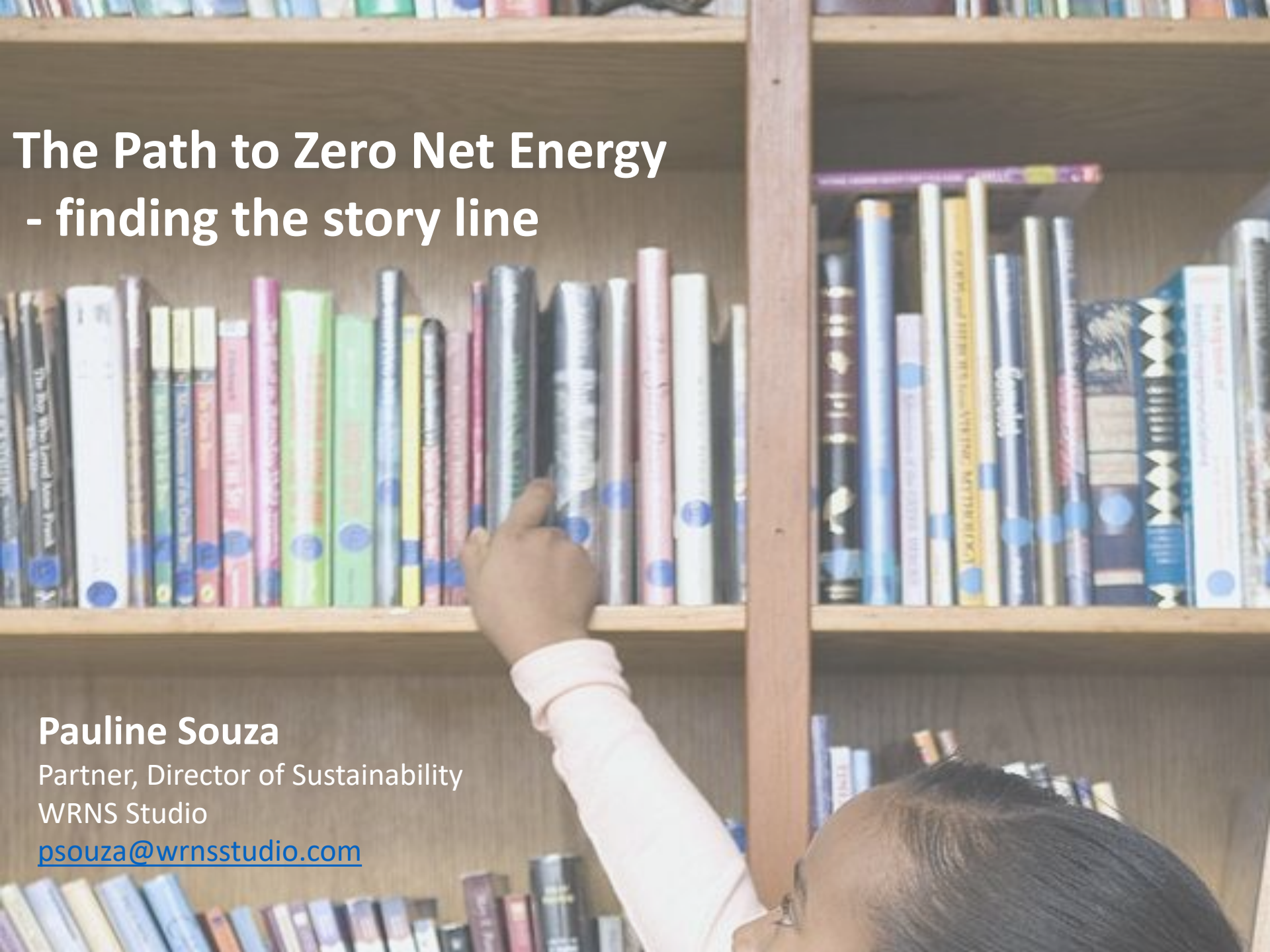


The Path to Zero Net Energy - finding the story line

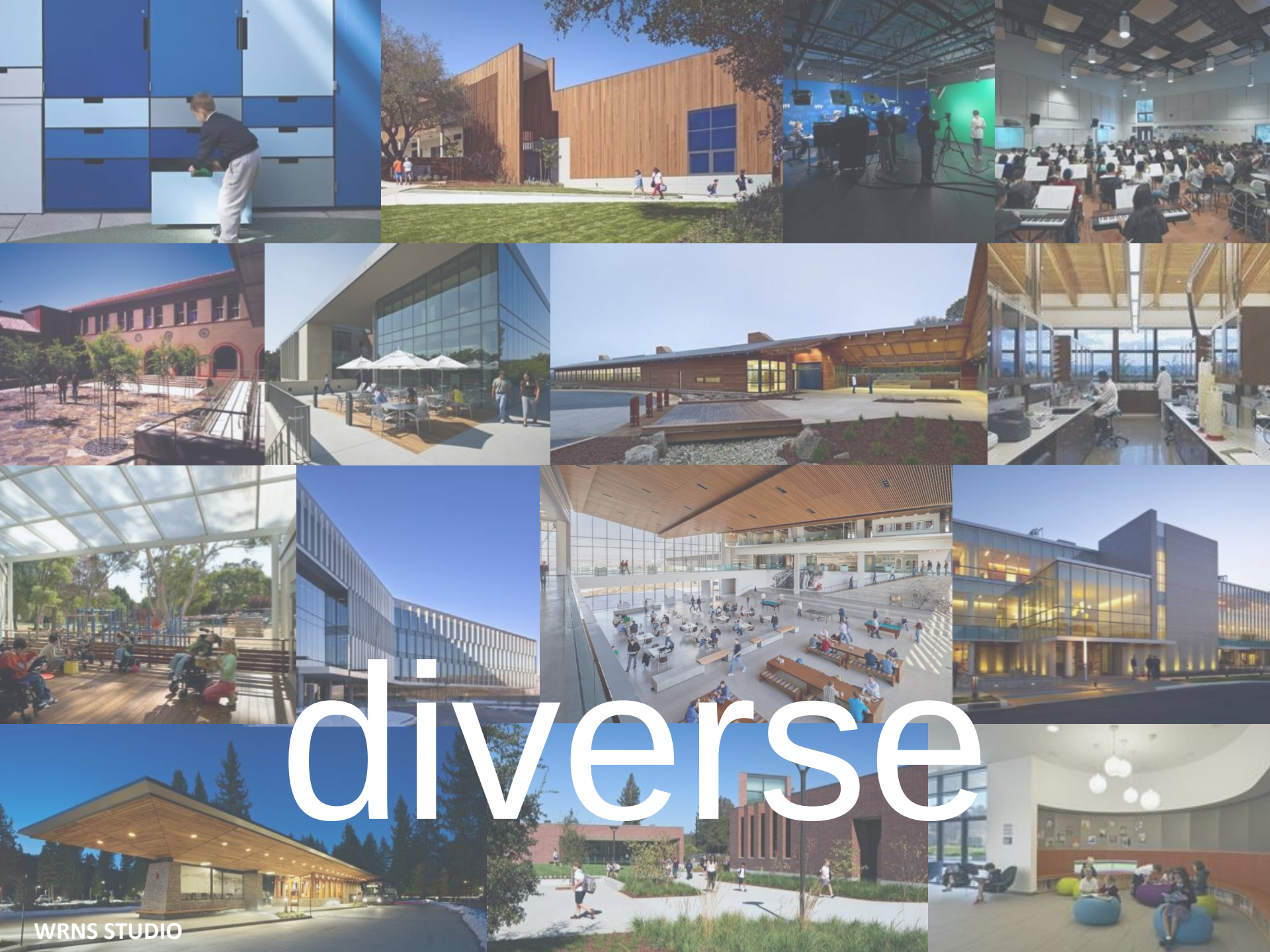
Pauline Souza
Partner, Director of Sustainability
WRNS Studio
psouza@wrnsstudio.com

big shed

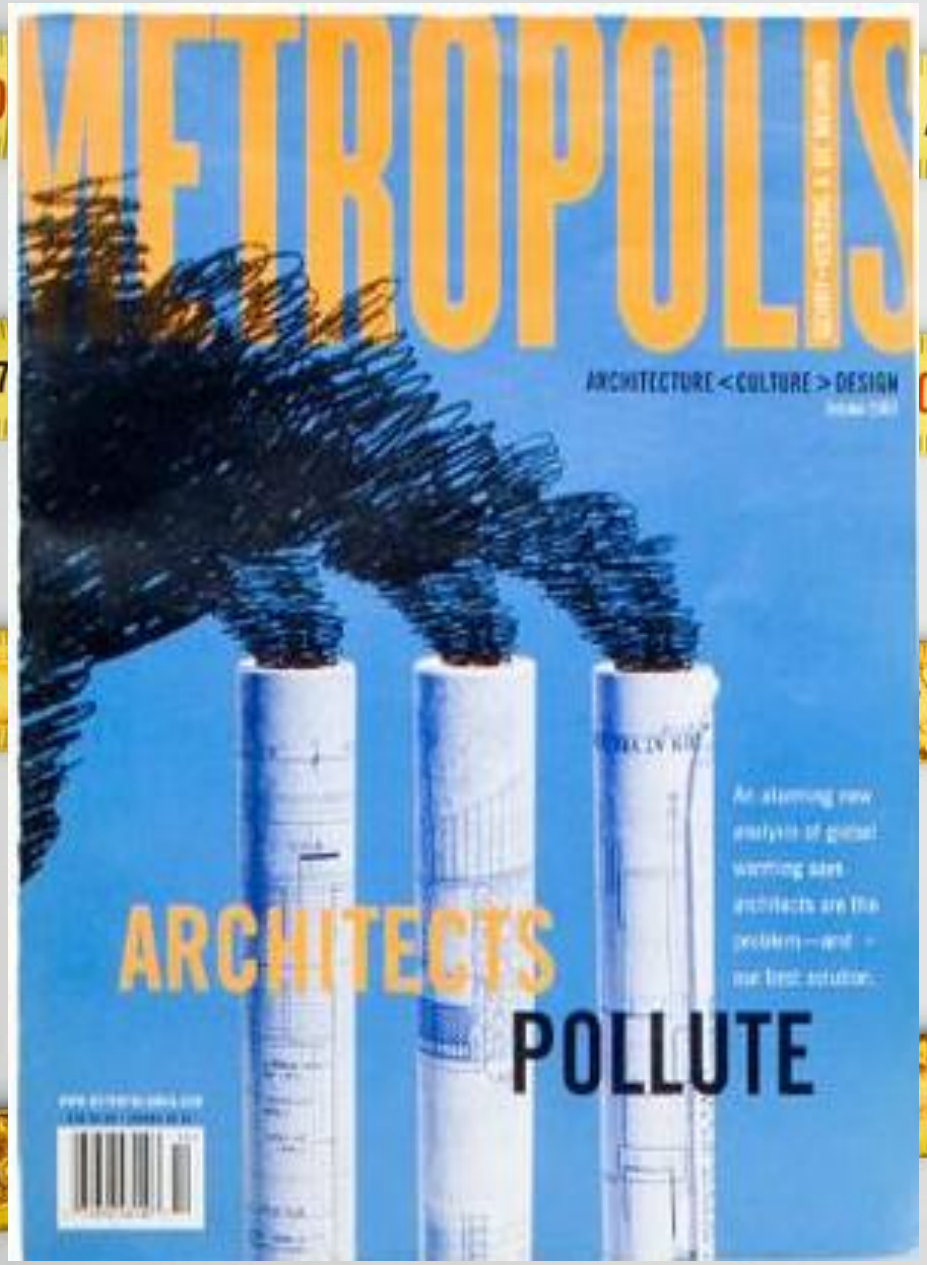
San Francisco, Honolulu and New York

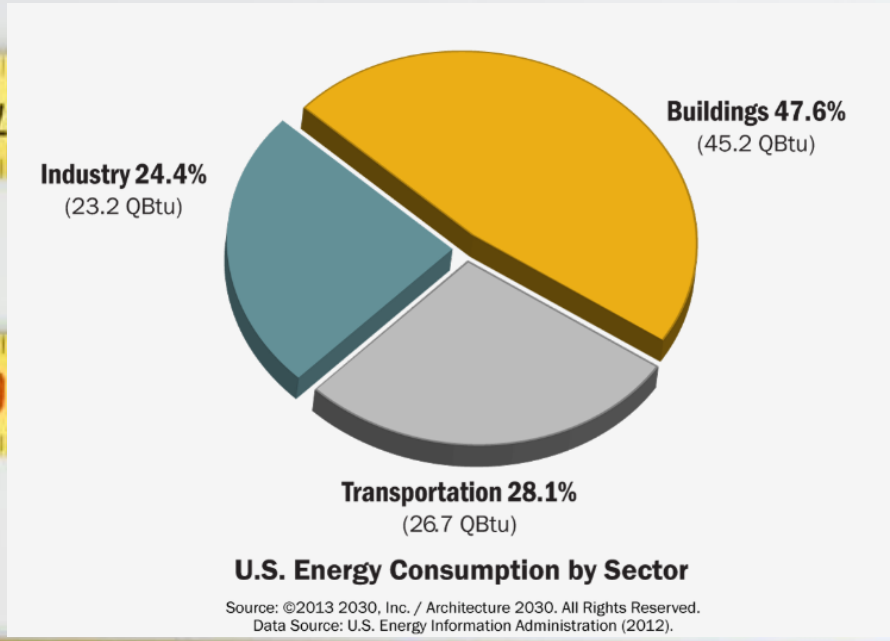
WRNS STUDIO

WRNS STUDIO


diverse
WRNS STUDIO


10+ years
old
257 projects

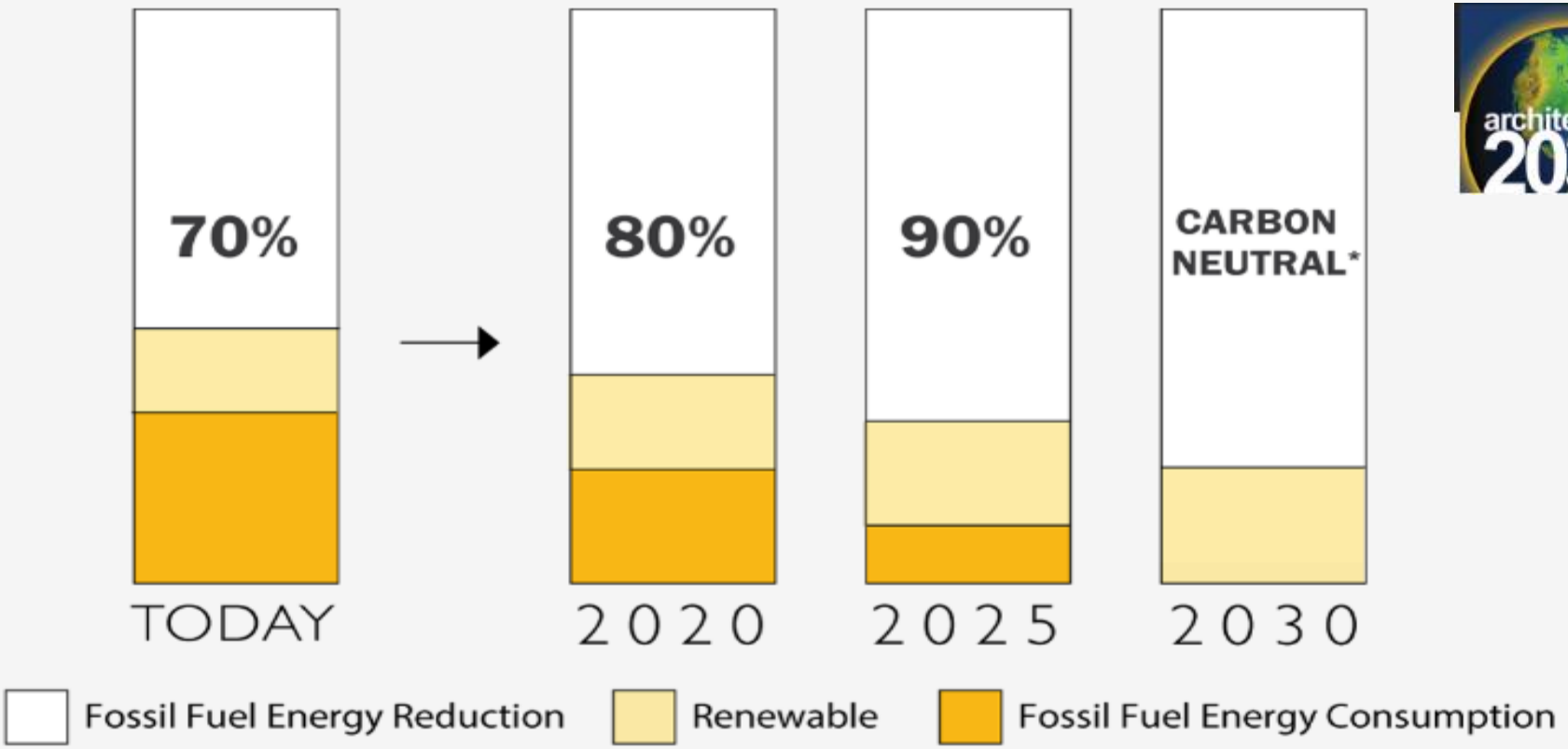




Turning down the global thermostat

THE 2030 CHALLENGE

All new buildings, developments, and major renovations shall be carbon-neutral by 2030



The 2030 Challenge

**Using no fossil fuel GHG-emitting energy to operate.*

AIA

2030 COMMITMENT

Measuring Industry Progress Toward 2030

The AIA 2030 Commitment is a growing national initiative that provides a consistent, national framework with simple metrics and a standardized reporting format to help firms evaluate the impact design decisions have on an individual project's energy performance.

