SUSTAINABLE MASTER PLANNING

01 High-level goal setting

LEED Platinum (15 or more energy points)

ENERGY STAR 100

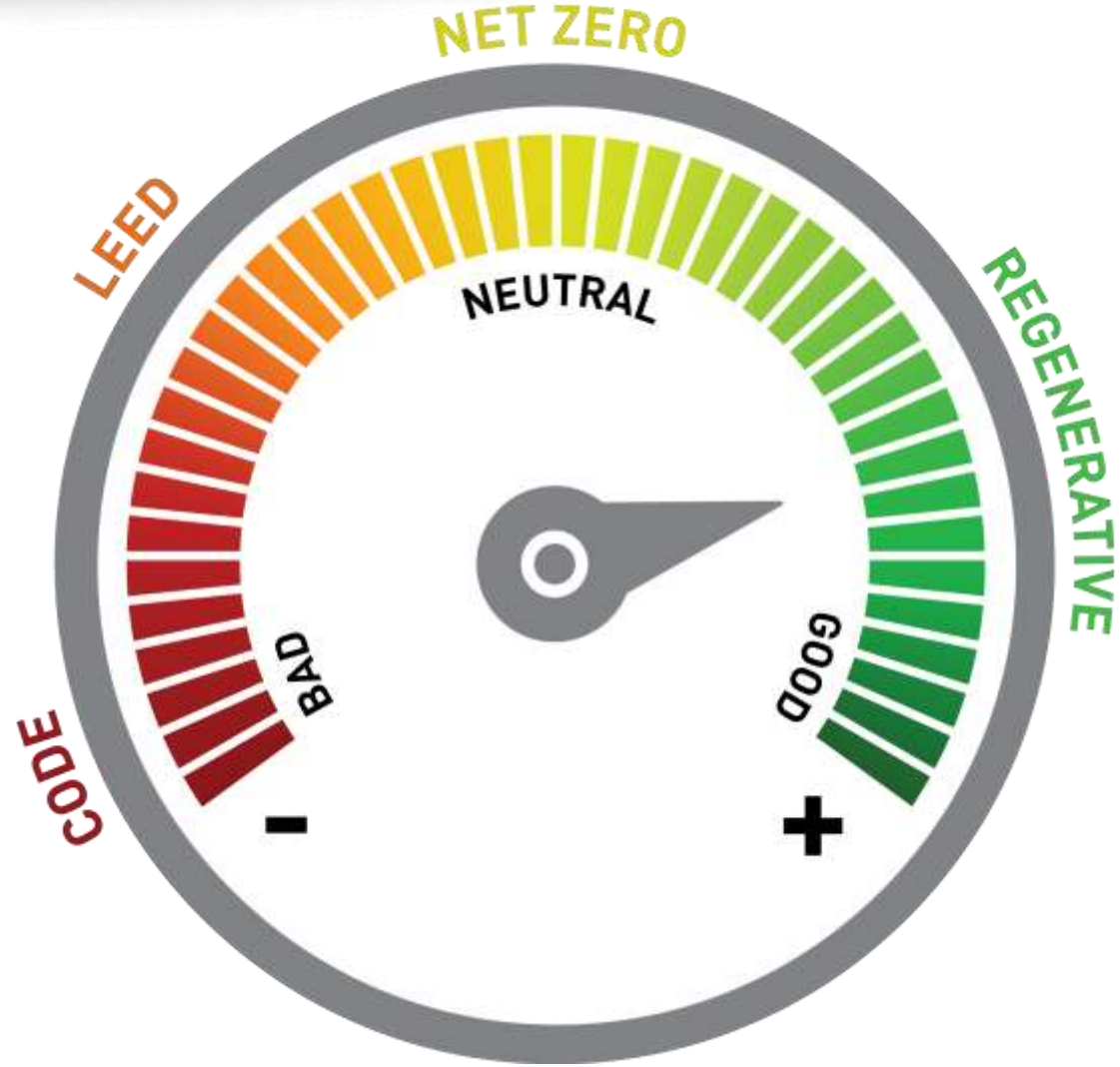
EUI 30 kBtu/sf/year (per 2030 Challenge)

Net zero energy ready

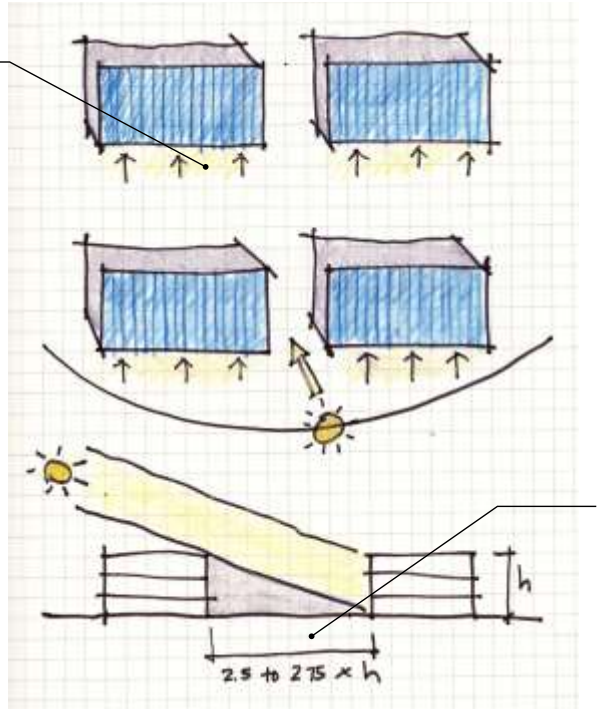
75+ 75+ year service life

Water conservation (potable, stormwater, wastewater)

