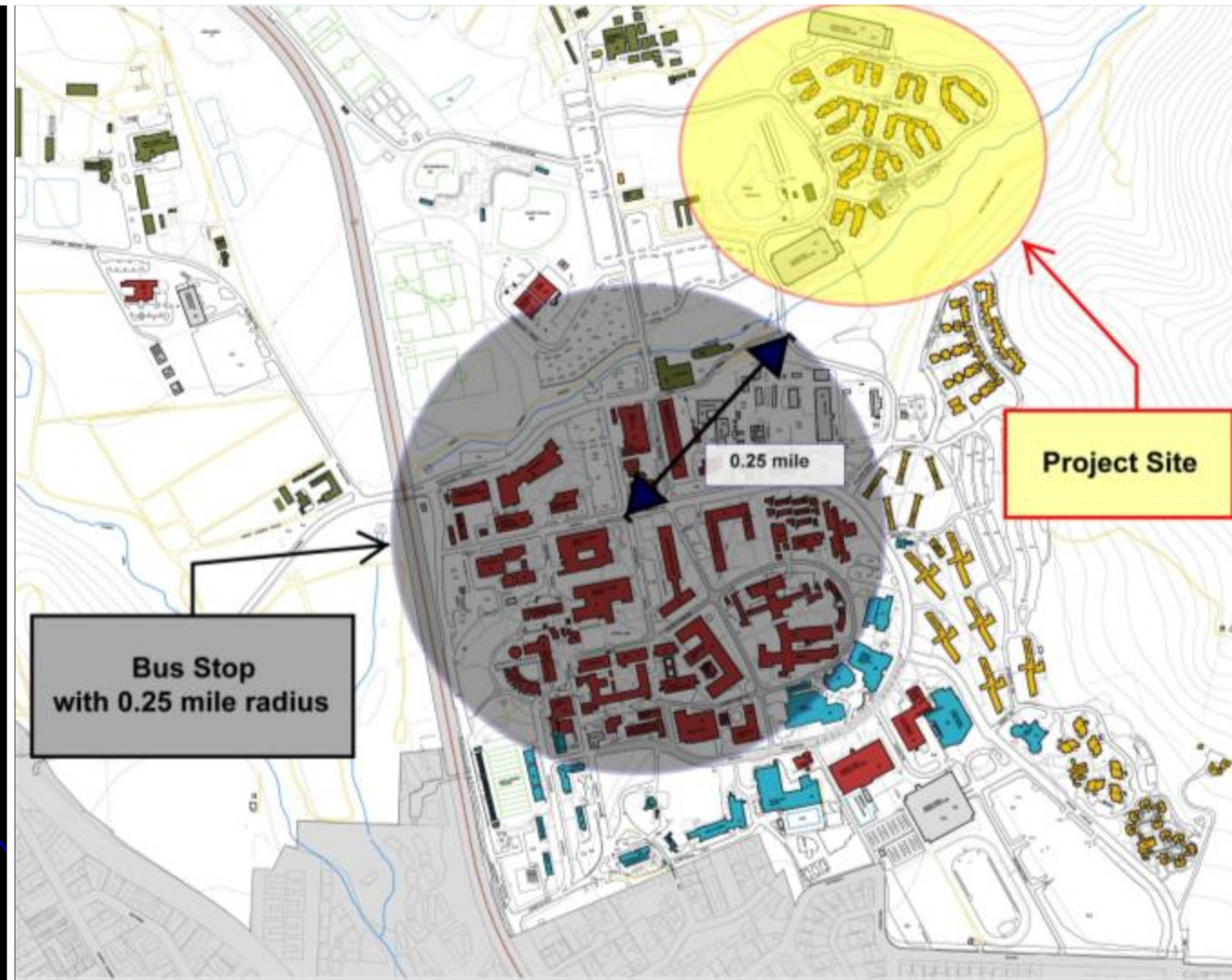
Project includes a bus stop.

Campus bus service is city/county operated.

No service provided at completion of project.

**DENIED**

LEED Credit 4.1 V-2.1  
Public Transportation  
Access







Alternative Transportation: *dedicated walking routes to main campus*



Alternative Transportation: *covered bike storage & surface racks*

74% increase to on-campus residency  
2670 additional on-campus residents  
6249 total on-campus residents  
Over 35% of enrollment now live on campus

Two parking structures with 1,926 spaces were intentionally designed to provide 30% fewer parking spaces than residents promoting bicycling and use of alternative transportation.