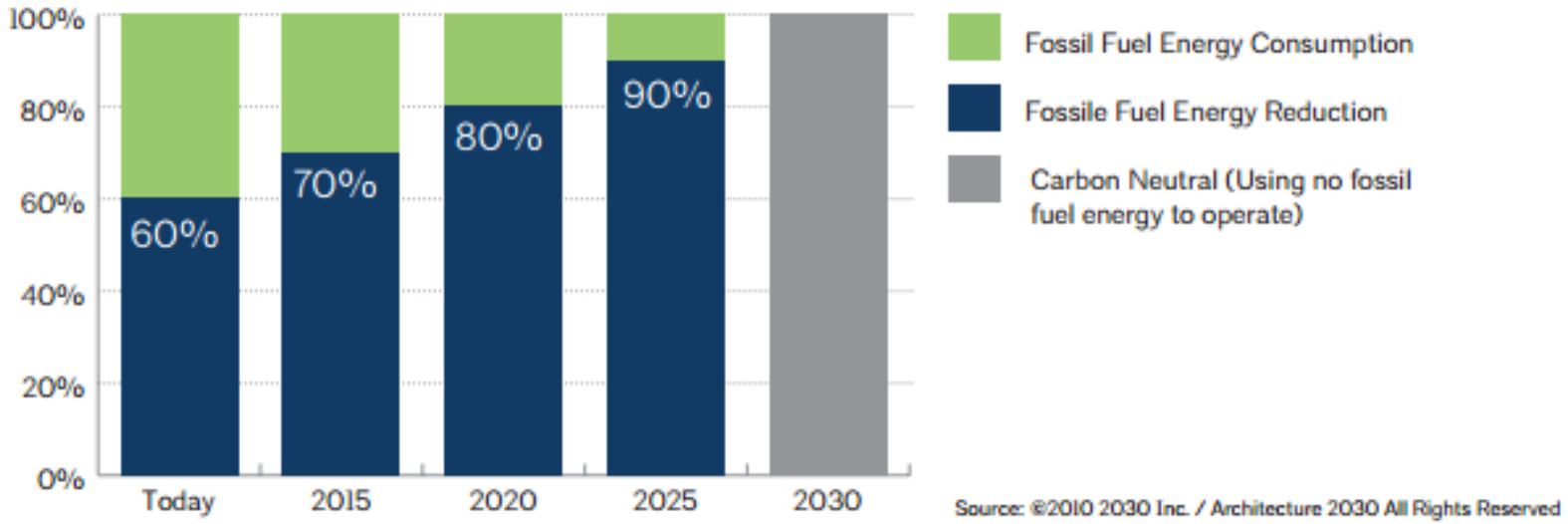
measure

Launched in 2009

We signed in 2011

We reported in **2013**

FIGURE 1. 2030 Challenge Goals

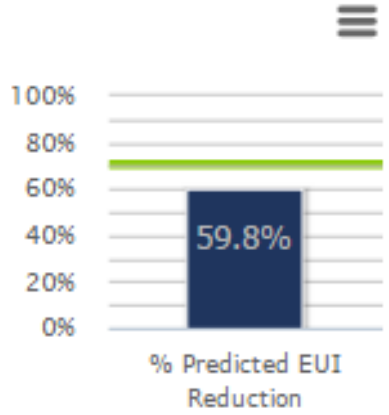


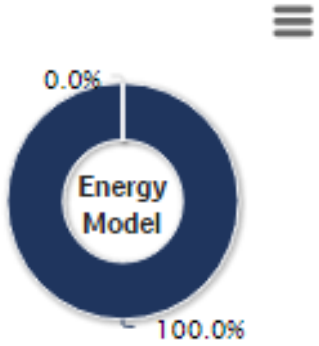
WRNS Studio
Overall Progress

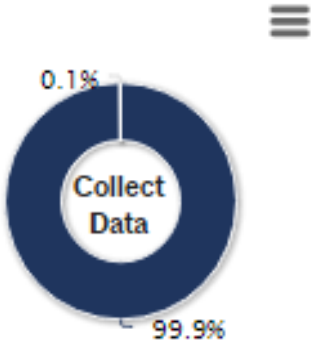
All Projects

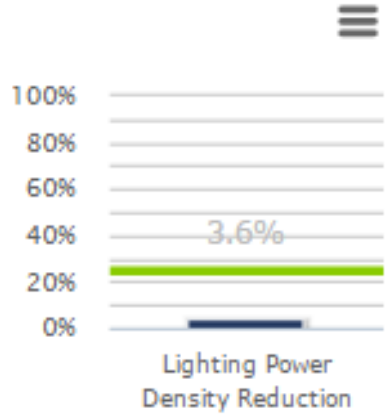
---

51 Projects And 6,186,333 GSF Included In Analysis.









% Predicted EUI Reduction
from Average EUI

Energy Model
% GSF of Projects

Will Actual EUI Data Be Collected
% GSF of Projects

Lighting Power Density Reduction
% of Projects

GSF Values

Total =	6,153,633	6,153,633	6,150,033	Total =	32,700
Meeting Target =	3,344,025			Meeting Target =	0
% Meeting Target =	54.3 %			% Meeting Target =	0.0 %

Interior-Only Projects: 3 projects and 32,700 GSF included in analysis.
Non-Residential and Residential Projects: 48 projects and 6,153,633 GSF included in analysis.

Report card

Assembly Bill No. 32

CHAPTER 488

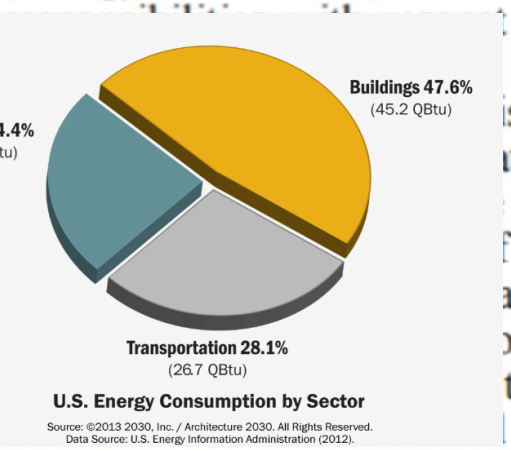
An act to add Division 25.5 (commencing with Section 38500) to the Health and Safety Code, relating to air pollution.

[Approved by Governor September 27, 2006. Filed with Secretary of State September 27, 2006.]

LEGISLATIVE COUNSEL'S DIGEST

AB 32, Nunez. Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006.

Under existing law, the State Air Resource
State Energy Resources Conservation and
(Energy Commission), and the California Clim
to the control o
Secretary for E
ission reductions
te government.
state board to ad
statewide green
ance with this p
oard to adopt
to the statewic
by 2020, as sp
the state board to adopt rules and regulatio
achieve the maximum technologically



California Gov. Jerry Brown Signs New Climate Change Laws

September 8, 2016 · 9:15 PM ET

RICHARD GONZALES

California is already on track to drastically reduce greenhouse gas emissions to 1990 levels by 2020.

Now under legislation signed by Gov. Jerry Brown, a Democrat, the state will ratchet up its fight against climate change by launching an ambitious campaign to scale back emissions 40 percent below 1990 levels by 2030.

"This is big, and I hope it sends a message across the country," Brown said.

California State Sen. Fra

The Act requires the California Air Resources Board (CARB) to develop regulations and market mechanisms that will cut the state's GHG emissions to 1990 levels by 2020—a 25% reduction statewide.


Why is it taking so long

it costs too much

the client doesn't want it

the schedule doesn't allow it

I don't have the fee

- us

it costs too much

Its too complicated

We don't have time/talent

We have never done that before

- clients


Education


Education


Lab


Library


Civic

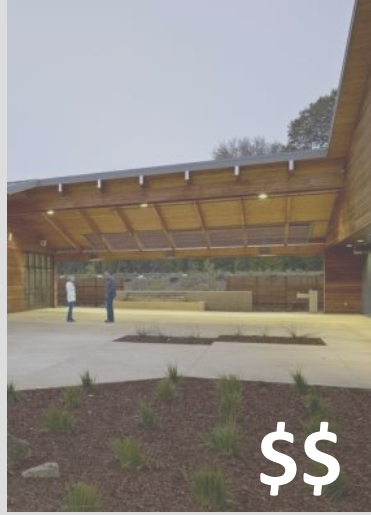

Waipahu High School
Campus


Renovation


Office


$


$$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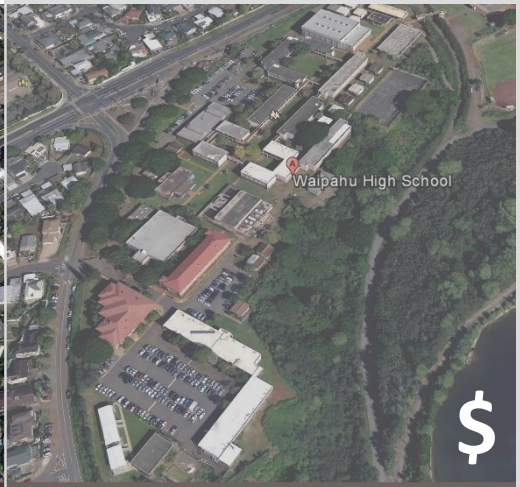
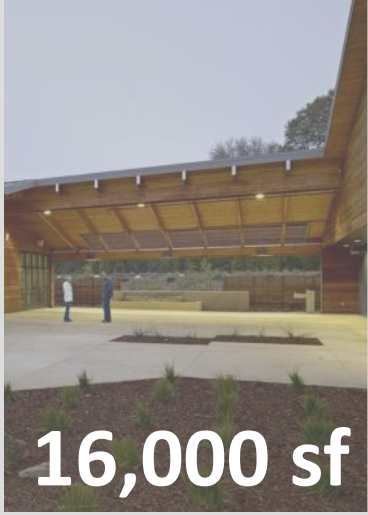

Waipahu High School
$


$


$$


24,000 sf


21,000 sf


16,000 sf


6,300 sf


38,000 sf


Waipahu High School
2 acres


35,000 sf


643,600 sf

BuildingGreen

Why We Let Ourselves Do Mediocre Work

Architects and designers want to do exceptional, challenging sustainability work. Why are we waiting for the unicorn client?