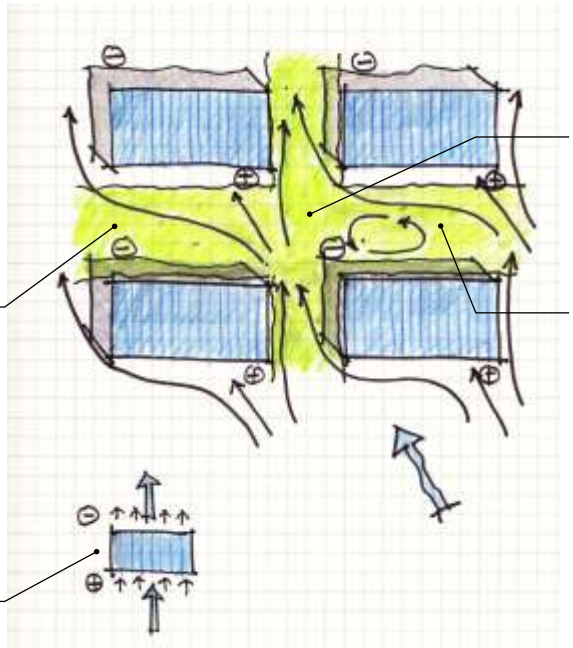
01 High-level goal setting



02 Passive planning principles



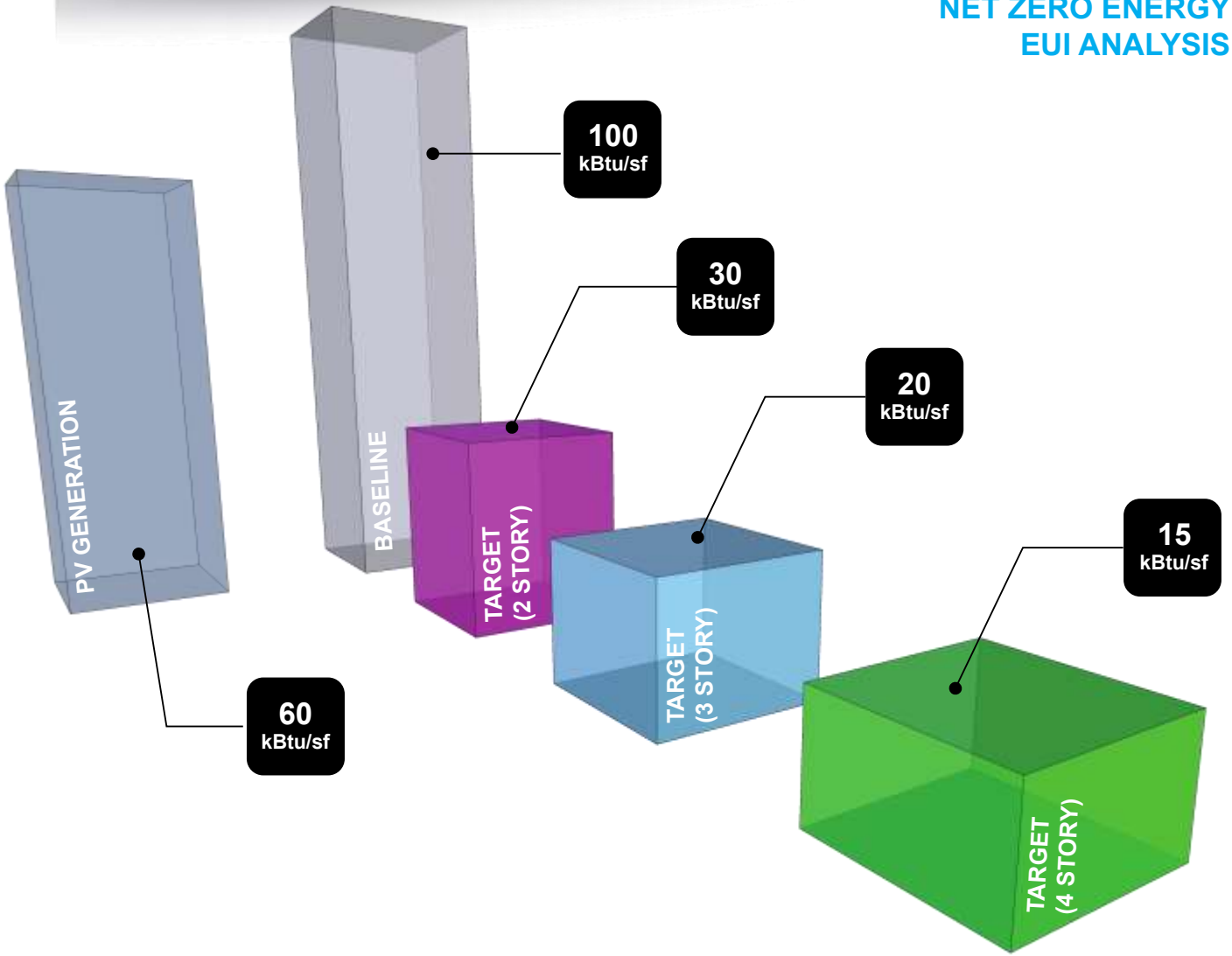
SOLAR COURTS



VEGETATED VENTILATION GRID

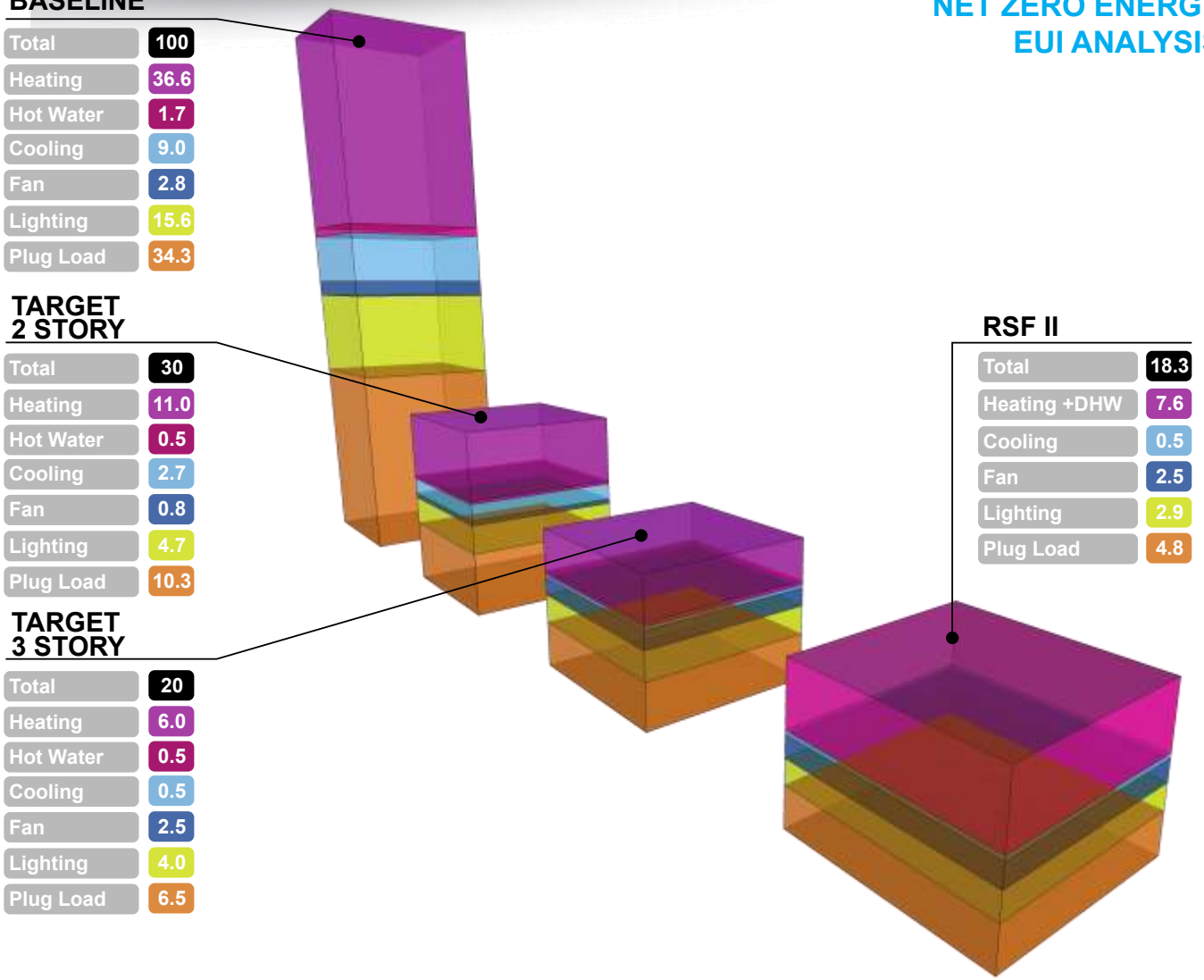
03 Campus-wide performance targets

NET ZERO ENERGY EUI ANALYSIS



03 Campus-wide performance targets

NET ZERO ENERGY EUI ANALYSIS



BASELINE

Total	100
Heating	36.6
Hot Water	1.7
Cooling	9.0
Fan	2.8
Lighting	15.6
Plug Load	34.3

TARGET 2 STORY

Total	30
Heating	11.0
Hot Water	0.5
Cooling	2.7
Fan	0.8
Lighting	4.7
Plug Load	10.3