- Cal Poly's greenhouse gas emissions due to commuting were reduced by 2.4 million pounds of CO<sub>2</sub> per year, or 17%.



Alternative Transportation: *carbon footprint reduction*

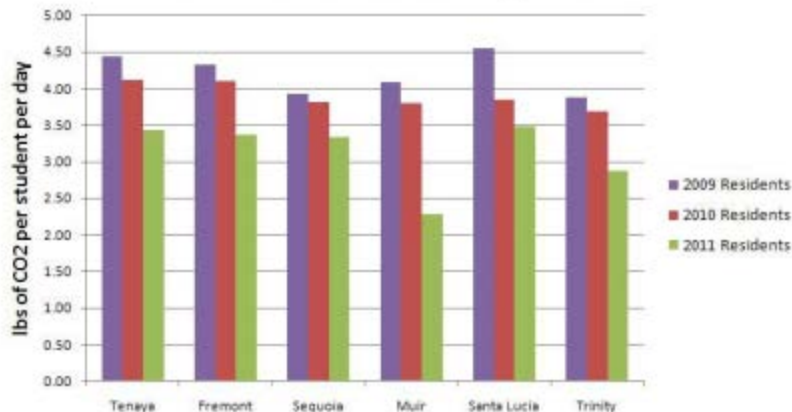
Green Campus Program  
Annual Conservation Competition  
for Energy & Water

<http://www.greencampus.calpoly.edu>

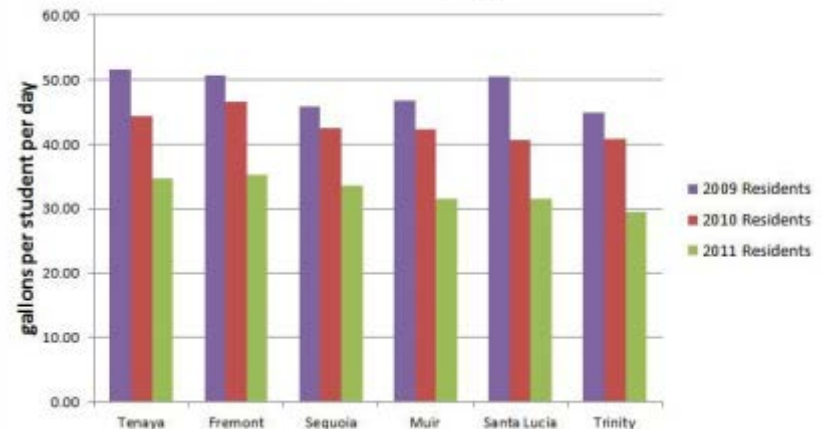
Students are educated about sustainable living, behavioral strategies to reduce their environmental footprint, and encouraged to demonstrate innovative ideas of their own.

November 10, 2010 Competition		relative daily impact per student	
Building		lbs CO <sub>2</sub>	gallons of H <sub>2</sub> O
Estrella (winner)	0.941	3.50	36.99
Aliso	0.953	3.55	37.46
Huasna	0.957	3.50	38.76
Buena Vista + Inyo	0.975	3.62	38.41
Gypsum	0.982	3.71	37.32
Corralitos	0.996	3.70	39.20
Dover	1.005	3.87	36.67
Foxen	1.040	3.50	41.01

### CO2 Emissions By Year



### Water Use By Year



Education: *personal responsibility and awareness*

### Energy Systems Design:

- High performance envelope
- No air conditioning in apartments, natural ventilation
- Hydronic heating with ceiling radiant panels
- High efficiency central plants with cogeneration
- High efficiency AC for admin and retail areas
- High efficiency lighting
- Low flow plumbing fixtures
- Native and drought tolerant plantings



### High Performance Envelope:

- Heating/cooling loads are a function of the envelope and ventilation
- 6" metal stud exterior walls, R19 insulation, DensGlass sheathing
- R30 attic insulation with venting
- Dual glazed low-e windows
- Light colors chosen for exterior walls and roofing
- Could have improved wall system performance with use of additional layer of rigid board insulation.