by Tristan Roberts

Image: BuildingGreen

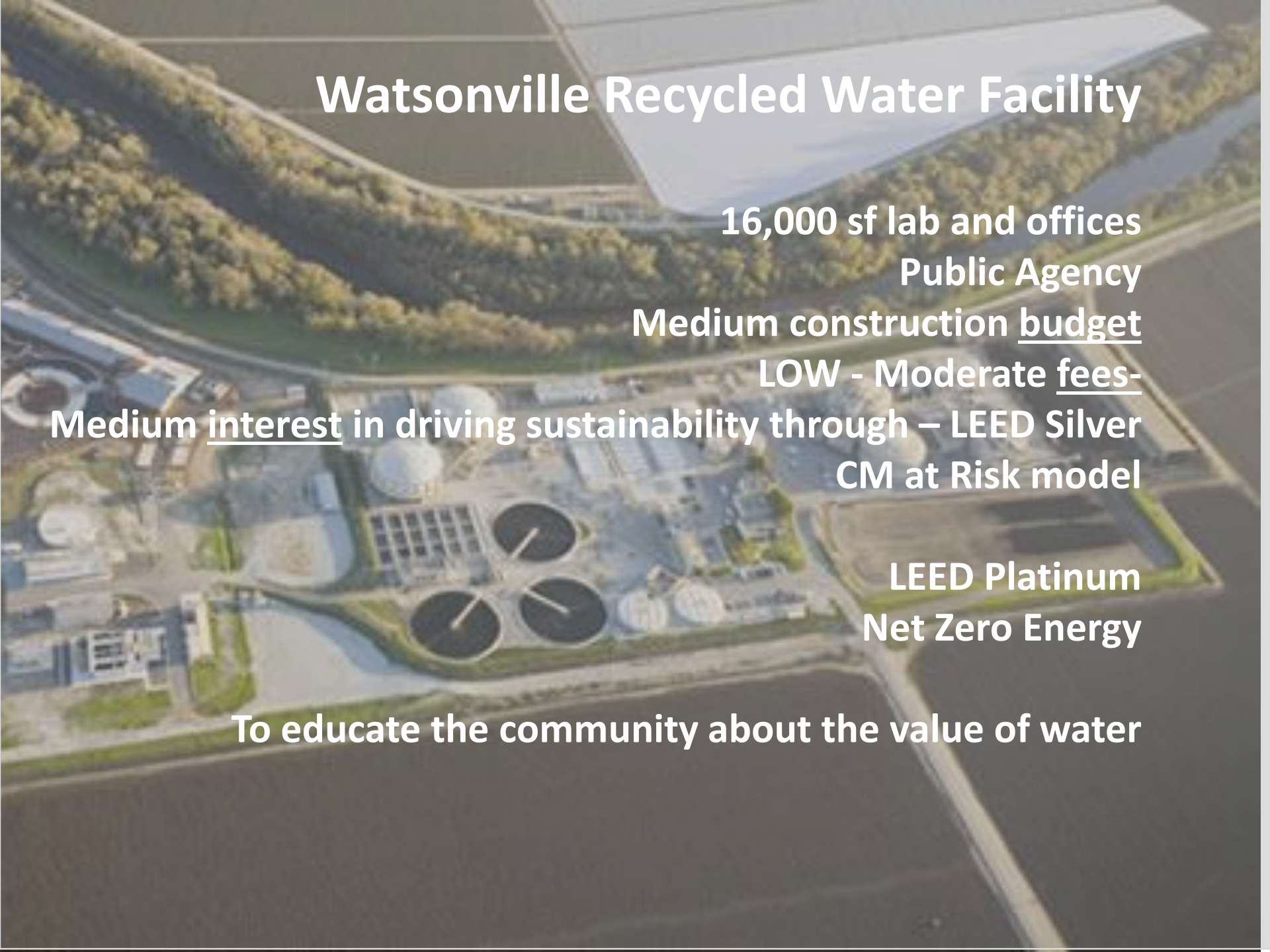
What worked before…

zero is not necessarily inspiring

Not always the place to start

Finding the Story

Listening for the cues



Watsonville Recycled Water Facility

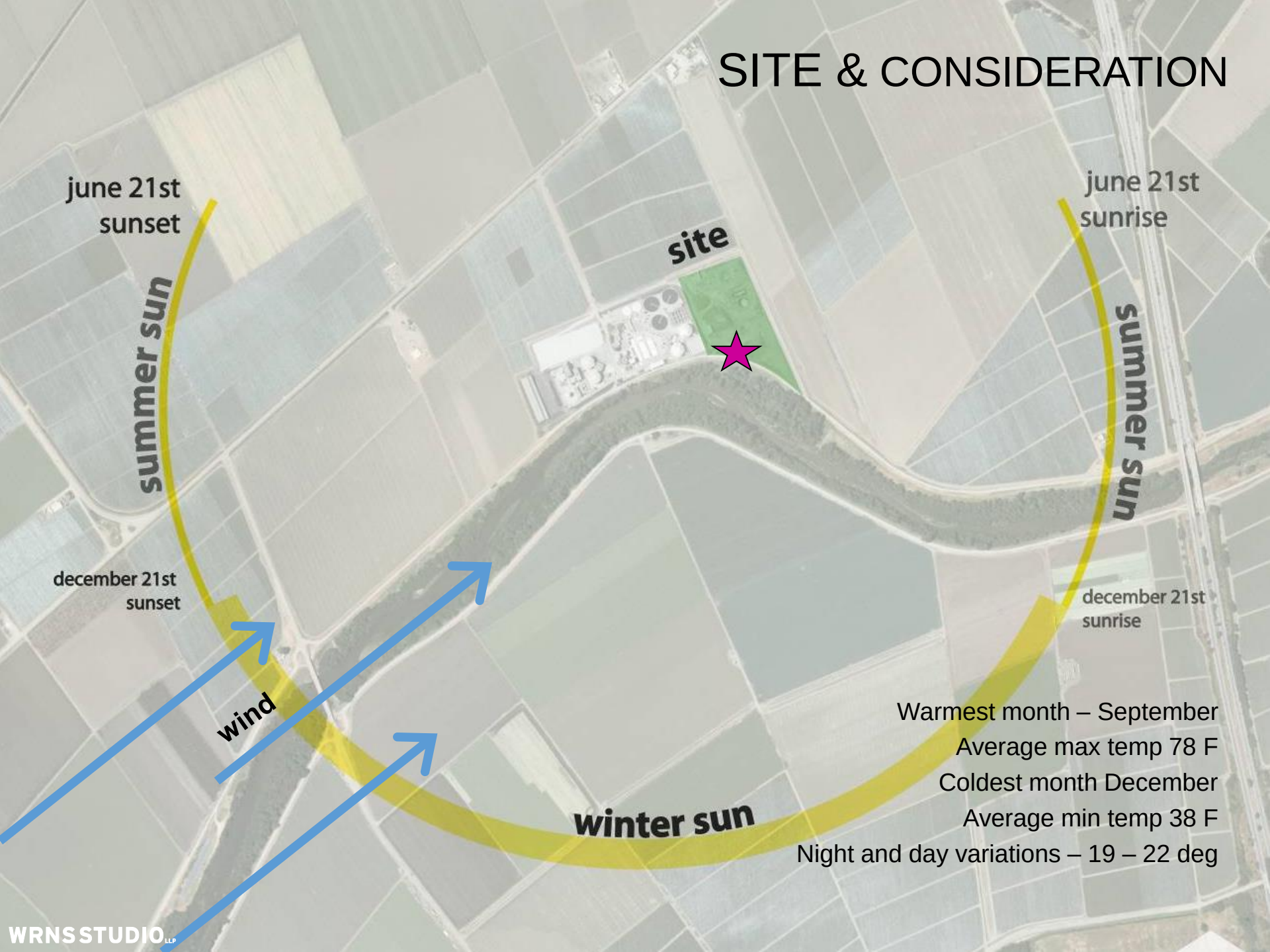
16,000 sf lab and offices
Public Agency
Medium construction budget
LOW - Moderate fees-
Medium interest in driving sustainability through – LEED Silver
CM at Risk model

LEED Platinum
Net Zero Energy

To educate the community about the value of water


salt water infiltration
WATSONVILLE
CITY OF WATSONVILLE
WATER RESOURCES CENTER
wind
NORTH

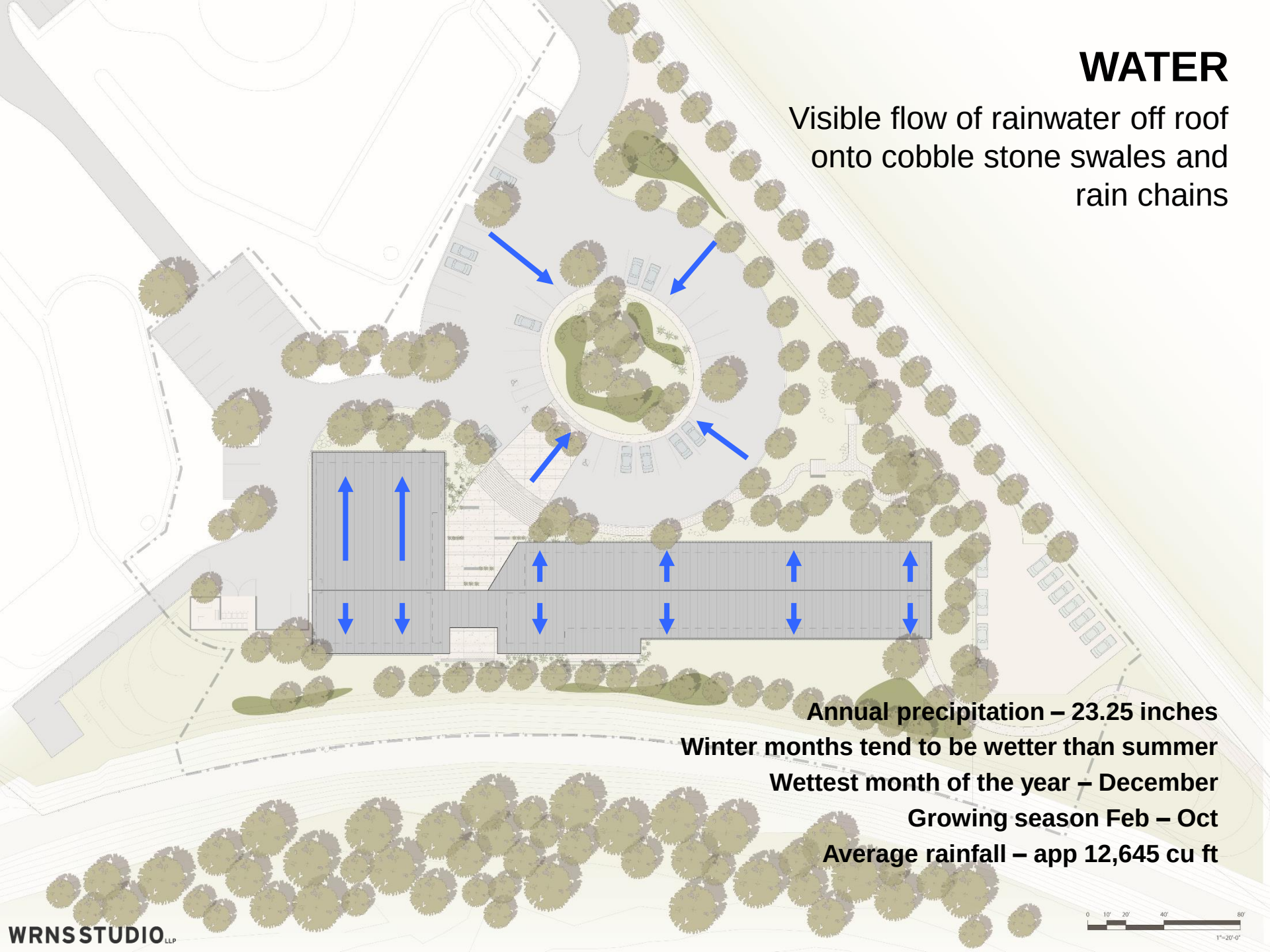
SITE & CONSIDERATION



Warmest month – September
Average max temp 78 F
Coldest month December
Average min temp 38 F
Night and day variations – 19 – 22 deg

WATER

Visible flow of rainwater off roof onto cobble stone swales and rain chains



Annual precipitation – 23.25 inches

Winter months tend to be wetter than summer

Wettest month of the year – December

Growing season Feb – Oct

Average rainfall – app 12,645 cu ft

WATER

Flow into cobble swales

And dry ponds at interpretation garden

Cobble and grassy swales around perimeter of project

Treatment by grassy swales and ponds

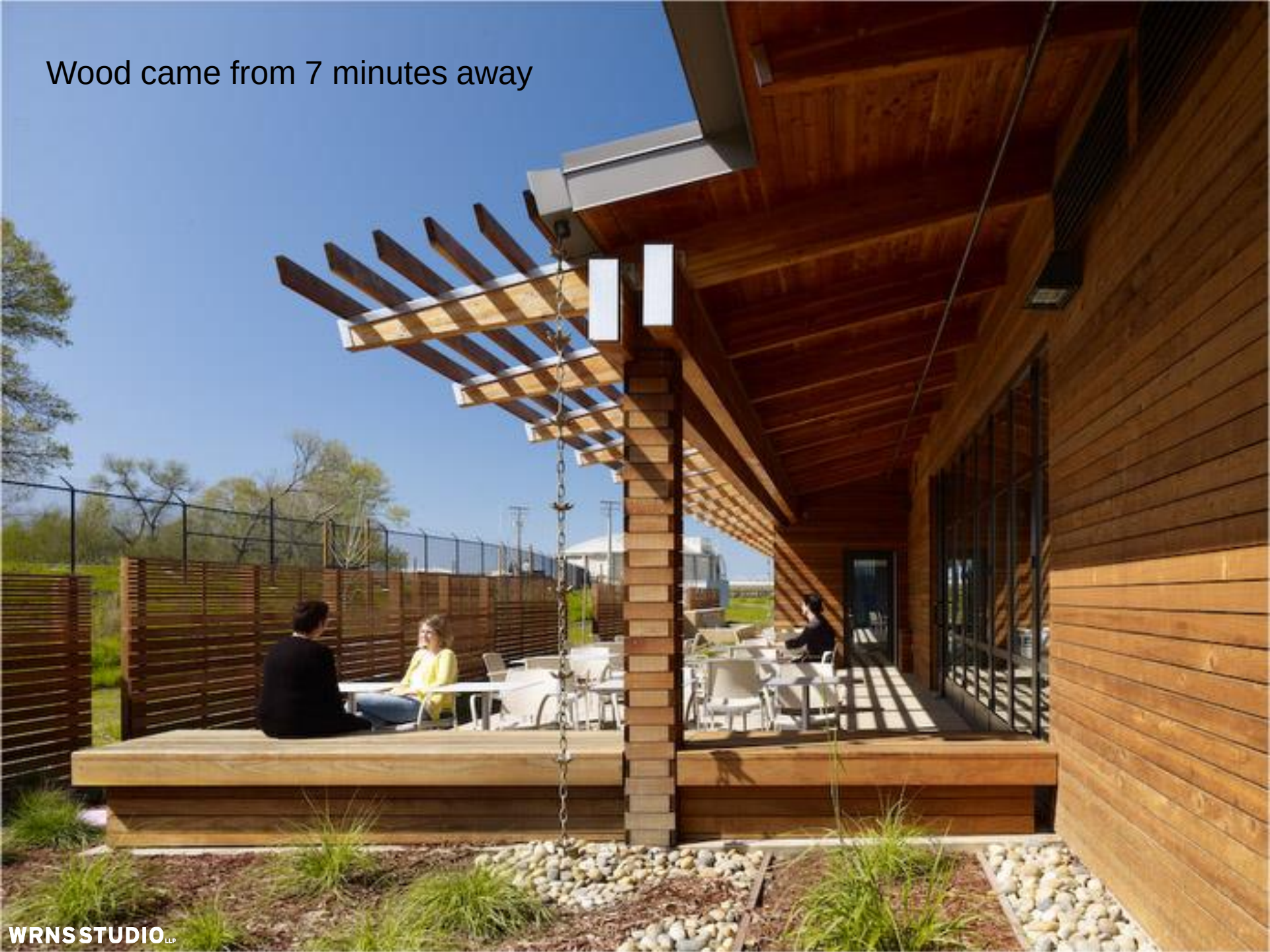
Two extended vegetated dry ponds = app. 16,000 square feet surface area