TARGET 3 STORY

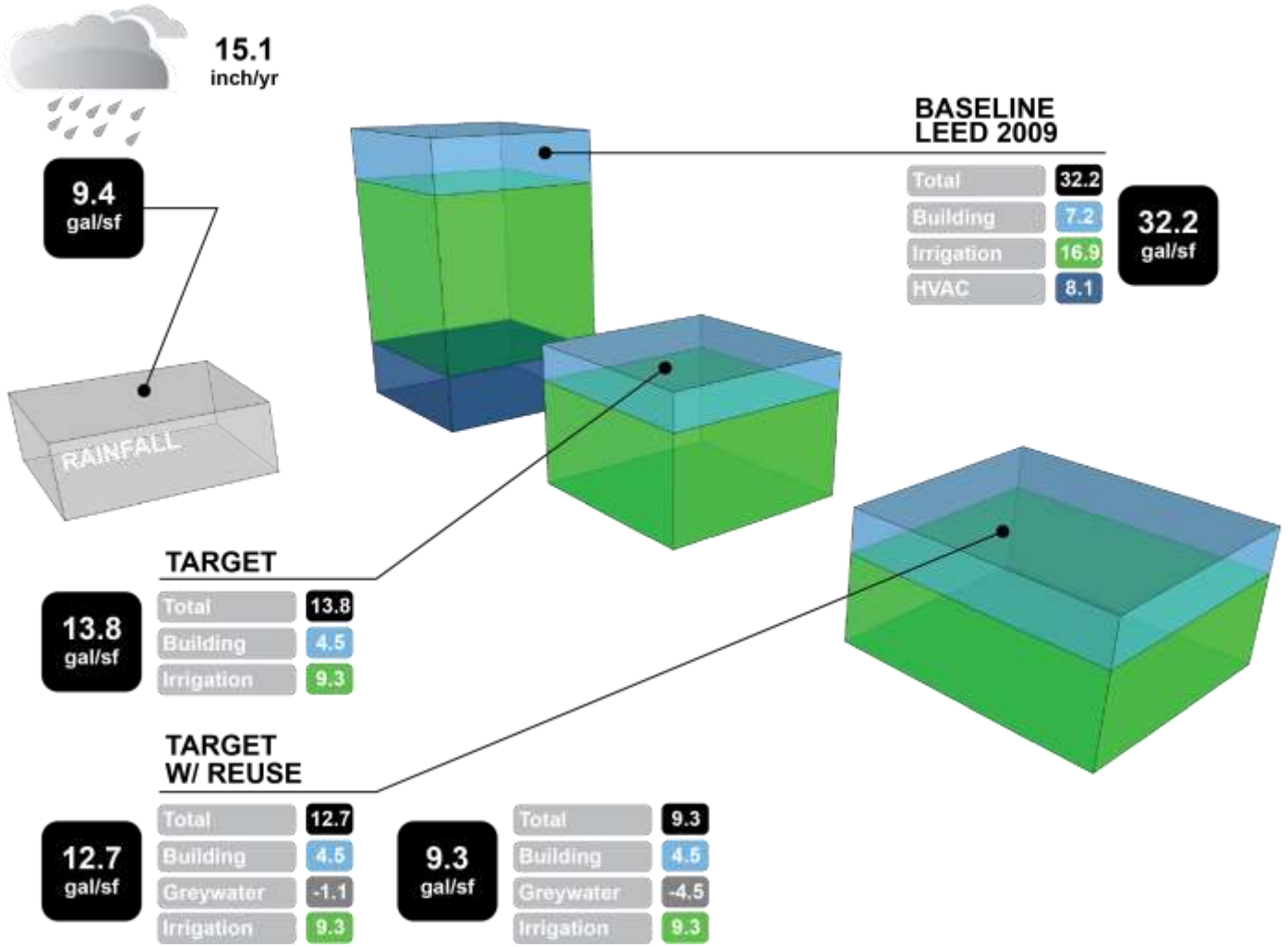
Total	20
Heating	6.0
Hot Water	0.5
Cooling	0.5
Fan	2.5
Lighting	4.0
Plug Load	6.5