### Apartment Heating System Design:

- Mild climate – 87 deg F ASHRAE summer design day
- No AC, natural ventilation, operable windows for ventilation
- Hydronic systems use 10% of the fan/pump energy of forced air for delivery
- Ceiling radiant panels provide ease of maintenance access and furniture arrangement
- Panels installed on all perimeter exposed walls
- One thermostat per apartment



### Central Plant Design:

- Performed LCCA of distributed equipment vs. 1 or 2 central plants
- 2 plants had lowest LCC
- CP1– 6 high efficiency boilers and two 250 kW cogen units with heat recovery
- CP2– 10 high efficiency boilers
- Now in the process of connecting the two plants to increase usability of cogeneration
- Variable flow primary/secondary
- Could have improved by using condensing boilers





### Admin and Retail AC:

- High SEER package rooftop Carrier AC units for retail spaces – special ordered with VAV capability, DDC controls
- Mitsubishi City Multi AC units for office areas – variable refrigerant flow, multiple zones, can deliver simultaneous heating and cooling
- Cal Poly air conditioning policy mandates high SEER, bans window units



### Lighting System Design:

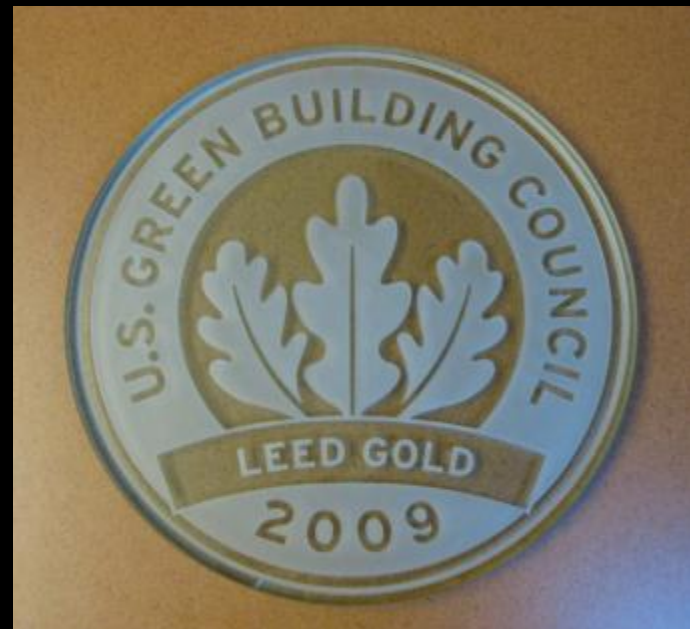
- Indoor – compact fluorescent and linear fluorescent
- Site lighting – metal halide
- Parking Structure – changed from HPS to low wattage linear fluorescent with daylighting control of perimeters
- Central lighting control system – LCD Blue Box
- Emergency lighting system – Myers fast transfer inverter
  - Transfer < 1 ms, HID lighting will not have to restrike
  - 98% efficiency, reduces charging and inversion losses
  - 25 year gel batteries instead of lead acid
- Outperformed ASHRAE 90.1 LPD by:
  - 26% for offices and retail
  - 46% for apartments
  - 73% for parking structures

### Water Efficiency:

- Low flow toilets, showerheads, and faucet aerators reduced water usage by 30% below code
- Used native and drought tolerant plantings in landscape - 58% of planting areas do not require permanent irrigation
- Reduced lawns to functional gathering/activity areas only
- Landscape staff uses mulching mowers
- Planting beds are covered with mulch from composted Cal Poly animal waste and green waste to add nutrients to soil and reduce water use

### Overall Performance:

- Outperformed ASHRAE 90.1 total energy budget by 51%
- Saves 4.7M kWh per year
- Reduced total campus BTU/GSF by 7%
- LEED Gold Certified
- Reduced total campus carbon emissions due to commuting by 17%
- Significantly reduced traffic and congestion on campus and in community neighborhoods



### Info and Resources:

- Cal Poly Sustainability Website [www.sustainability.calpoly.edu](http://www.sustainability.calpoly.edu)
- Cal Poly Green Campus Program [www.greencampus.calpoly.edu](http://www.greencampus.calpoly.edu)
- Cal Poly University Housing <http://housing.calpoly.edu/>
- Poly Canyon Village website <http://polycanyonvillage.calpoly.edu/>