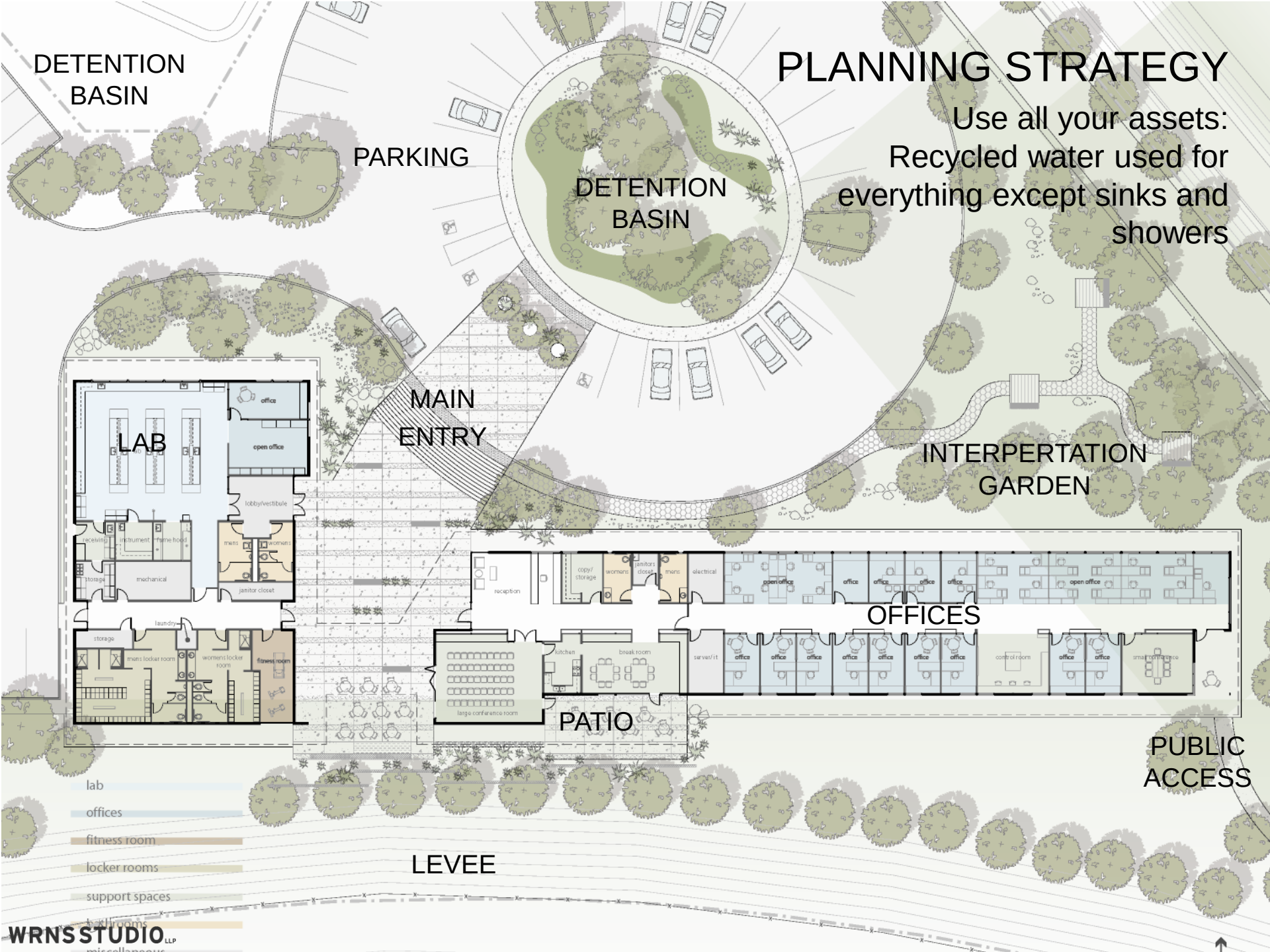
WRNS STUDIO LLP

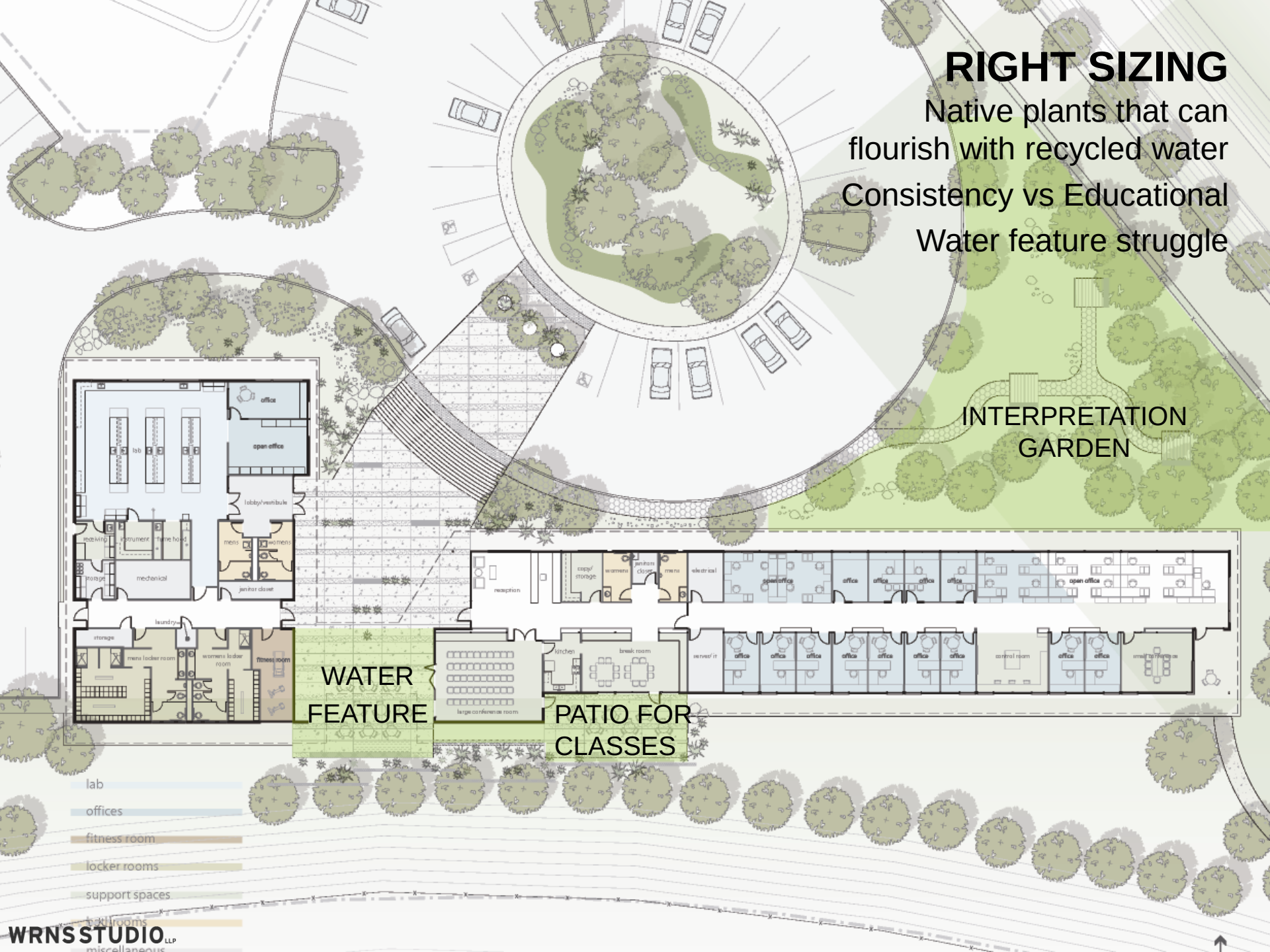

WATER
Through to dry ponds and detention basin
Through to waste water facility
WRNS STUDIO LLP


No gutters


Rain screen siding


Wood came from 7 minutes away
WRNS STUDIO LLP


DETENTION BASIN
PARKING
DETENTION BASIN
PLANNING STRATEGY
Use all your assets:
Recycled water used for everything except sinks and showers
LAB
office
open office
lobby/vestibule
receiving
instrument
fume hood
mechanical
janitor closet
storage
laundry
mens locket room
womens locker room
fitness room
MAIN ENTRY
INTERPERTATION GARDEN
reception
copy/ storage
womens
janitors closet
mens
electrical
OFFICES
kitchen
break room
server/ it
control room
large conferance room
PATIO
PUBLIC ACCESS
lab
offices
fitness room
locker rooms
support spaces
LEVEE
WRNSSTUDIO LLP

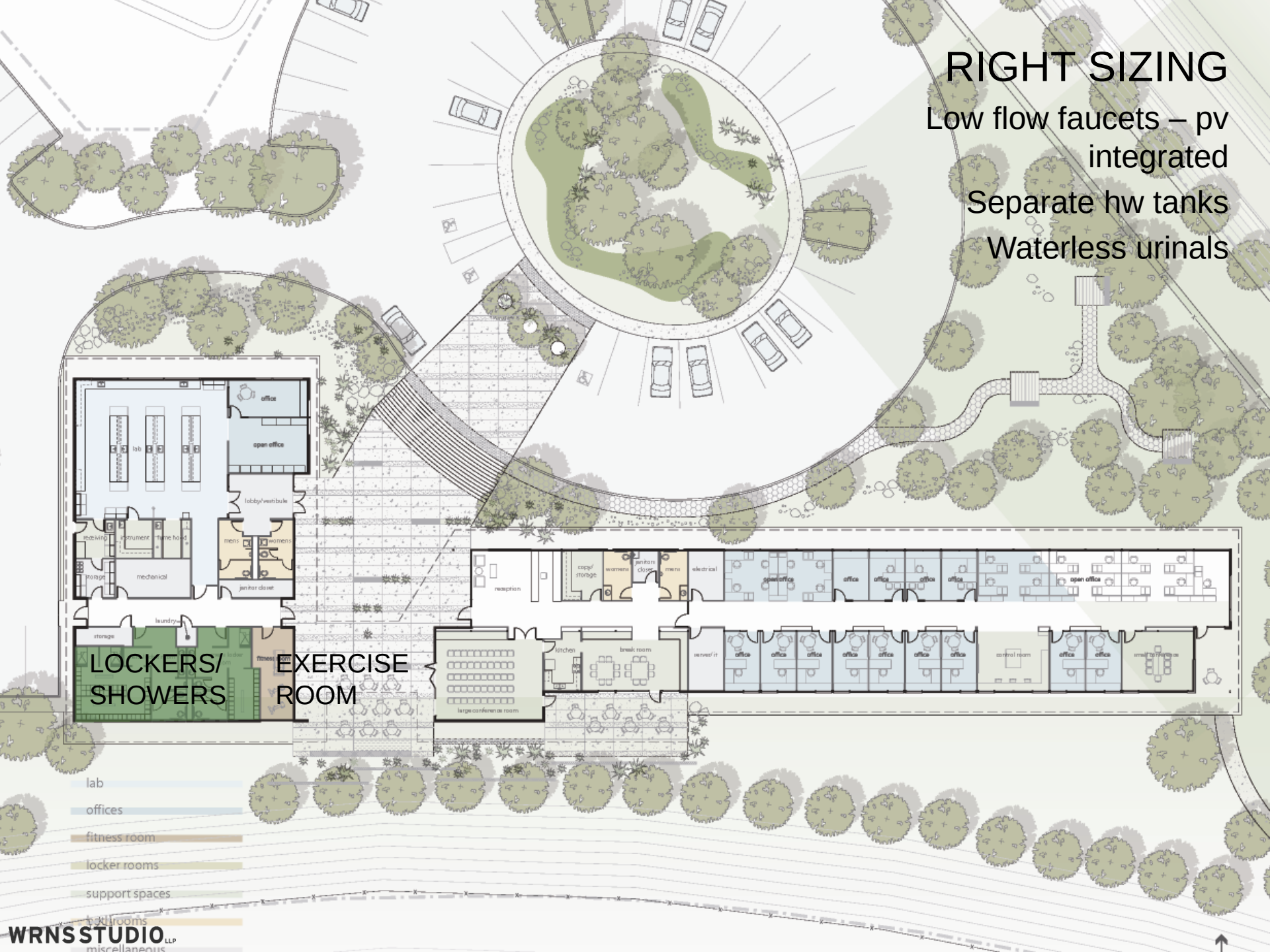

RIGHT SIZING
Native plants that can flourish with recycled water
Consistency vs Educational
Water feature struggle
INTERPRETATION GARDEN
WATER FEATURE
PATIO FOR CLASSES
lab
offices
fitness room
locker rooms
support spaces
WRNS STUDIO LLP