RSF II

Total	18.3
Heating +DHW	7.6
Cooling	0.5
Fan	2.5
Lighting	2.9
Plug Load	4.8

03 Campus-wide performance targets

WATER BALANCE
WUI ANALYSIS



04 Urban design and sustainability

Stage 3 - 2 Selected Diagrams

Diagram 3

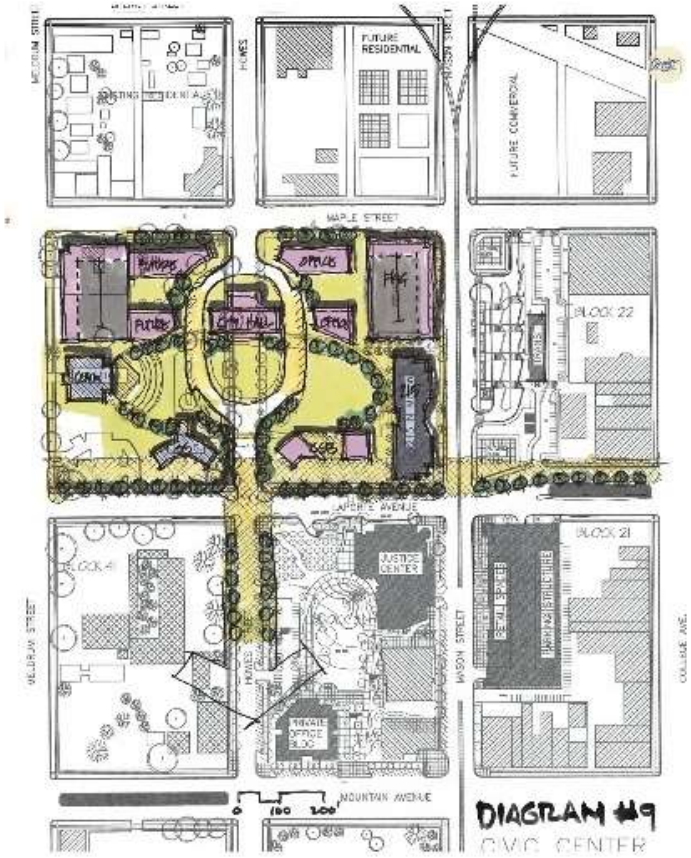


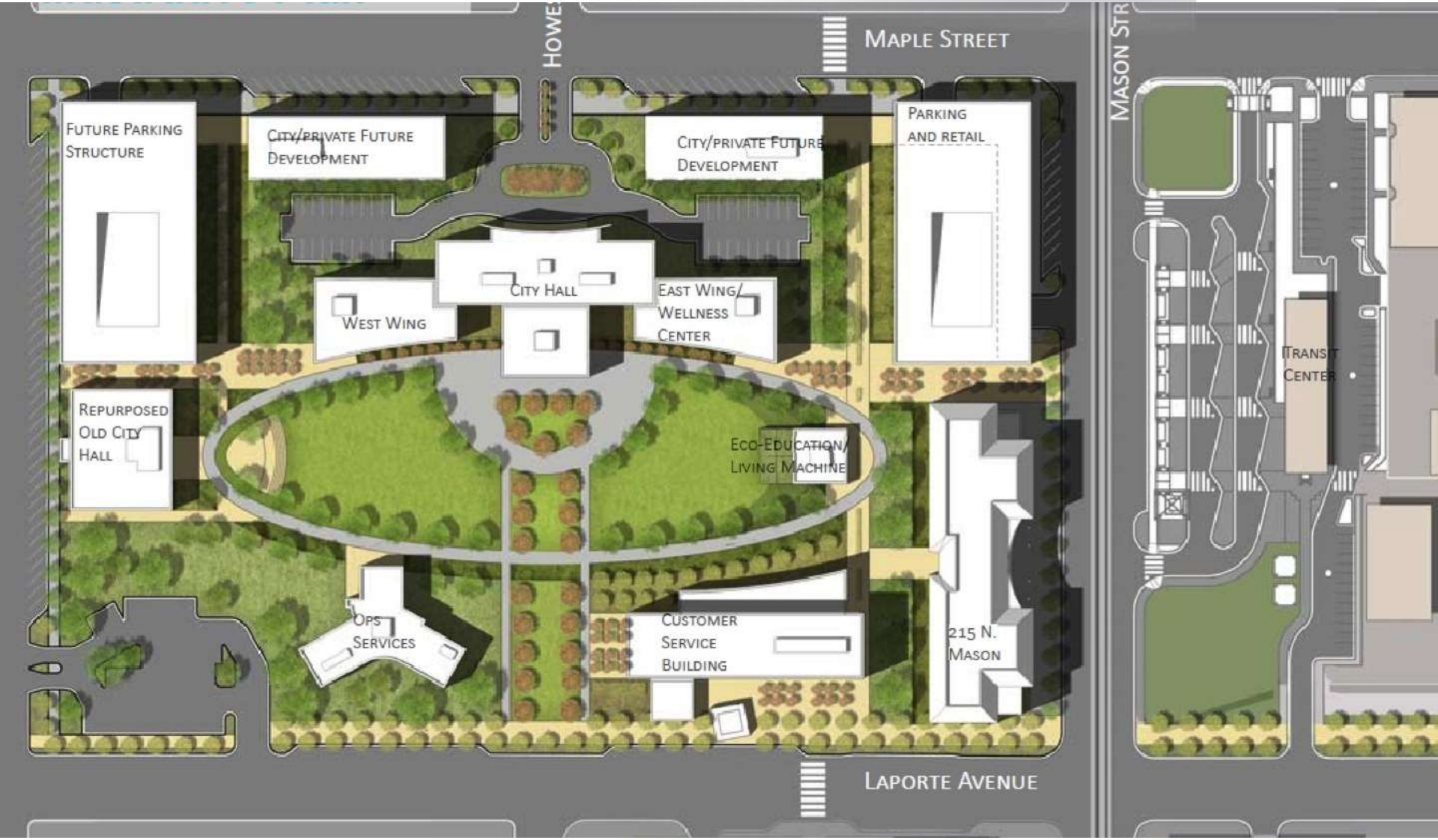
Diagram 9

04 Urban design and sustainability

Diagram 3 - Illustrative Plan

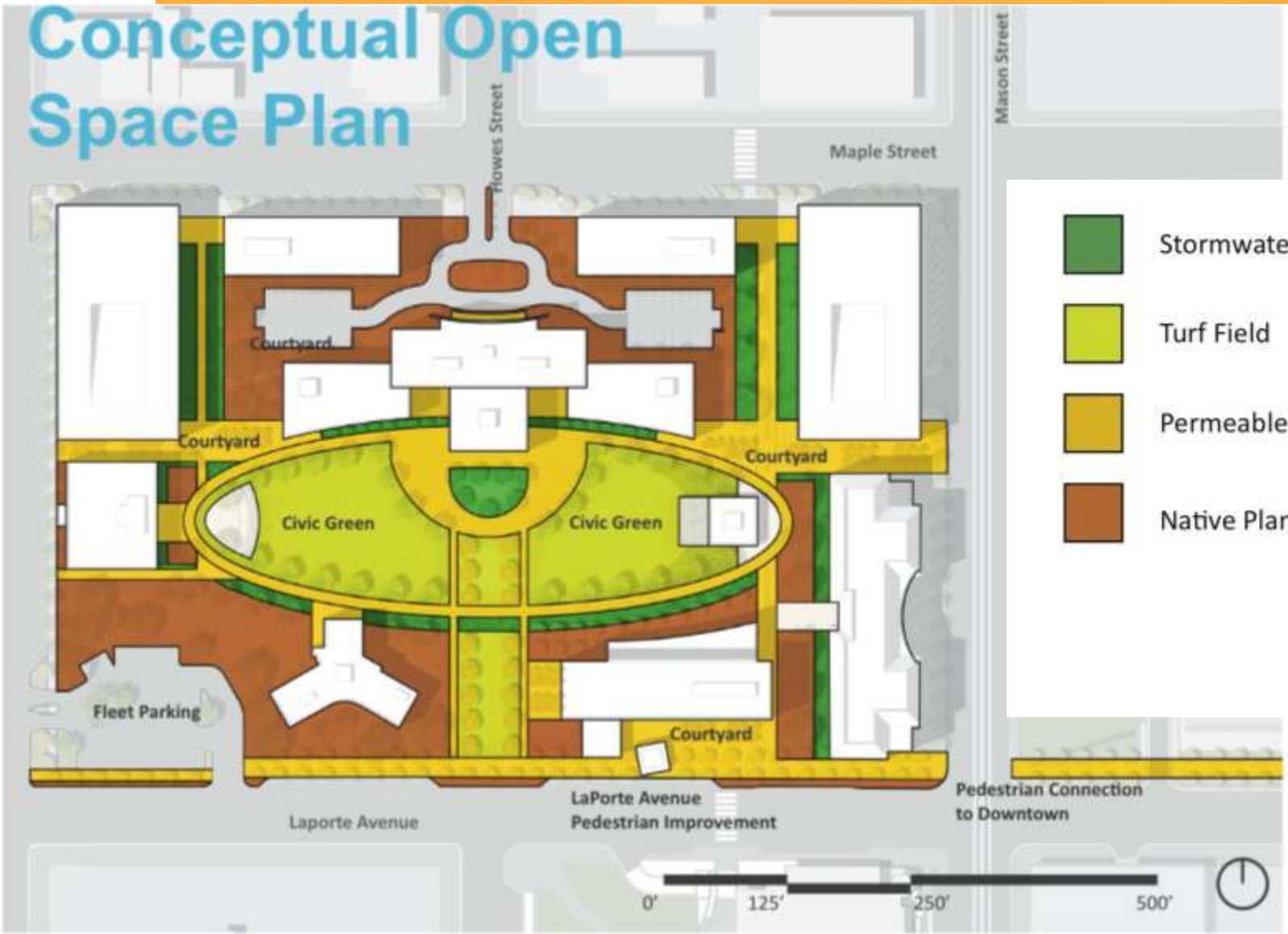
Diagram 9 - Illustrative Plan

04 Urban design and sustainability



04 Urban design and sustainability

Conceptual Open Space Plan



05 Integrate district systems

Sustainable Site Strategies


Pervious Paving