RIGHT SIZING

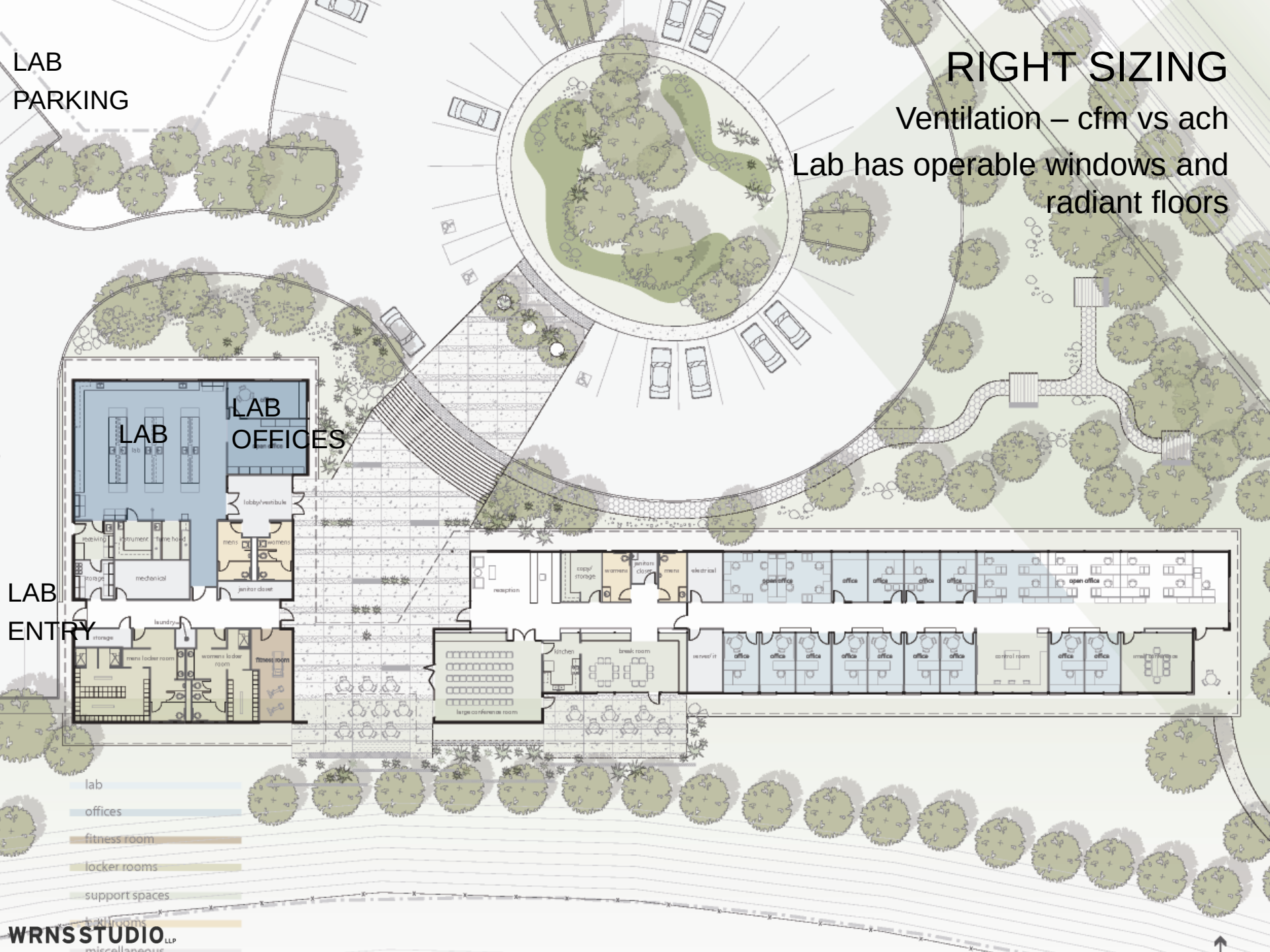
Low flow faucets – pv integrated

Separate hw tanks

Waterless urinals



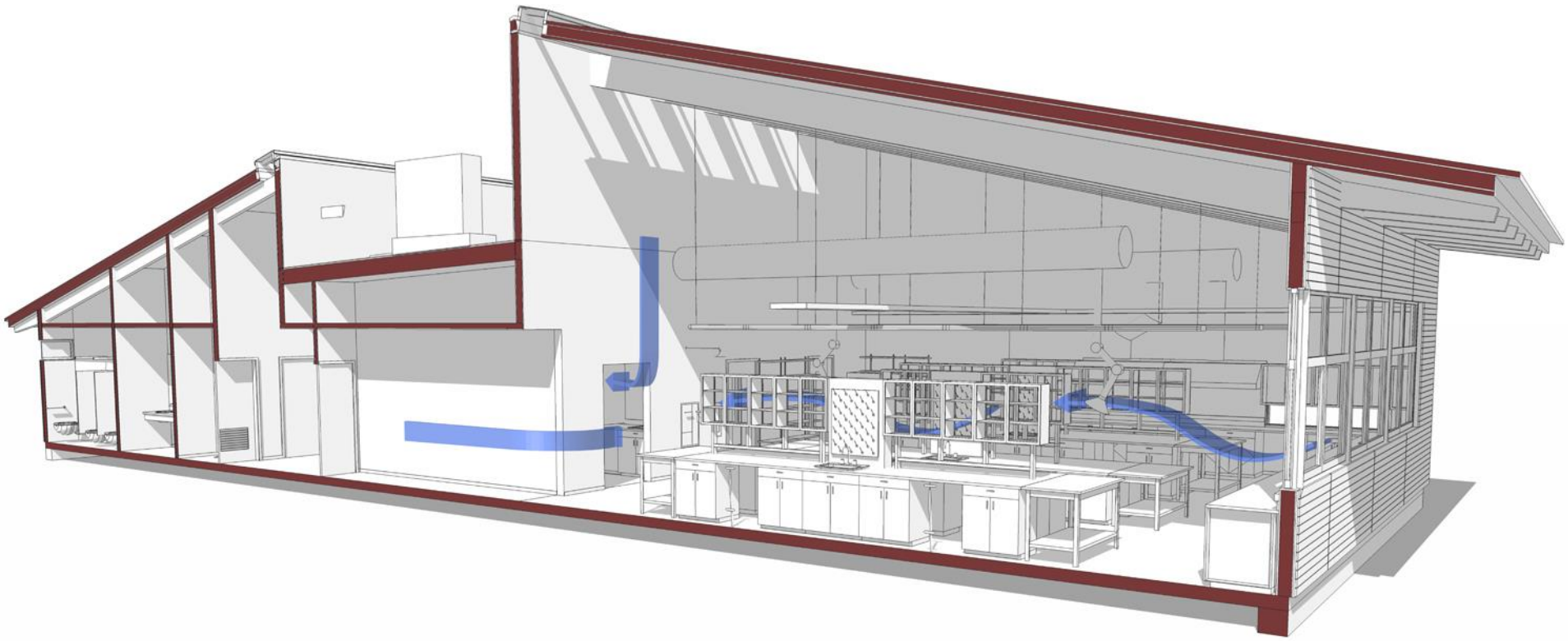
WRNS STUDIO LLP



RIGHT SIZING

Ventilation – cfm vs ach

Lab has operable windows and radiant floors

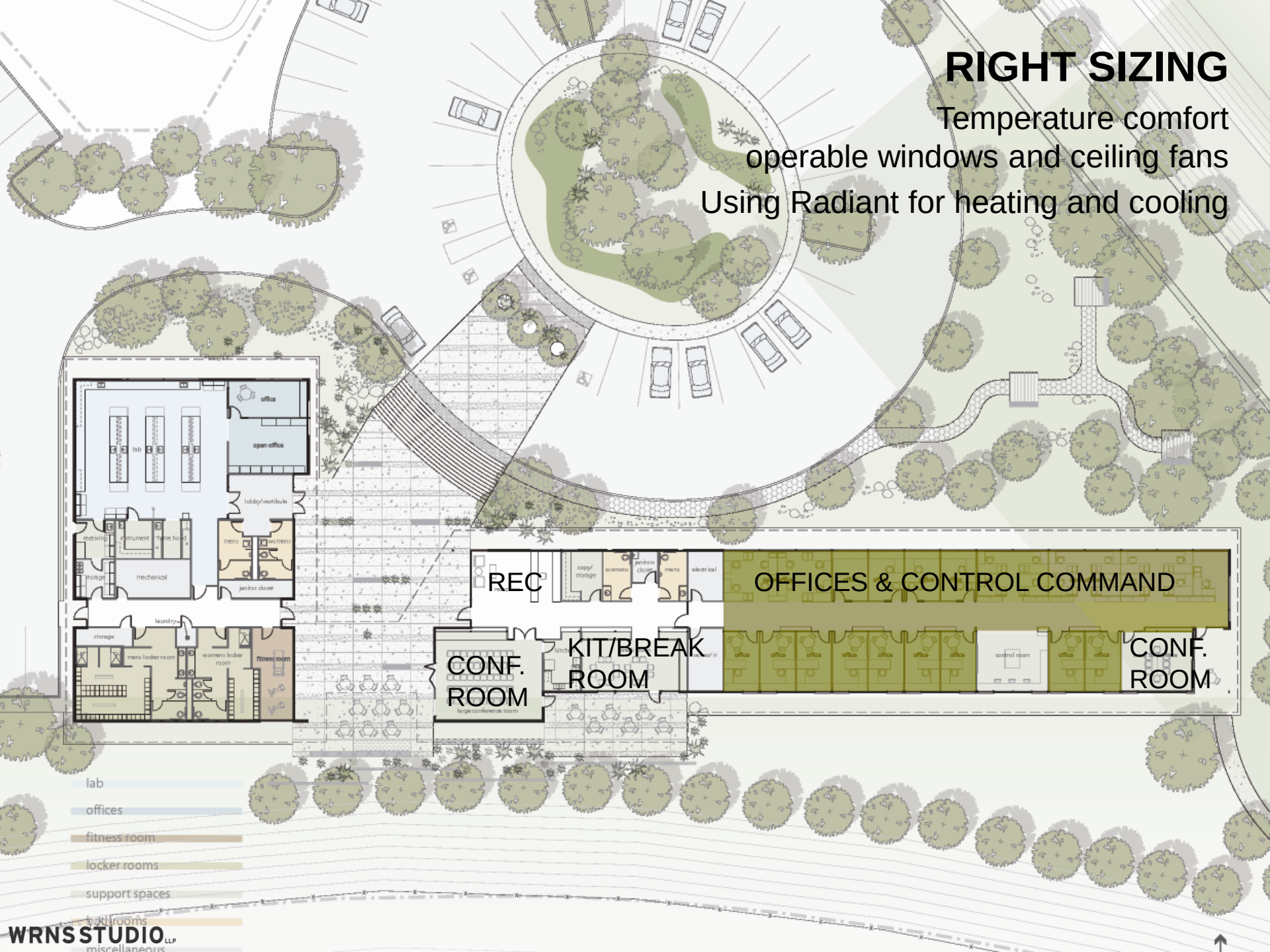


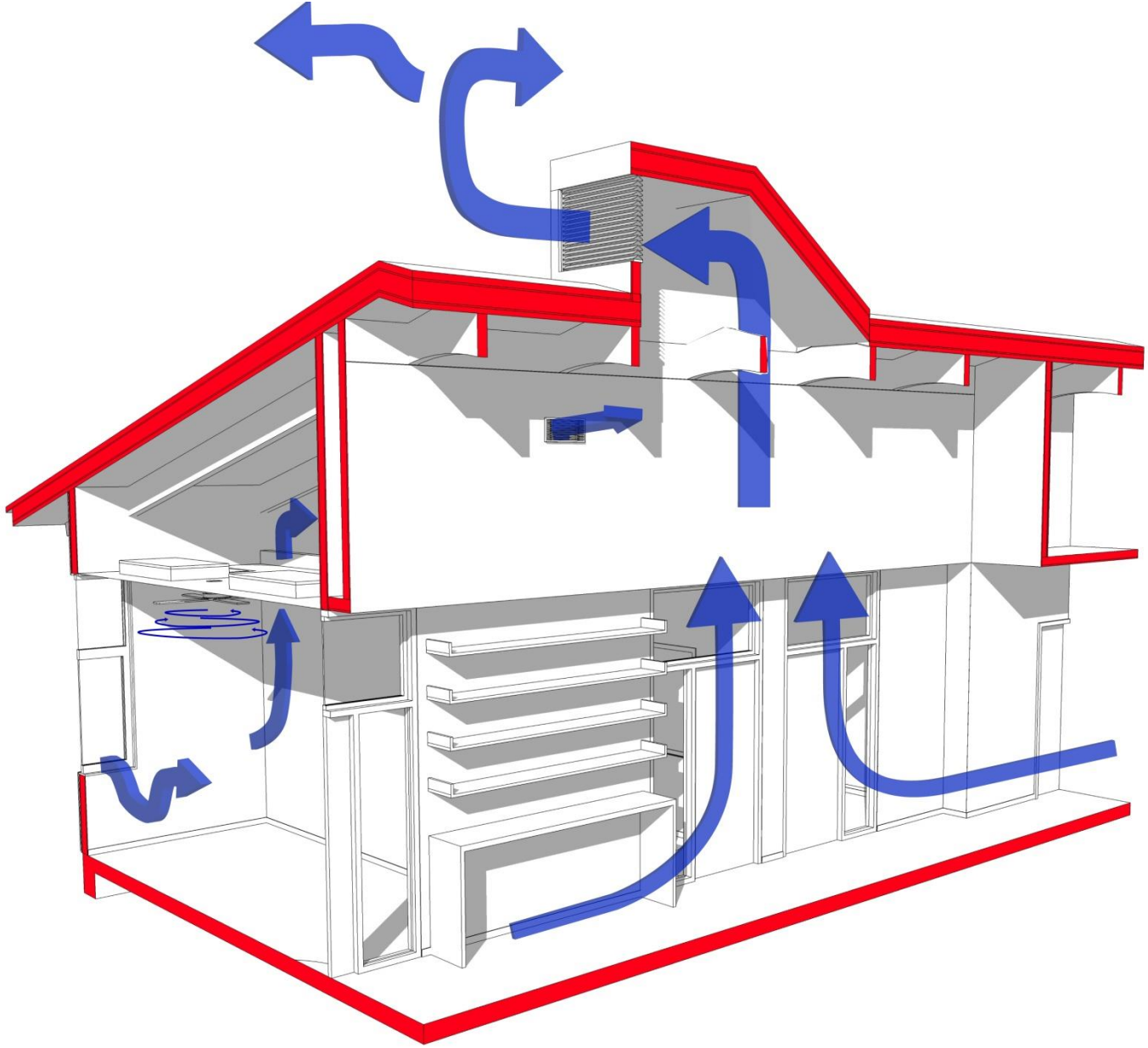
RIGHT SIZING

Temperature comfort

operable windows and ceiling fans

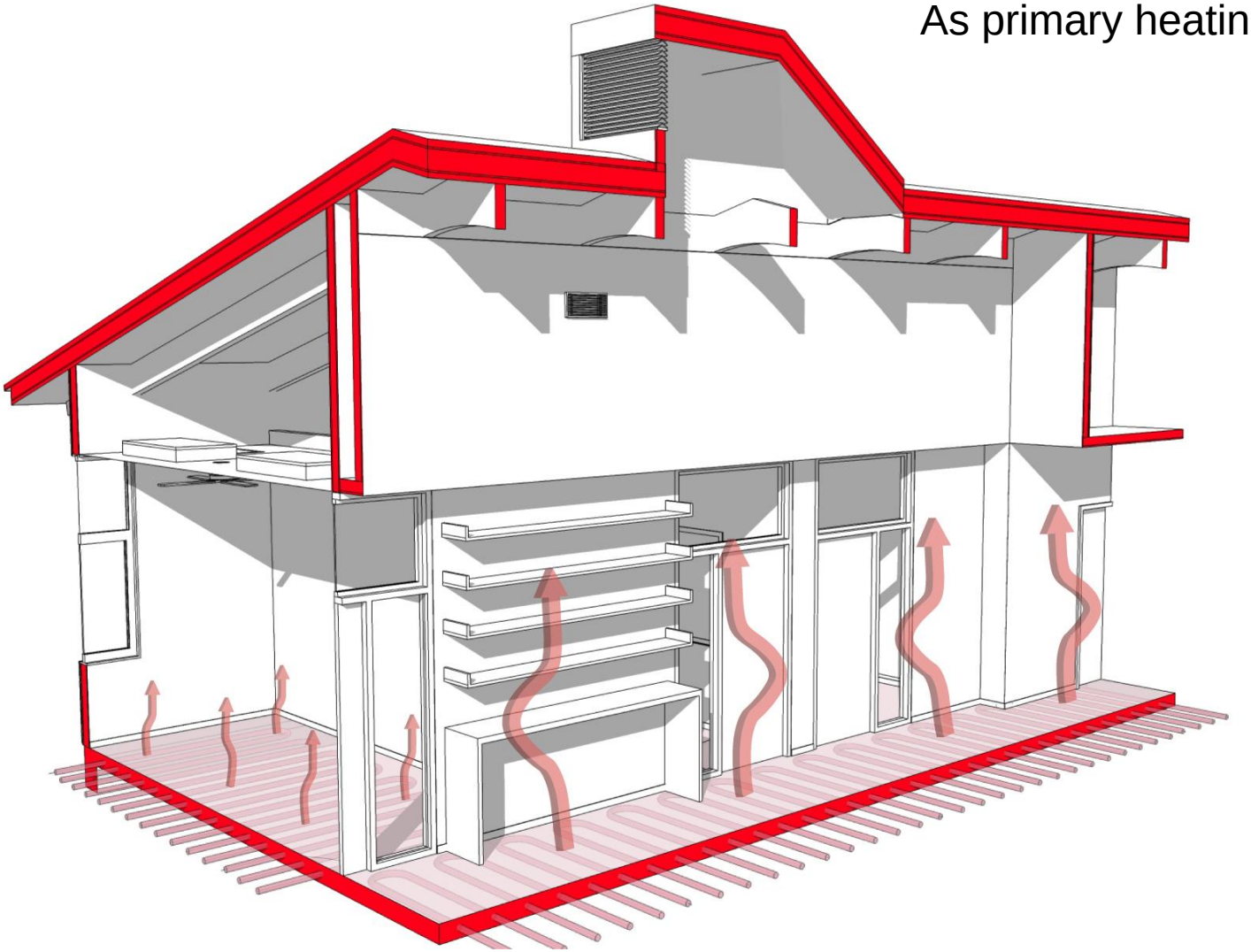
Using Radiant for heating and cooling





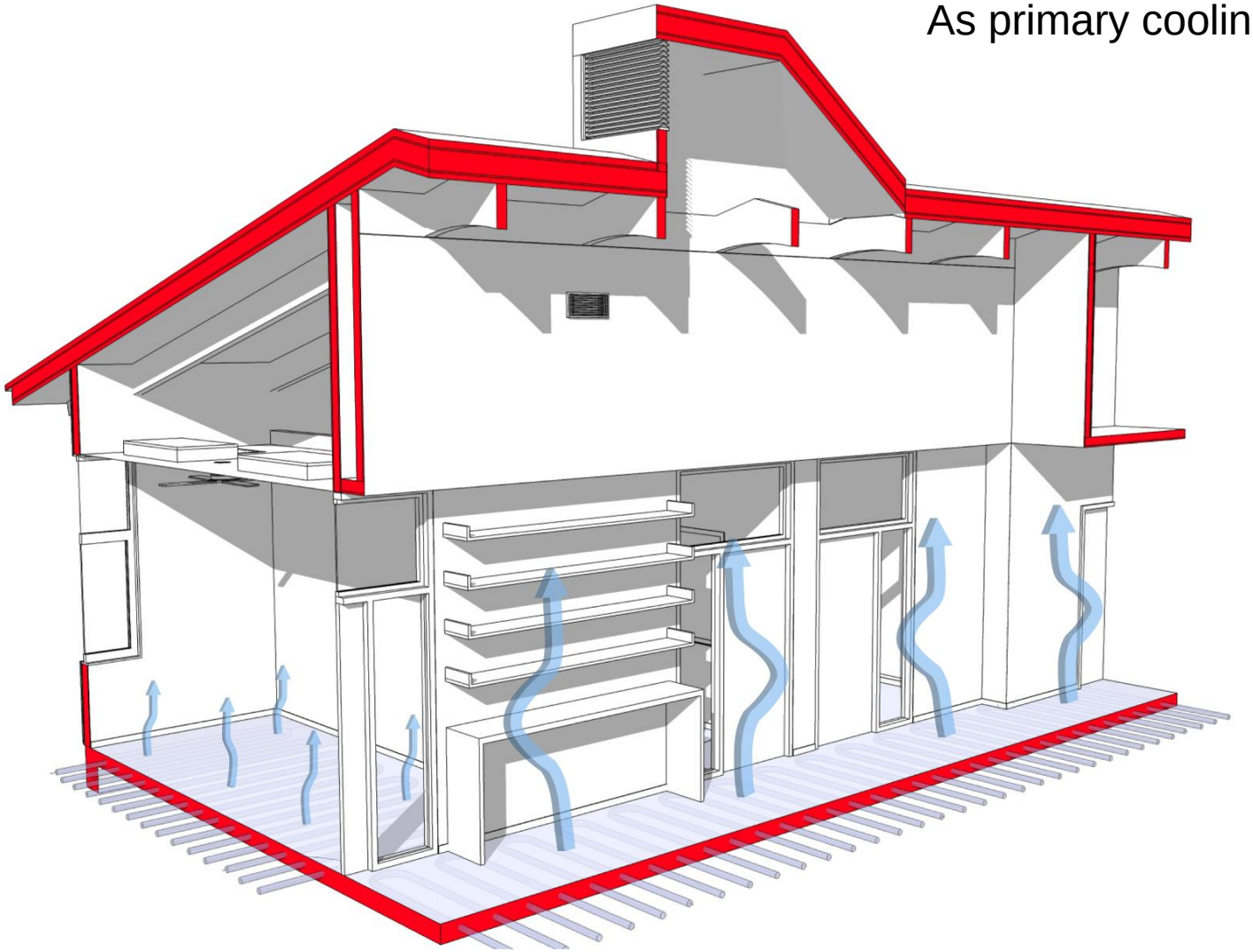
WATER

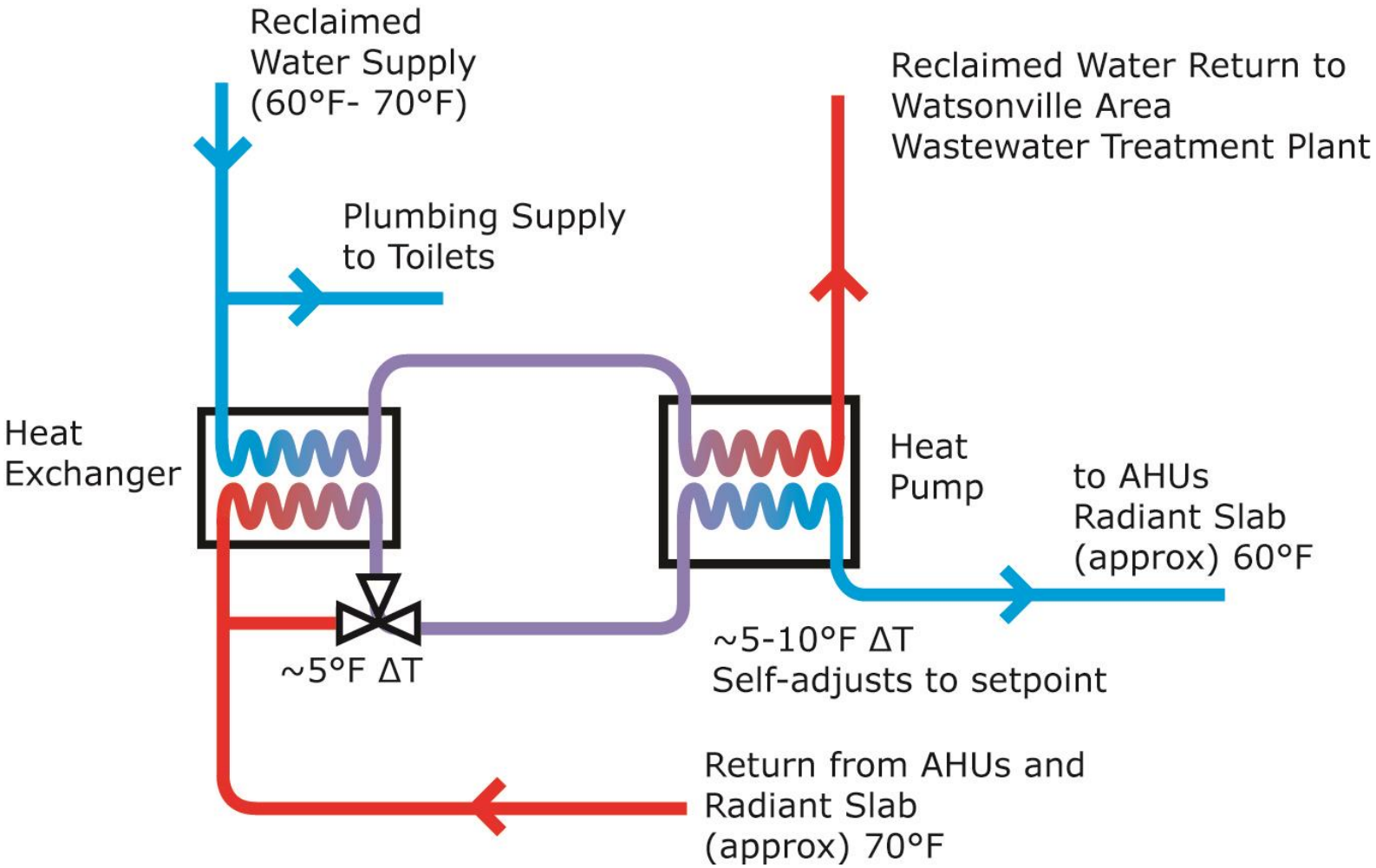
As primary heating medium



WATER

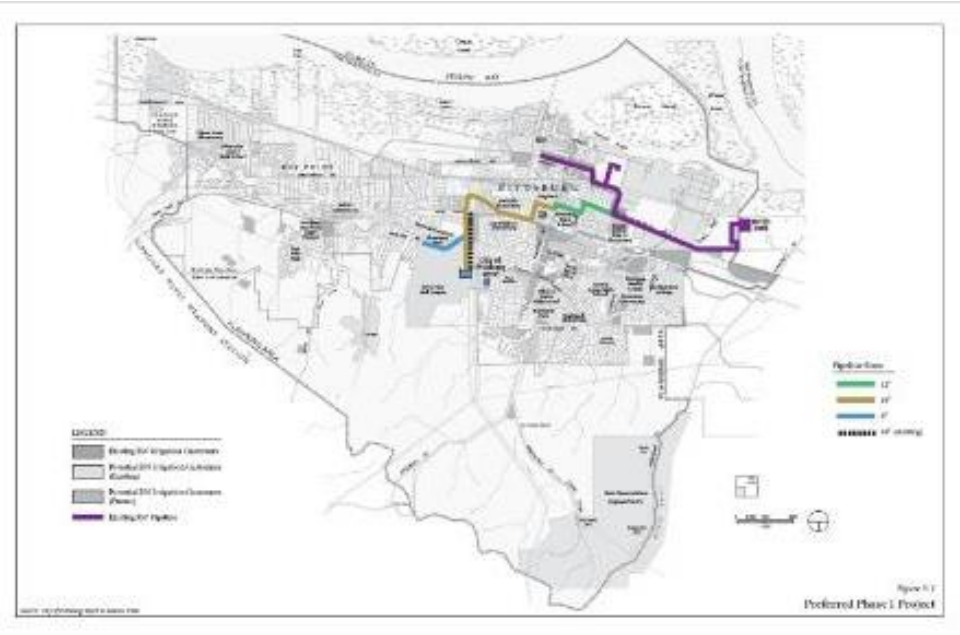
As primary cooling medium



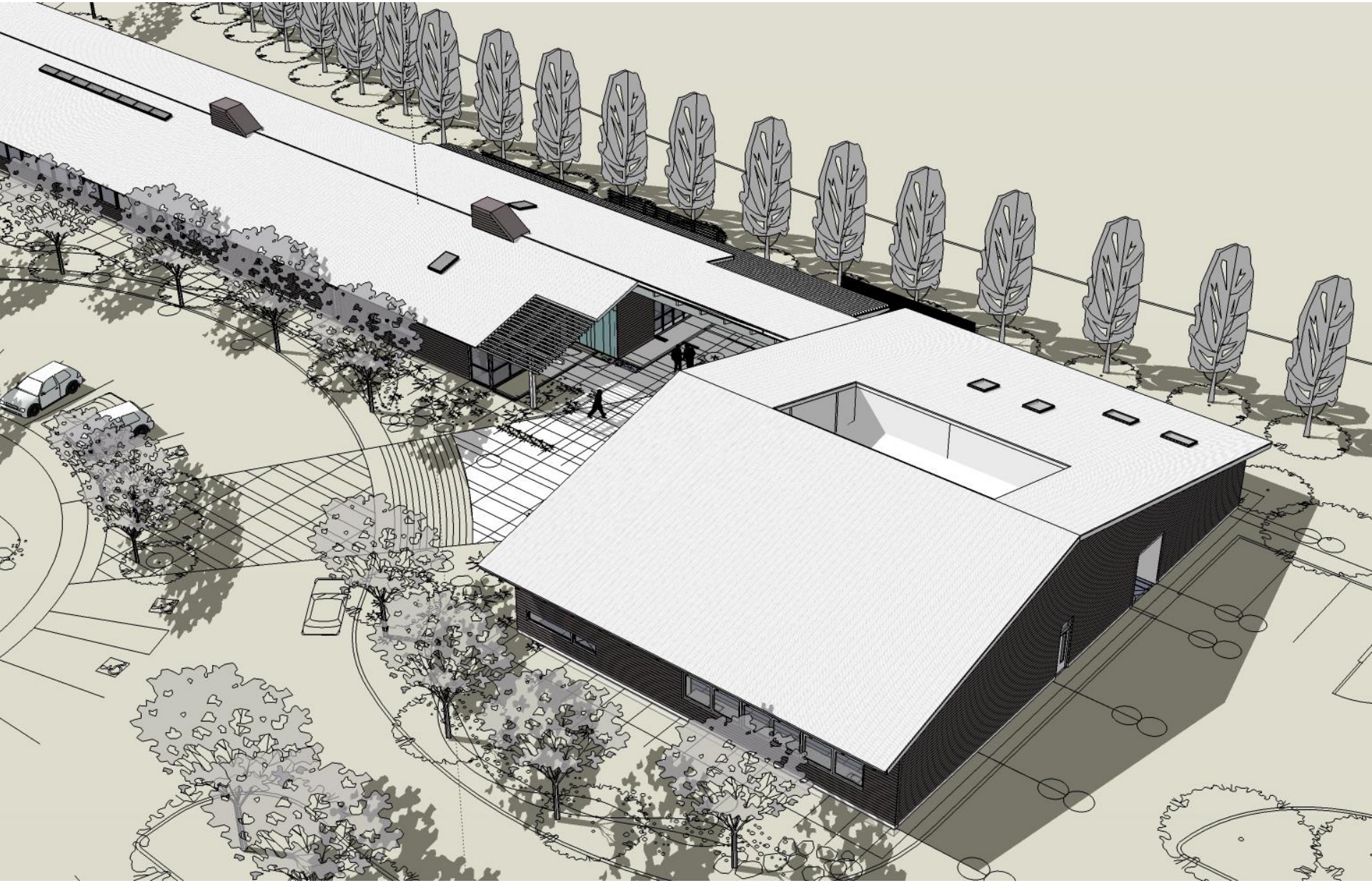

Reclaimed
Water Supply
(60°F- 70°F)
Plumbing Supply
to Toilets
Reclaimed Water Return to
Watsonville Area
Wastewater Treatment Plant
Heat
Exchanger
Heat
Pump
to AHUs
Radiant Slab
(approx) 60°F
~5°F ΔT
~5-10°F ΔT
Self-adjusts to setpoint
Return from AHUs and
Radiant Slab
(approx) 70°F

The aha moment of WATER & ENERGY

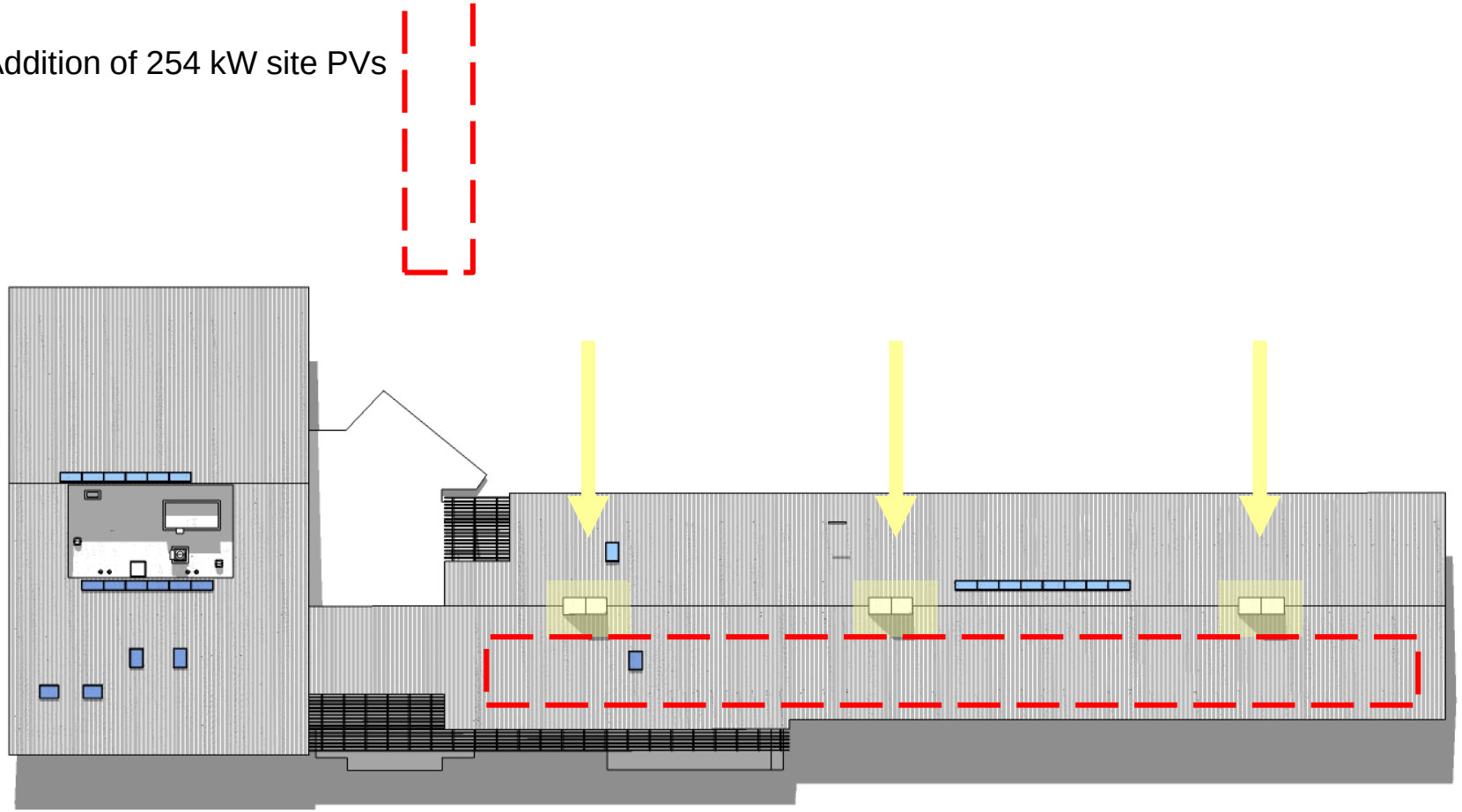
- **10-20% of municipal energy in California used for water pumping**
- Potential Energy Savings from use of RCW
- Large source of Reclaimed Water onsite @ Watsonville provides energy saving opportunity
- RCW not readily available for most projects