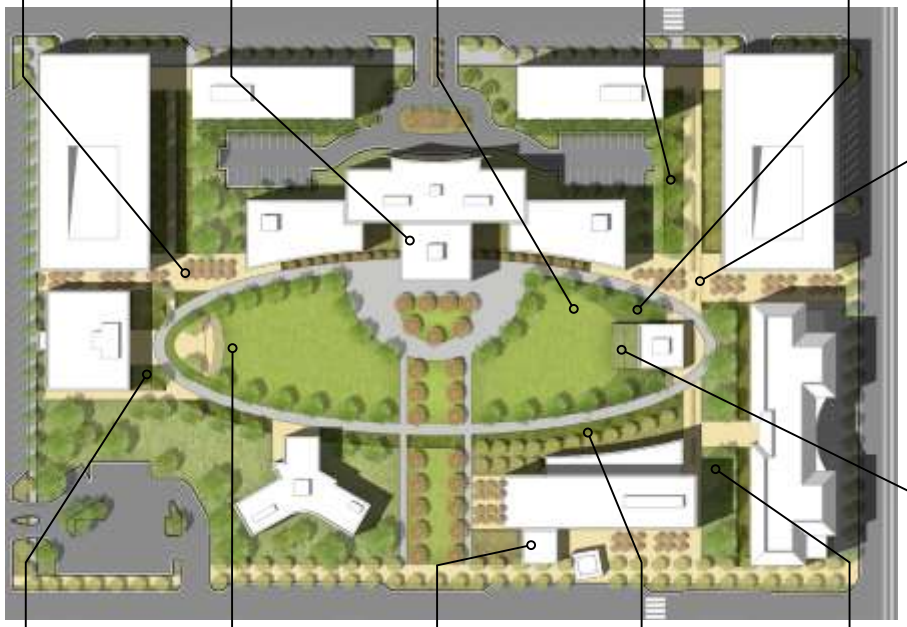

Green Roof


Native Detention Area


Rain Gardens


Urban Wildlife Habitat


Pedestrian Paths




Rain Gardens


Community Green

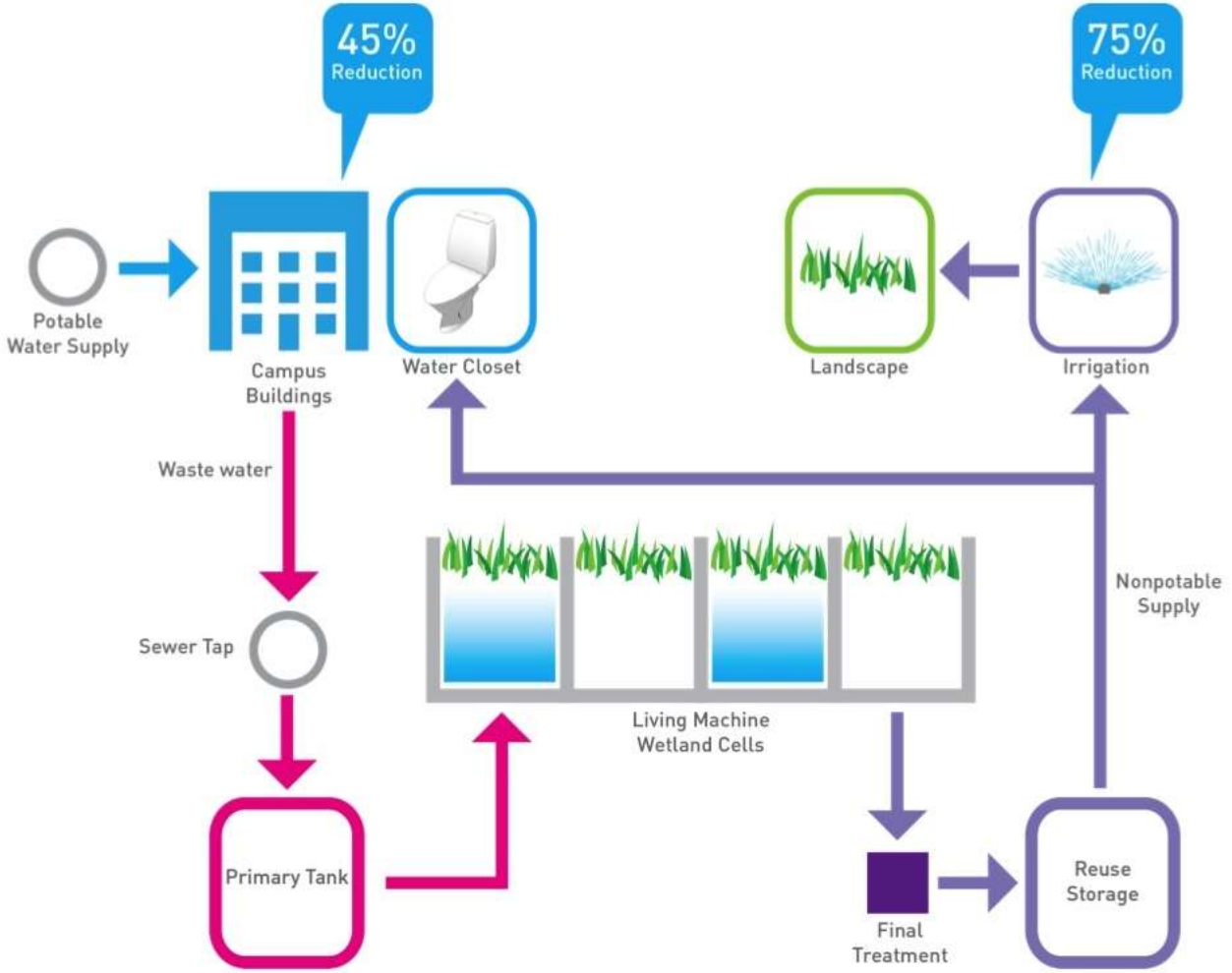

Green Roof


Bioswale

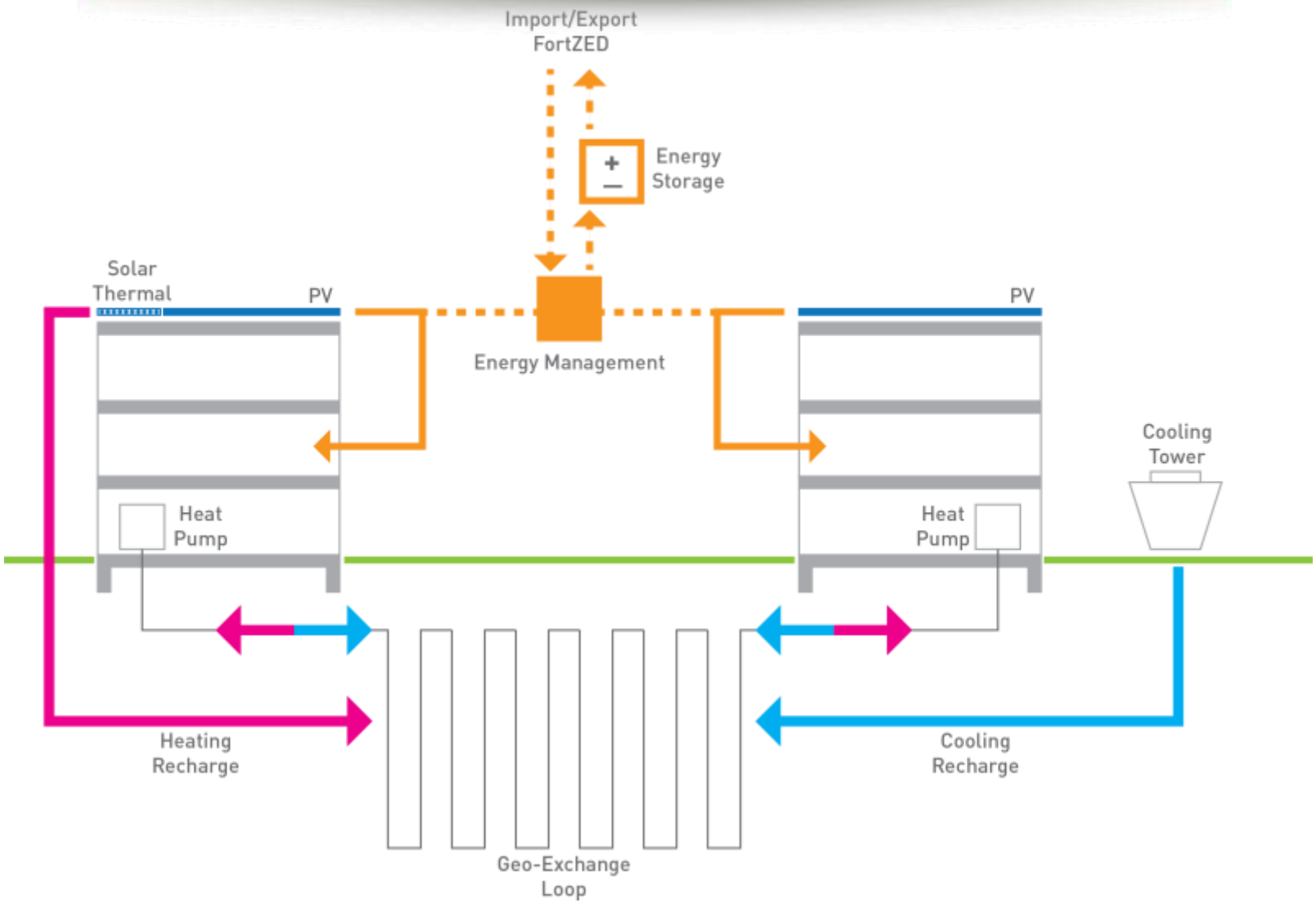

Rainwater Capture


Living Machine