Find the Story
now
Connect the Dots



Addition of 254 kW site PVs



Linear skylights to wash walls for reflected light

Specific skylights for locker/restroom

Ventilation chimneys

Modeled EUI at 56.9 and actual at 51.4 kBtu/sf

Roof for PVs- 96 kW on roof

Building as a teaching tool


Low VOC wood cabinets


WRNS STUDIO LLP


Ventilation stack effect -
chimneys

Ventilation stack effect
Operable interior windows


Daylight as primary source for light


Expandable rooms

Ceiling Fans for ventilation

METRICS

- Exceeds ASHRAE 90.1 2005 Standards by 76.1%
- Drought tolerant and native landscape – 100% of irrigation uses recycled water
- Potable water consumption reduced by 50%
- Site Paving includes pervious paved surfaces, and Street Print (to reduce heat island effect)
- Lighting power was reduced to .7w/sq ft – 30% reduction from 2009 code. Has daylight sensors
- All furniture is low VOC – Greenguard
- Primarily a naturally ventilated building
- CO2 monitors assist with ventilation needs for good air quality
- Wood salvaged from city forests

AIA COTE:
10 MEASURES

1 Design & Innovation
2 Regional/Community Design
3 Land Use & Site Ecology
4 Bioclimatic Design
5 Light & Air
6 Water Cycle
7 Energy Flows & Energy Future
8 Materials & Construction
9 Long Life Loose Fit
10 Collective Wisdom and Feedback Loops