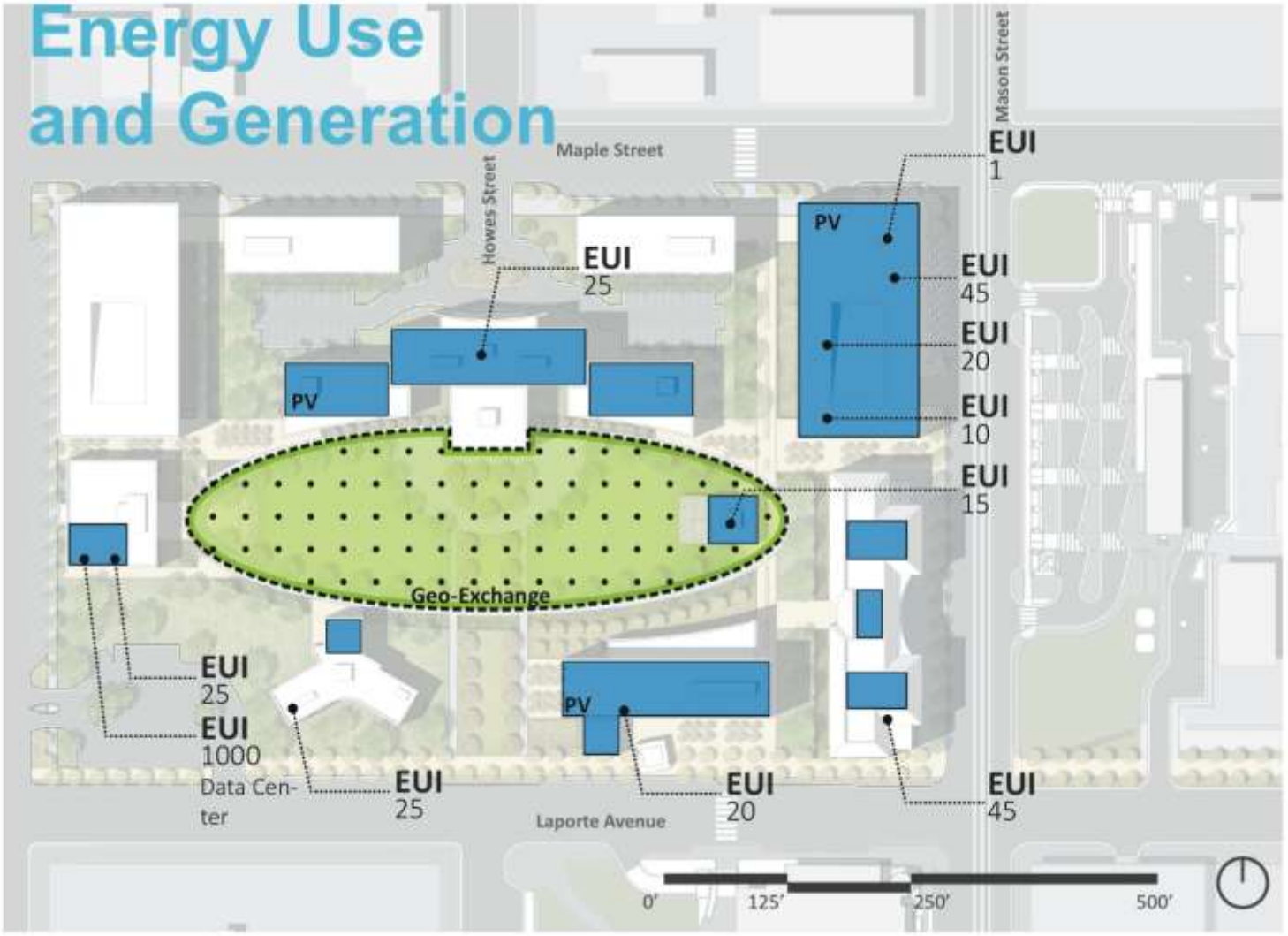
05 Integrate district systems



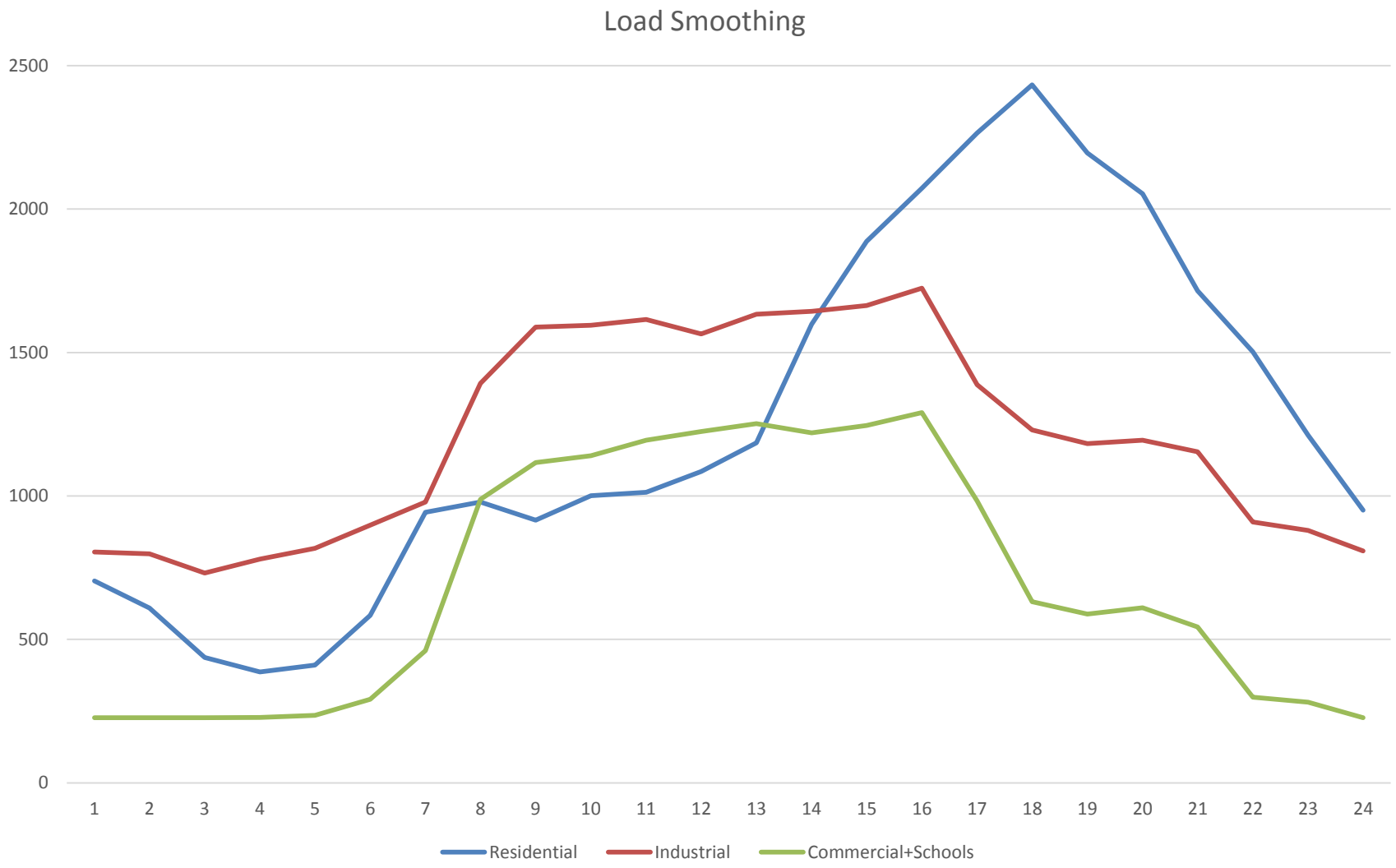
05 Integrate district systems



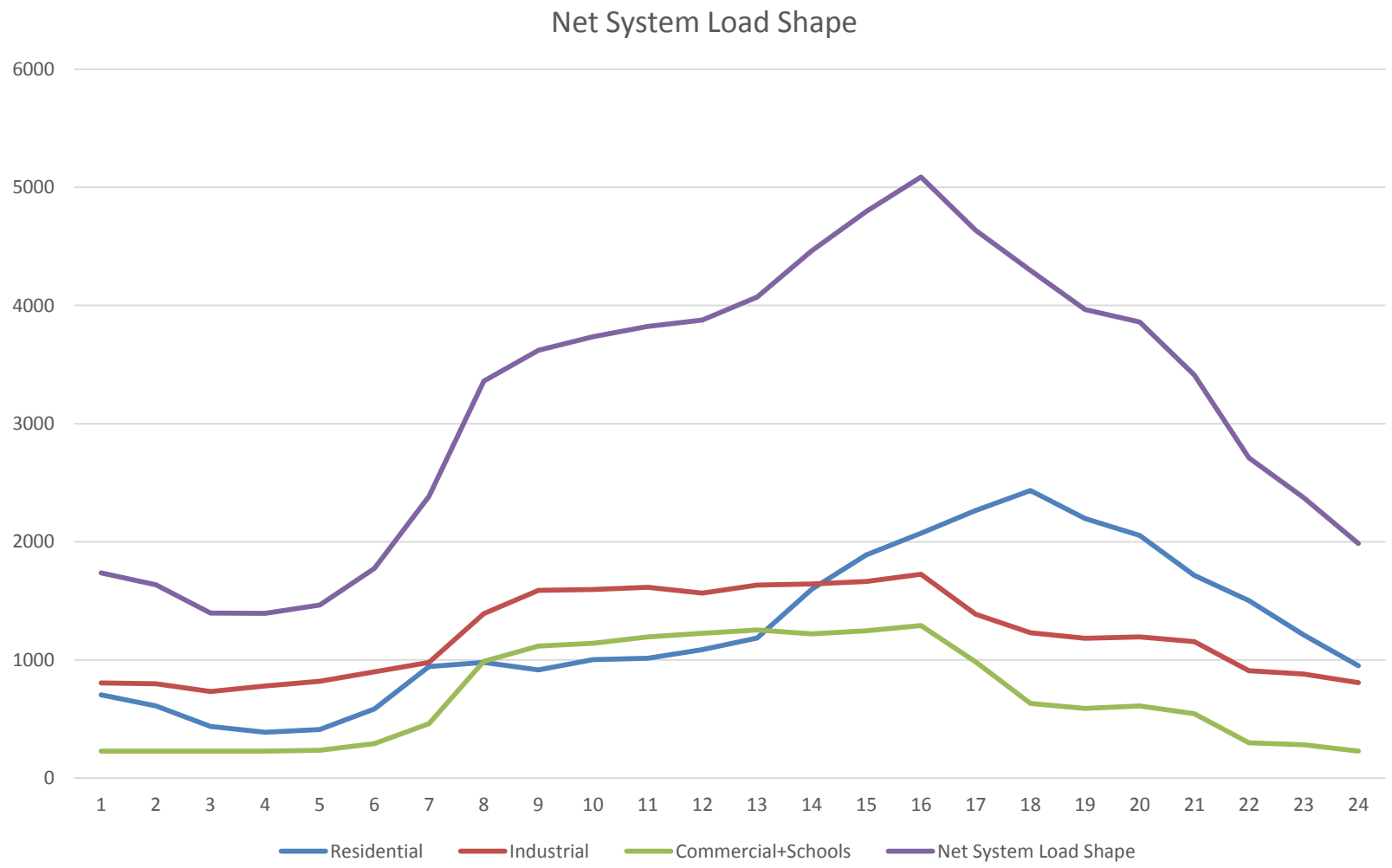
05 Integrate district systems



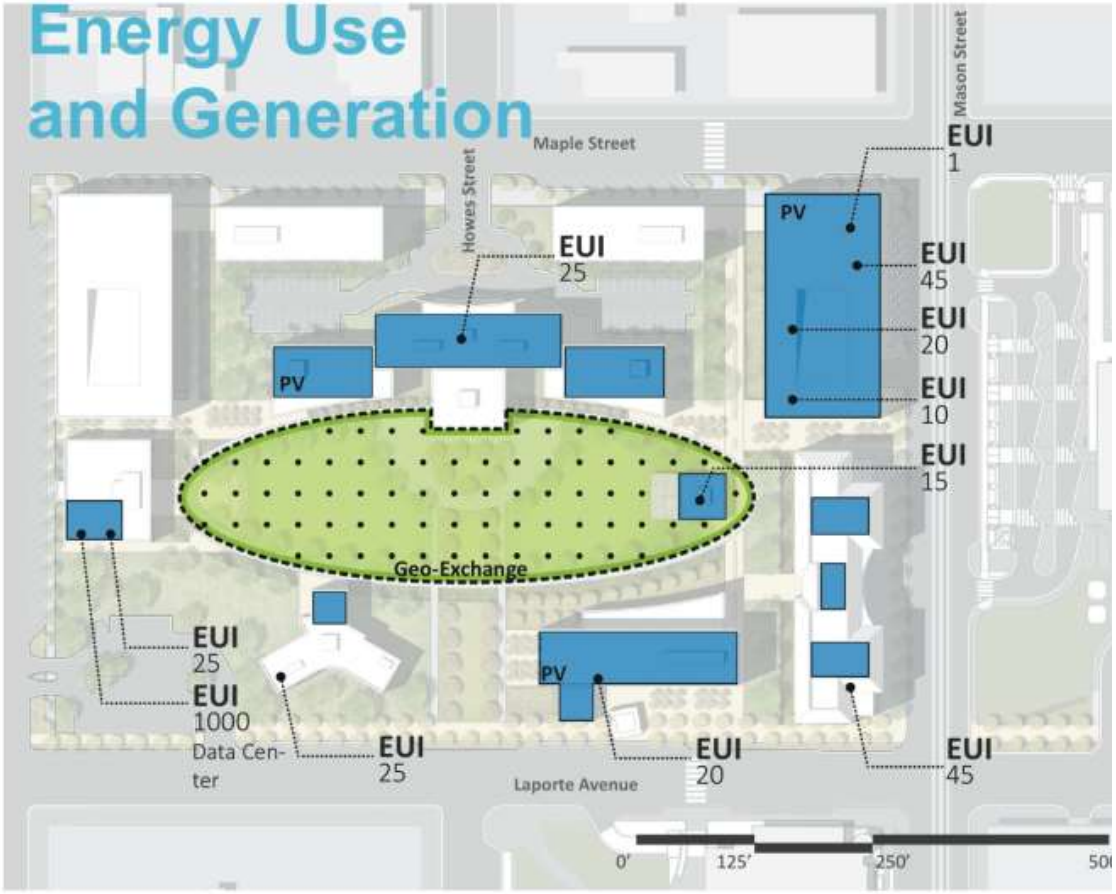
Coaxial Borehole Design with Integral Thermal Storage

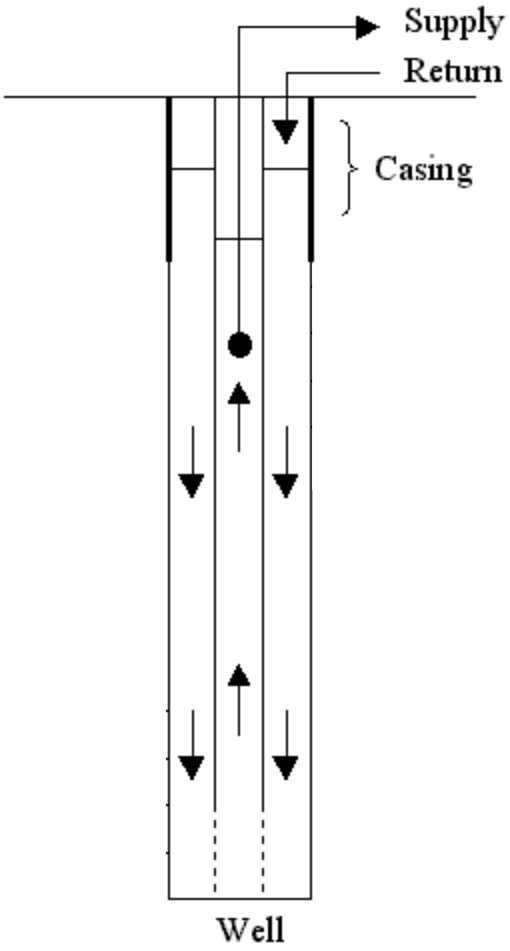


Load Diversity Increases Capacity Factor

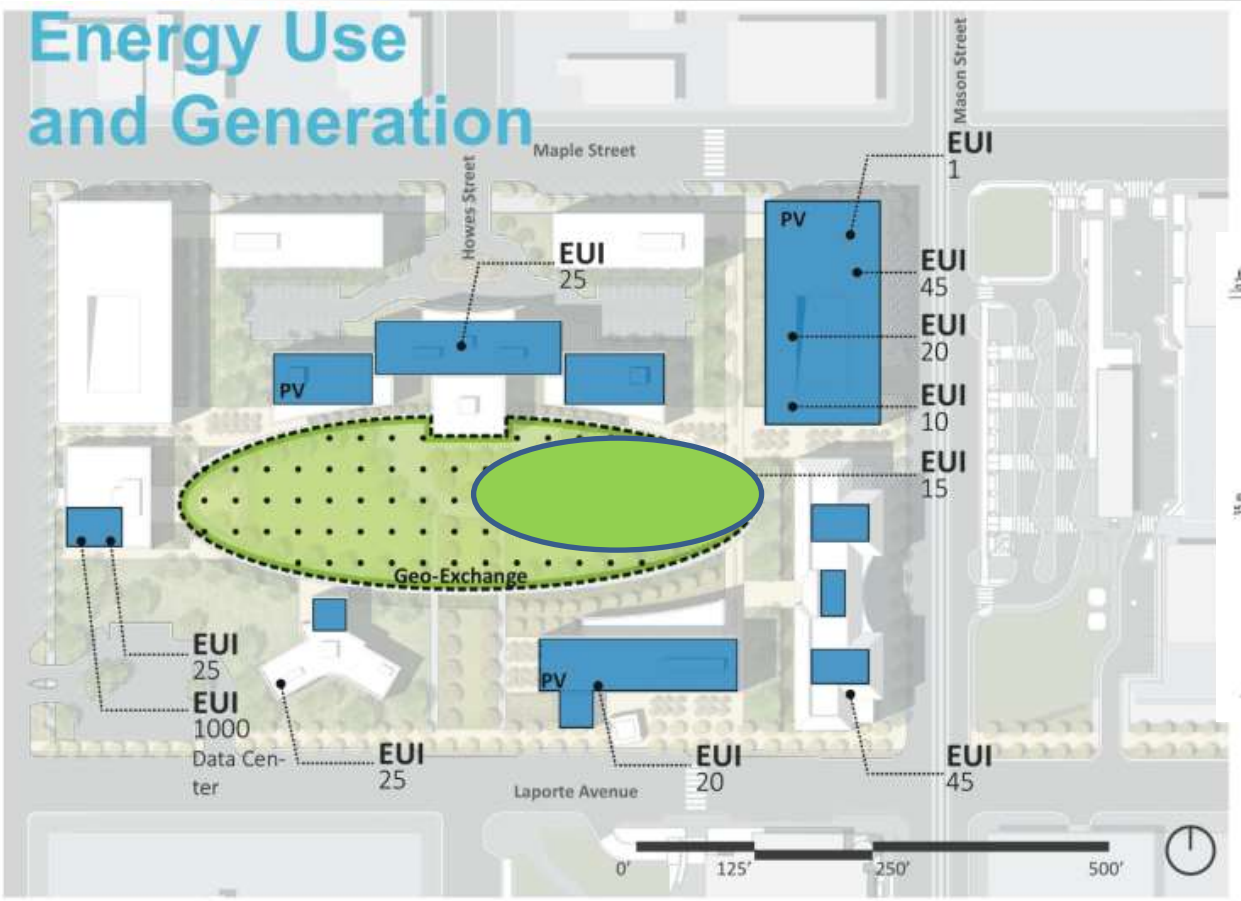


Coaxial Borehole Design with Integral Thermal Storage



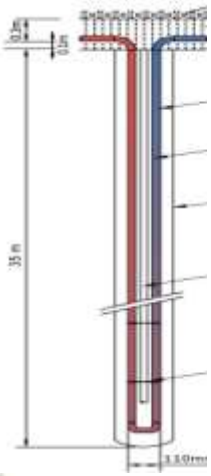


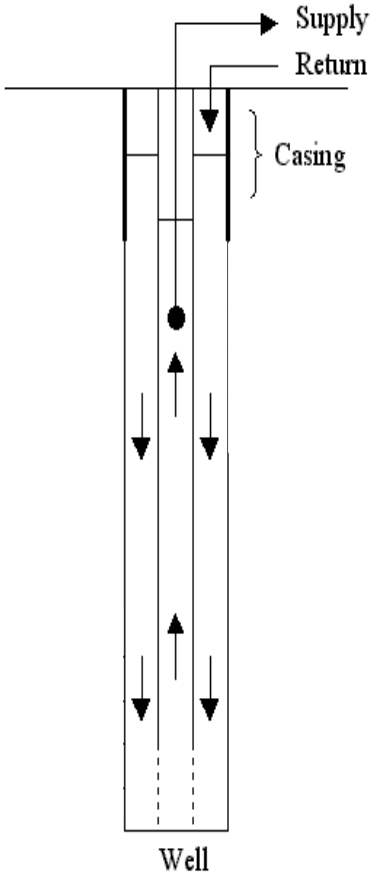
Coaxial Borehole Design with Integral Thermal Storage



400’ depth
5.5” Diameter

1100’ depth
8” Diameter





Geothermal gradient 0.55F/100’ = 61F for coaxial vs 57F for conventional

Low Energy Radiant Slabs + DOAS with Heat Wheel

- Permits 60F cooling supply and 120F heating supply
- Cooling loads met 90% of the time direct without vapor compression

Challenges

- Conventional Systems Given Lower Cost Estimates
- Budgets for each building rather than evaluation of total site budget
- Innovative approaches perceived with higher risk; translated to higher cost estimates
- Low energy costs make it difficult to justify incremental cost innovation

Economies of District Scales

30 tons

$1700/tonr

$900/ton for
30 ton ASHP

$700/ton for
200 ton ASHP

250 tons

$350/tonr