LEED Platinum
Zero Net Energy

2010 recipient

WRNS STUDIO LLP


WATER RESOURCES CENTER

Unpack the paradigms

What are the impediments

it costs too much

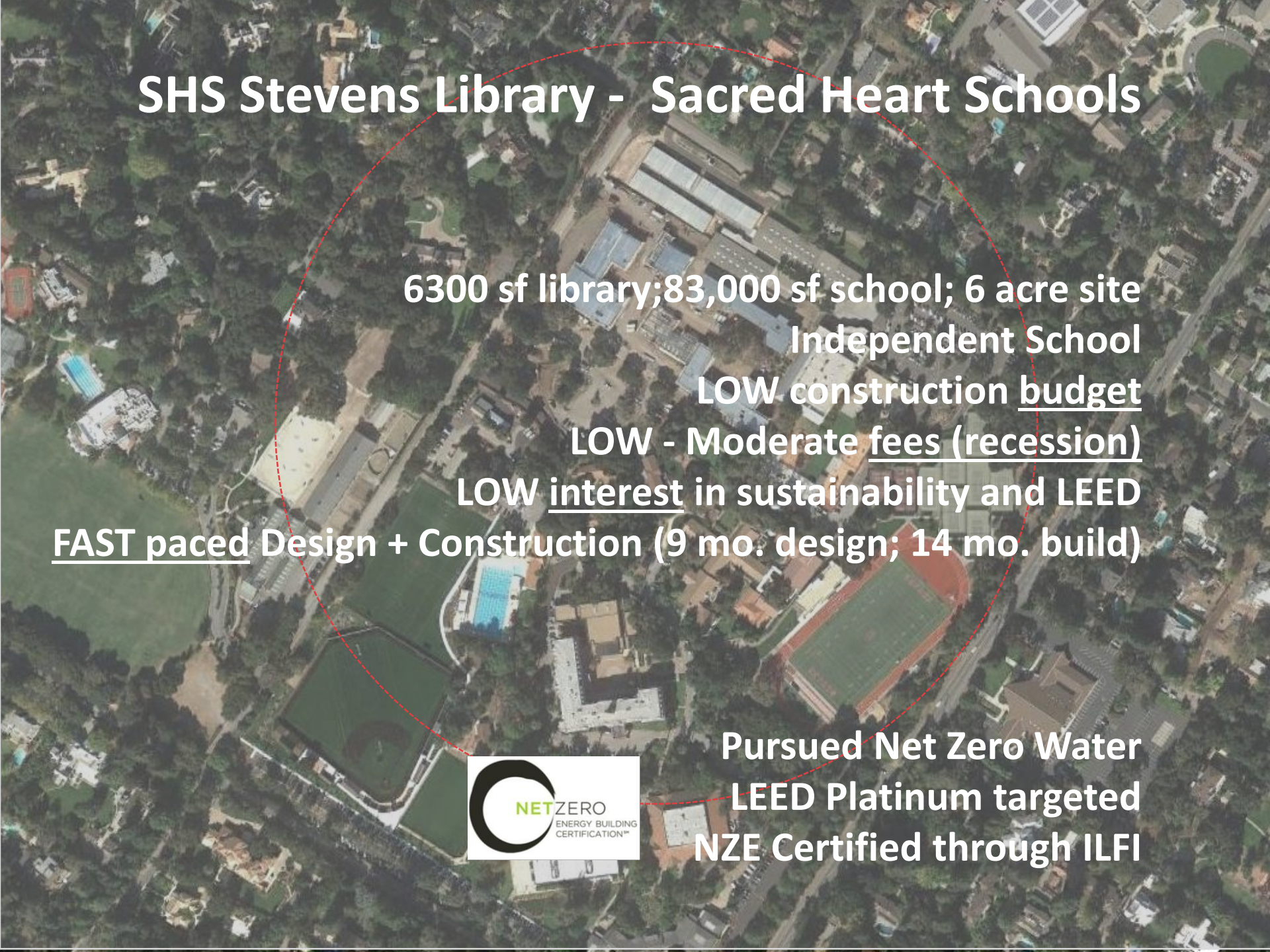
Its too complicated

We don't have time/talent

We have never done that before

- clients

SHS Stevens Library - Sacred Heart Schools



6300 sf library;83,000 sf school; 6 acre site

Independent School

LOW construction budget

LOW - Moderate fees (recession)

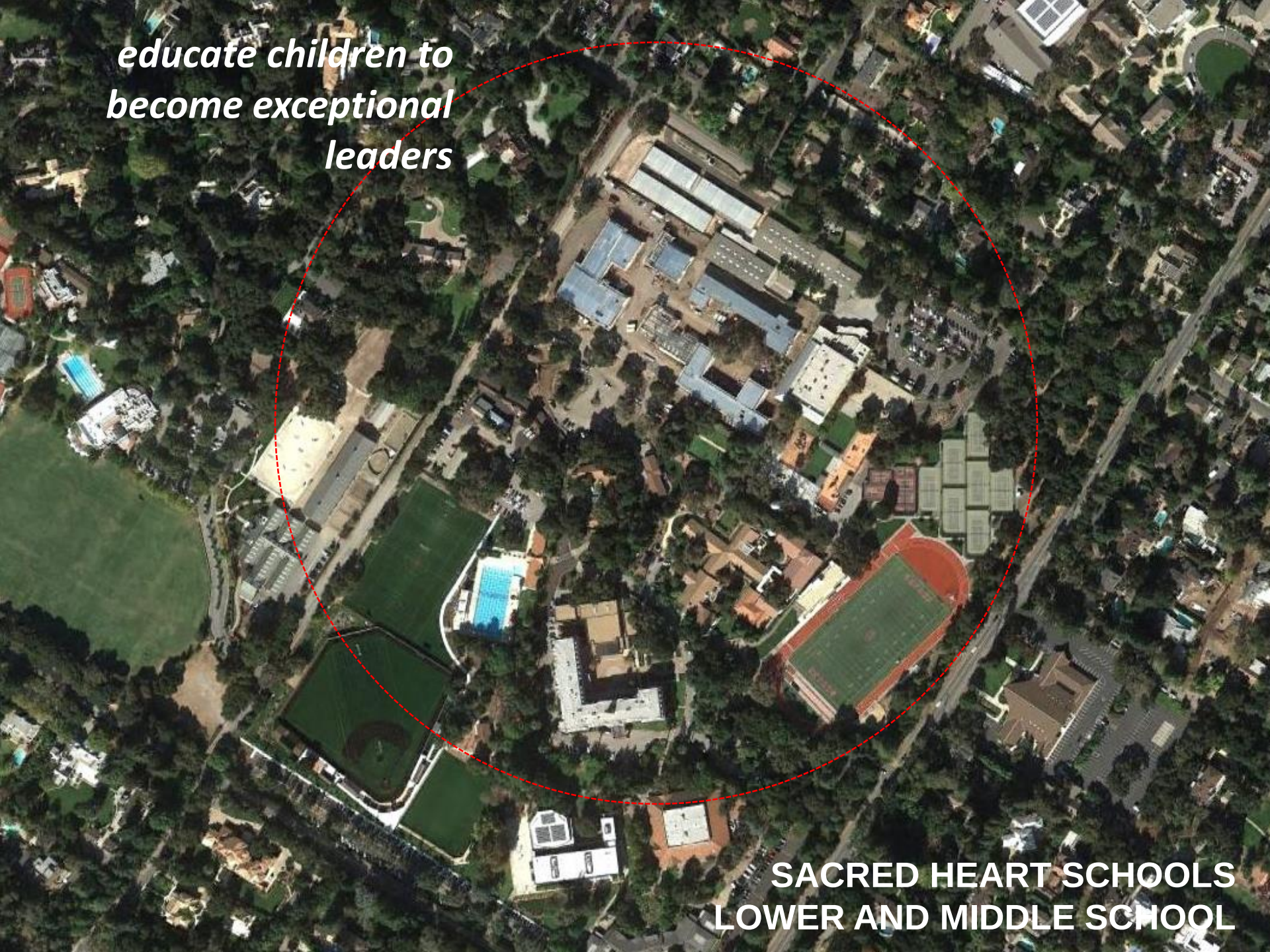
LOW interest in sustainability and LEED

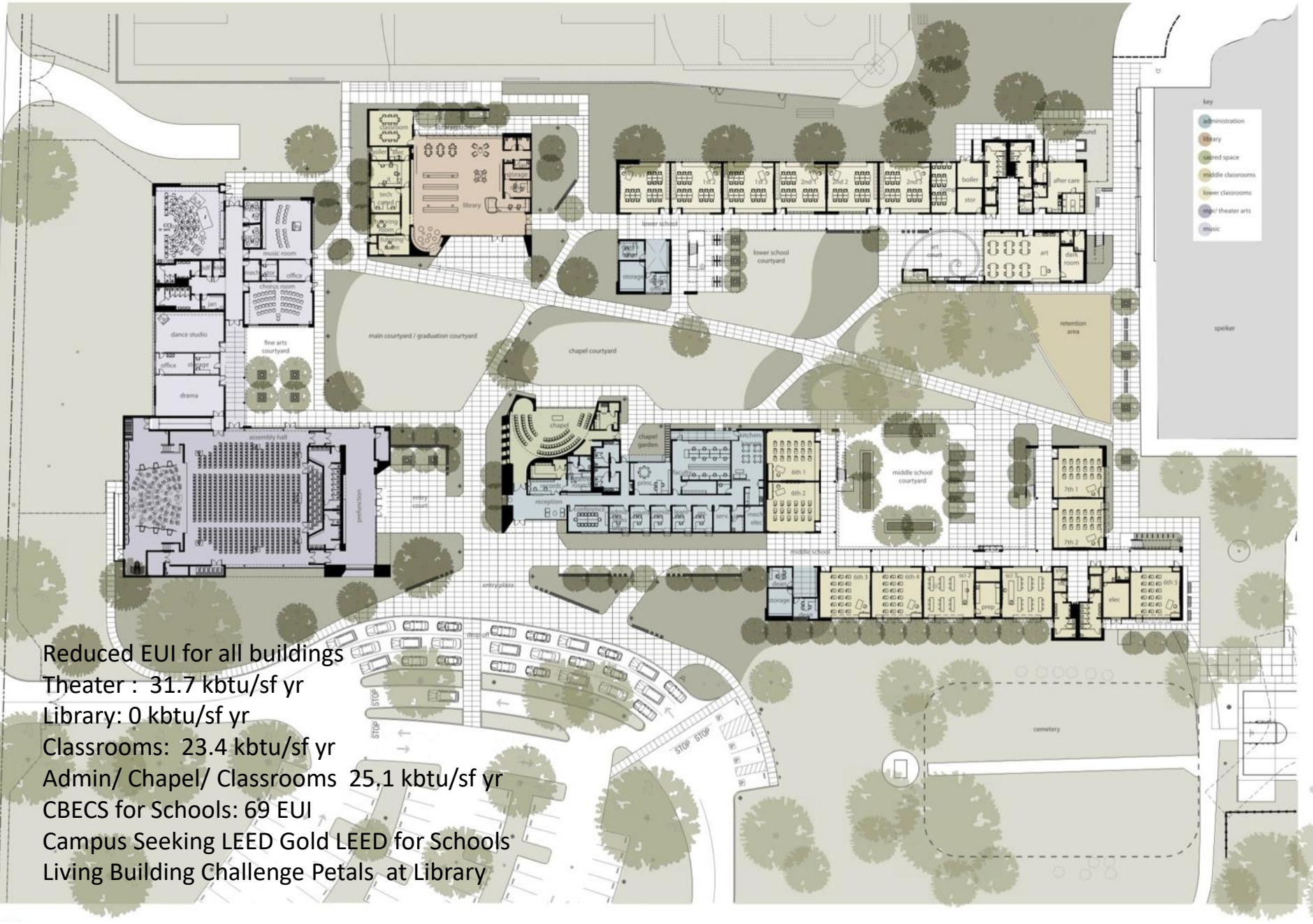
FAST paced Design + Construction (9 mo. design; 14 mo. build)

Pursued Net Zero Water

LEED Platinum targeted

NZE Certified through ILFI


educate children to become exceptional leaders
SACRED HEART SCHOOLS
LOWER AND MIDDLE SCHOOL



Reduced EUI for all buildings
Theater : 31.7 kbtu/sf yr
Library: 0 kbtu/sf yr
Classrooms: 23.4 kbtu/sf yr
Admin/ Chapel/ Classrooms 25.1 kbtu/sf yr
CBECS for Schools: 69 EUI
Campus Seeking LEED Gold LEED for Schools
Living Building Challenge Petals at Library


Lower School
Middle School
Library
Administration
Performing Arts

Limited dollars - $250 - $300/sf – approximately 20% less than the current construction dollar

No green

1

63 acres plus – site needed to accommodate flow from the overall site

Local code requirements:

- **2 year storm**
- **accommodate a 25 year storm for 48 hours**

Permeability of soils – coefficient less than 10^{-8} cm/sec
Clay Soils – hydraulic soil group "D"

Site water management

Inherited approach

Need to capture water from larger campus – 9 acres of stormwater

Local code requirements:

accommodate a 25 year storm for 48 hours

Permeability of soils – coefficient less than 10^{-8} cm/sec

Clay Soils – hydraulic soil group "D"

Tight Construction Budget

First solution was an 80" dia. Pipe

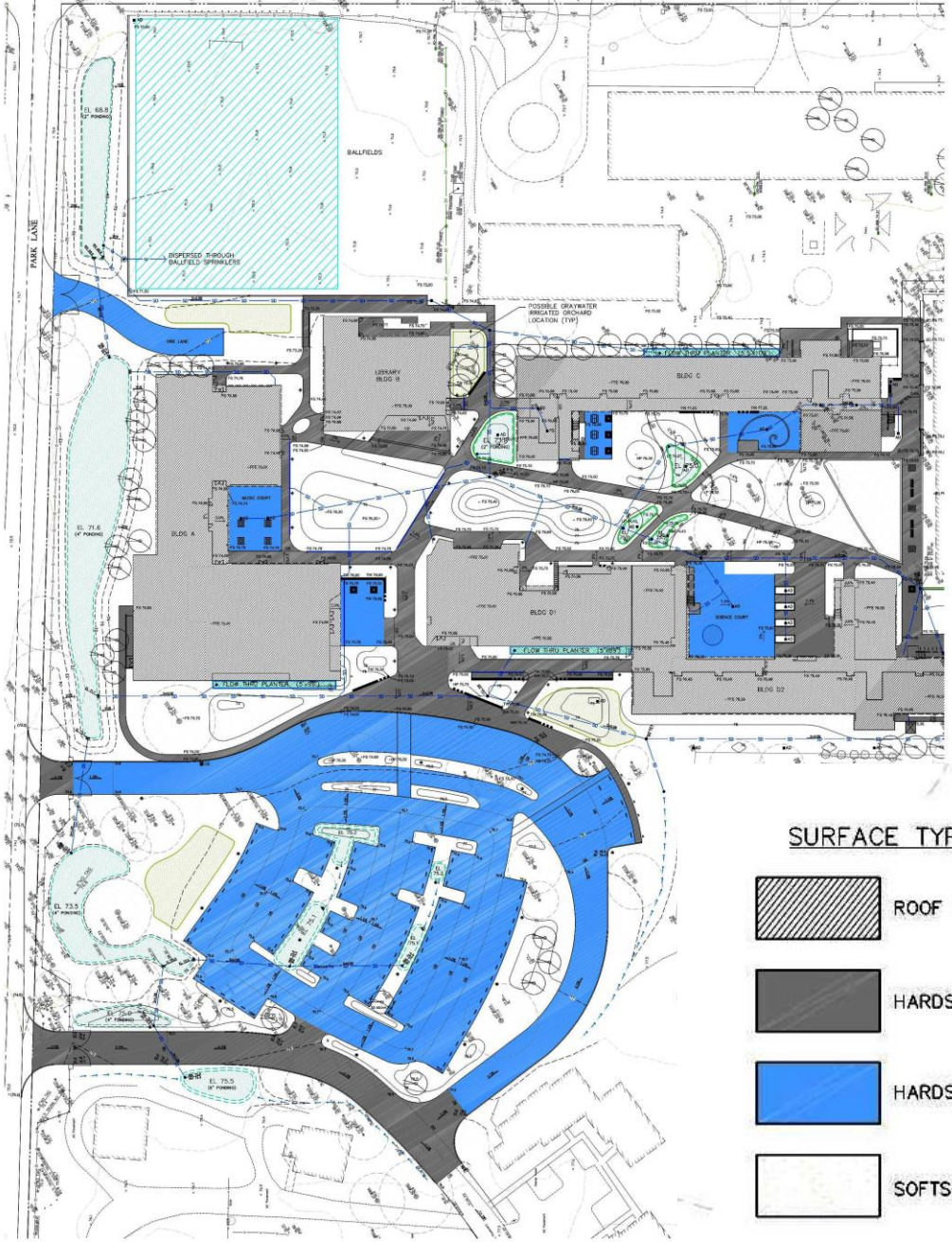
$$$$$$

Hancor Perforated Pipe system

A different way of looking at the same problem – multiple discussions – regulatory education Sherwood and BFS

Stormwater cleansed through landscape based natural treatment – meets C3 regulatory requirements

Stormwater flow rates are reduced through maximized pervious paving and Increased landscape – calculate and prove



- With Sherwood, New Strategy for Stormwater Management of the Site through multiple city agency discussions and calculations

- Capturing the runoff from the new campus PLUS the contributing 9 acre run off from the south part of campus in distributed areas

- Make it a Teaching Opportunity

SURFACE TYPES

- ROOF (IMPERVIOUS)
- HARDSCAPE (IMPERVIOUS)
- HARDSCAPE (PERVIOUS)
- SOFTSCAPE (PERVIOUS)

STORMWATER FEATURES

- RAINGARDEN
- FLOW THROUGH PLANTER
- BALLFIELD SUBSURFACE STORAGE
- PERVIOUS HARDSCAPE SUBSURFACE STORAGE

SHERWOOD Design Engineers

STORMWATER MANAGEMENT STRATEGY

SAINT JOSEPH ACADEMY

DATE: 09/07/10

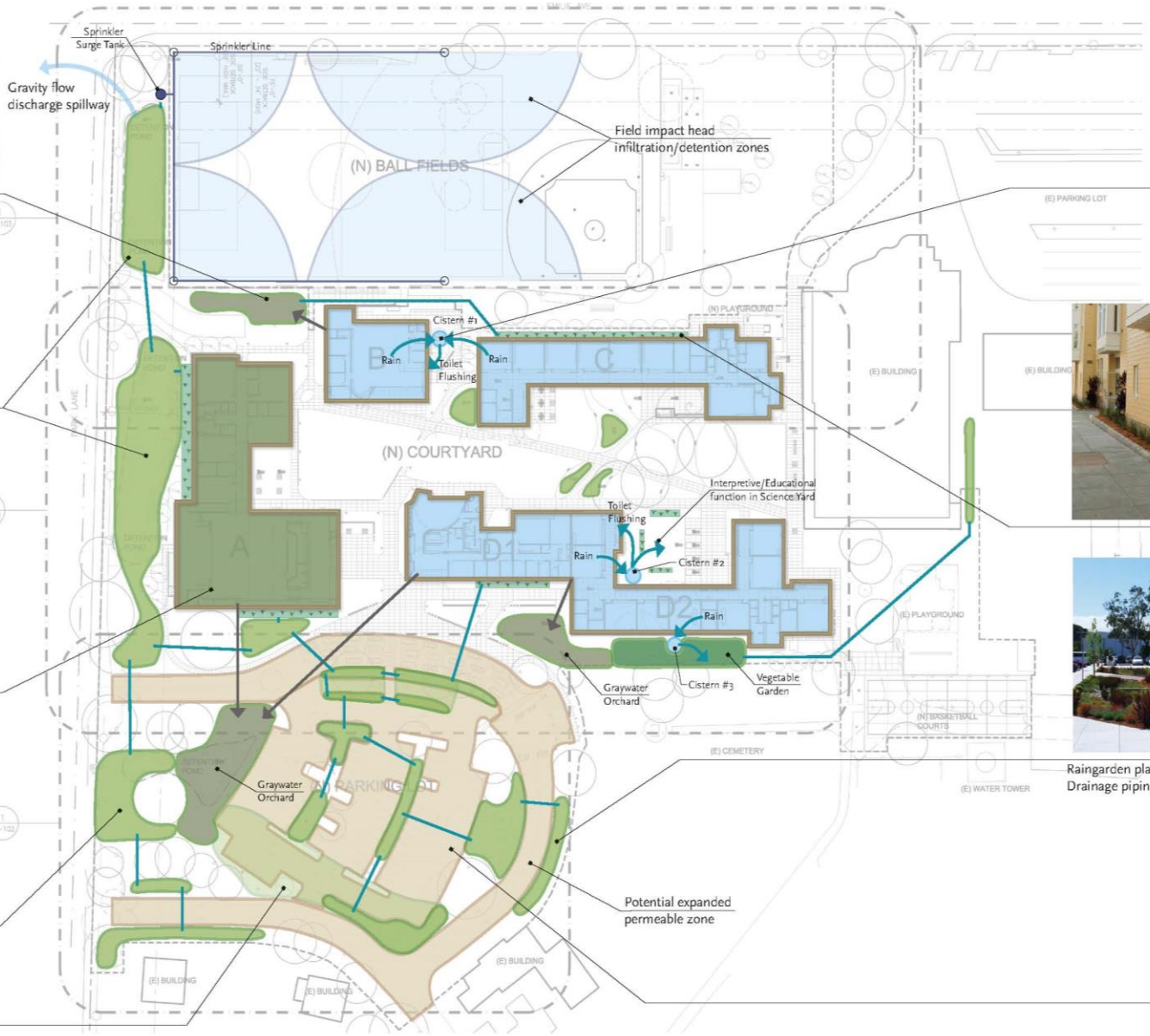
Graywater irrigated orchard

Large raingarden areas, assumed to provide 12" storage depth, max.

Green roof creates 30% or greater runoff reduction vs standard roof

Stormwater management areas

Alternative detention area
Surface storage area during large and infrequent storm events



Rainwater harvesting cistern

Flow-through planter, 6" storage depth, ty

Raingarden planting, assumed 3"-4" retention depth.
Drainage piping to be adjusted to accommodate these ar

Parking lot surfaced in pervious paveme

Stormwater Diagram

SAINT JOSEPH ACADEMY

ATHERTON, CALIFORNIA

SHERWOOD
Design Engineers

the story line

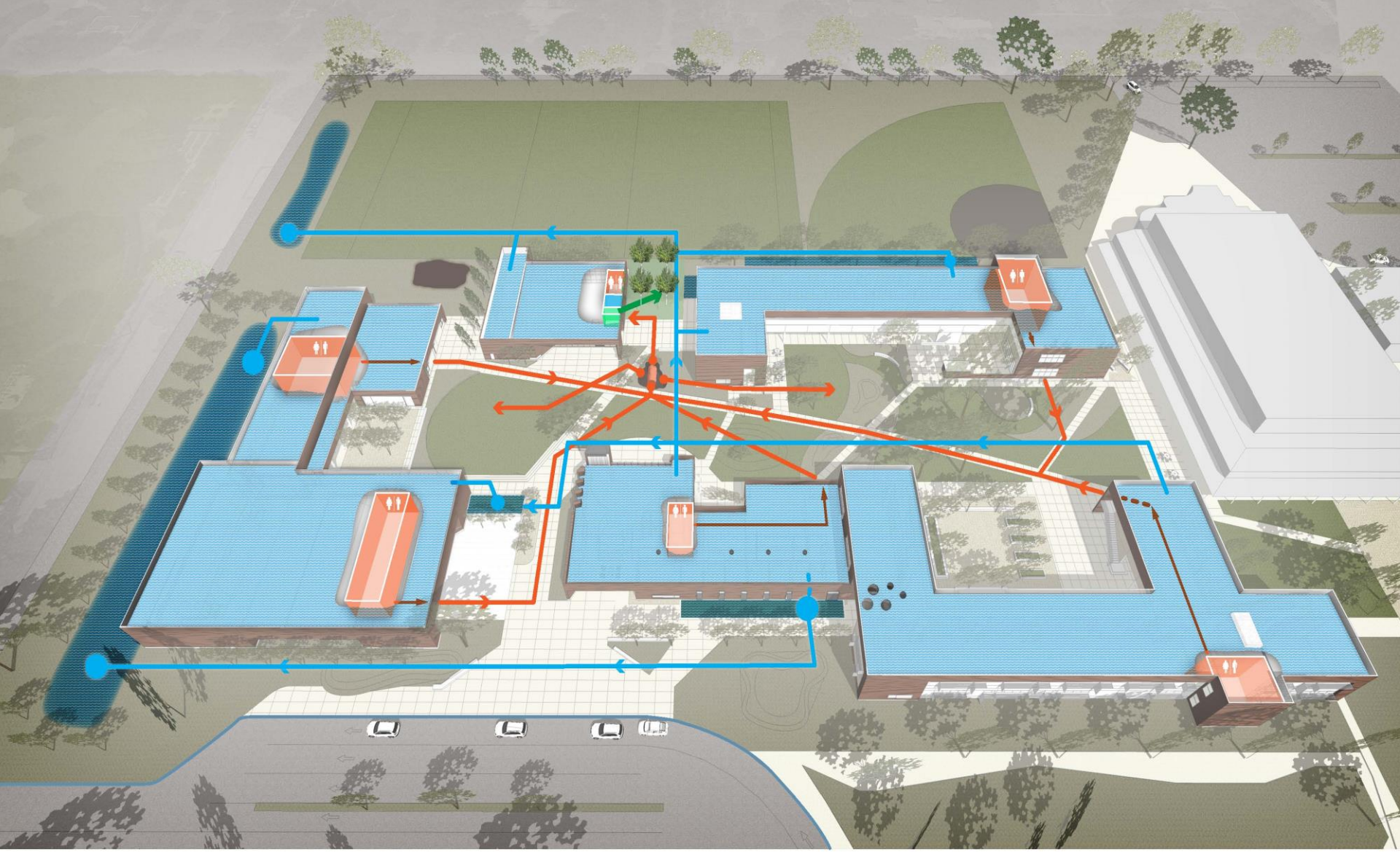
educate children to become exceptional leaders


Bioswales and retention areas


Experience how it changes

Flow through planters serve as seating

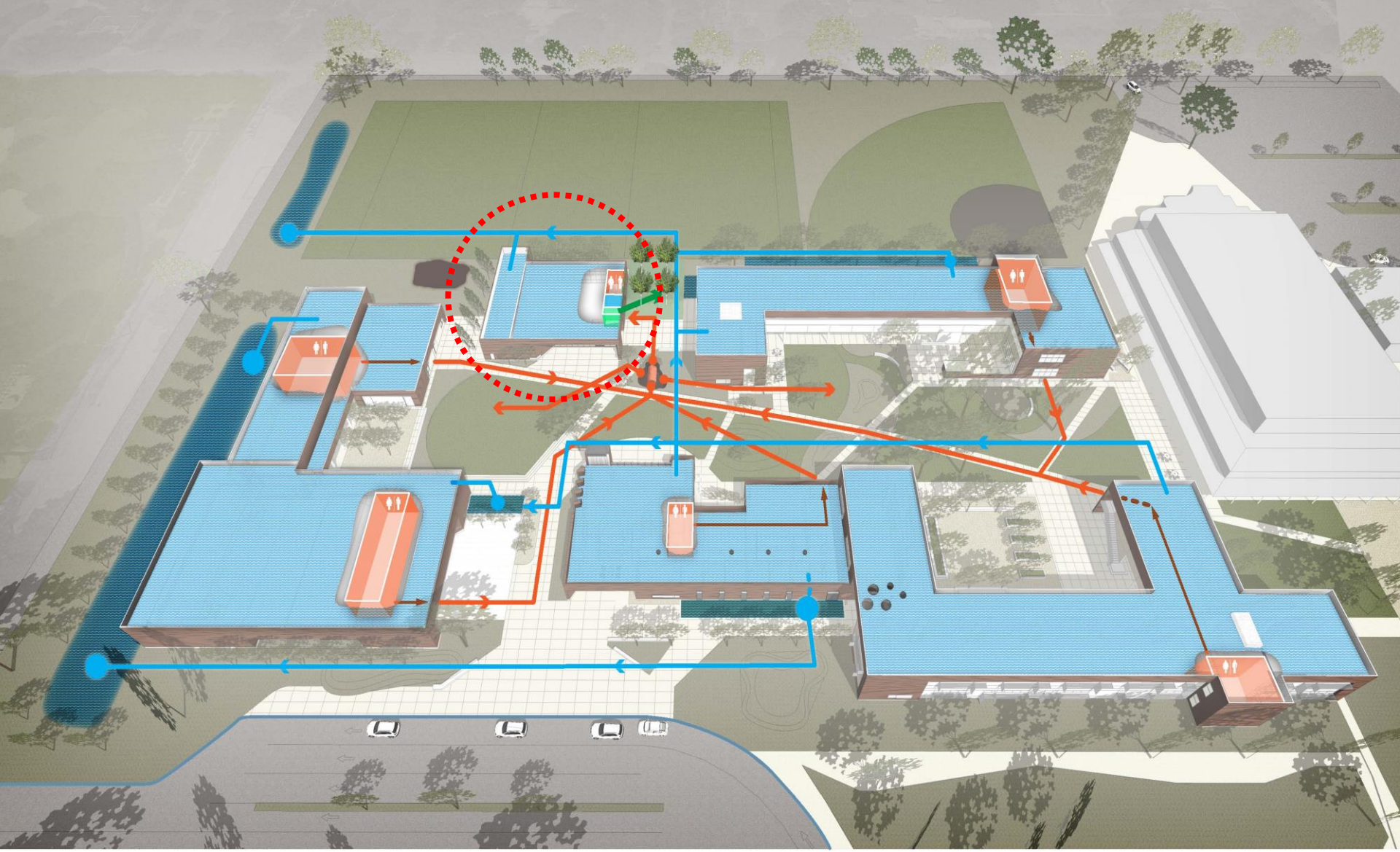
Experience when it rains



SHS
SACRED HEART SCHOOLS
ATHERTON, CA
LOWER & MIDDLE SCHOOLS

STORMWATER, RAINWATER, GREYWATER COMPOSITE DIAGRAM

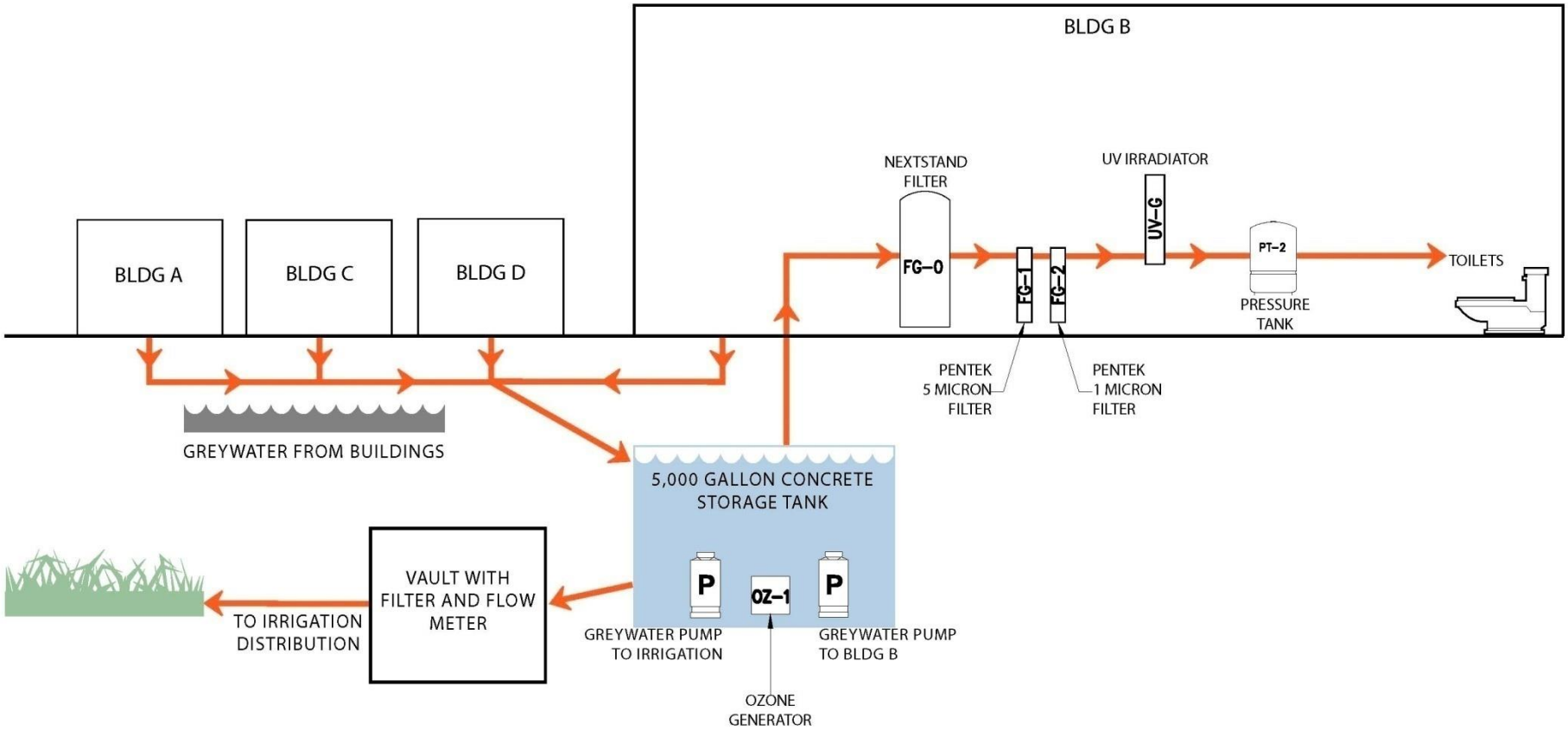
WRNS STUDIO LLP



SACRED HEART SCHOOLS
ATHERTON, CA
LOWER & MIDDLE SCHOOLS

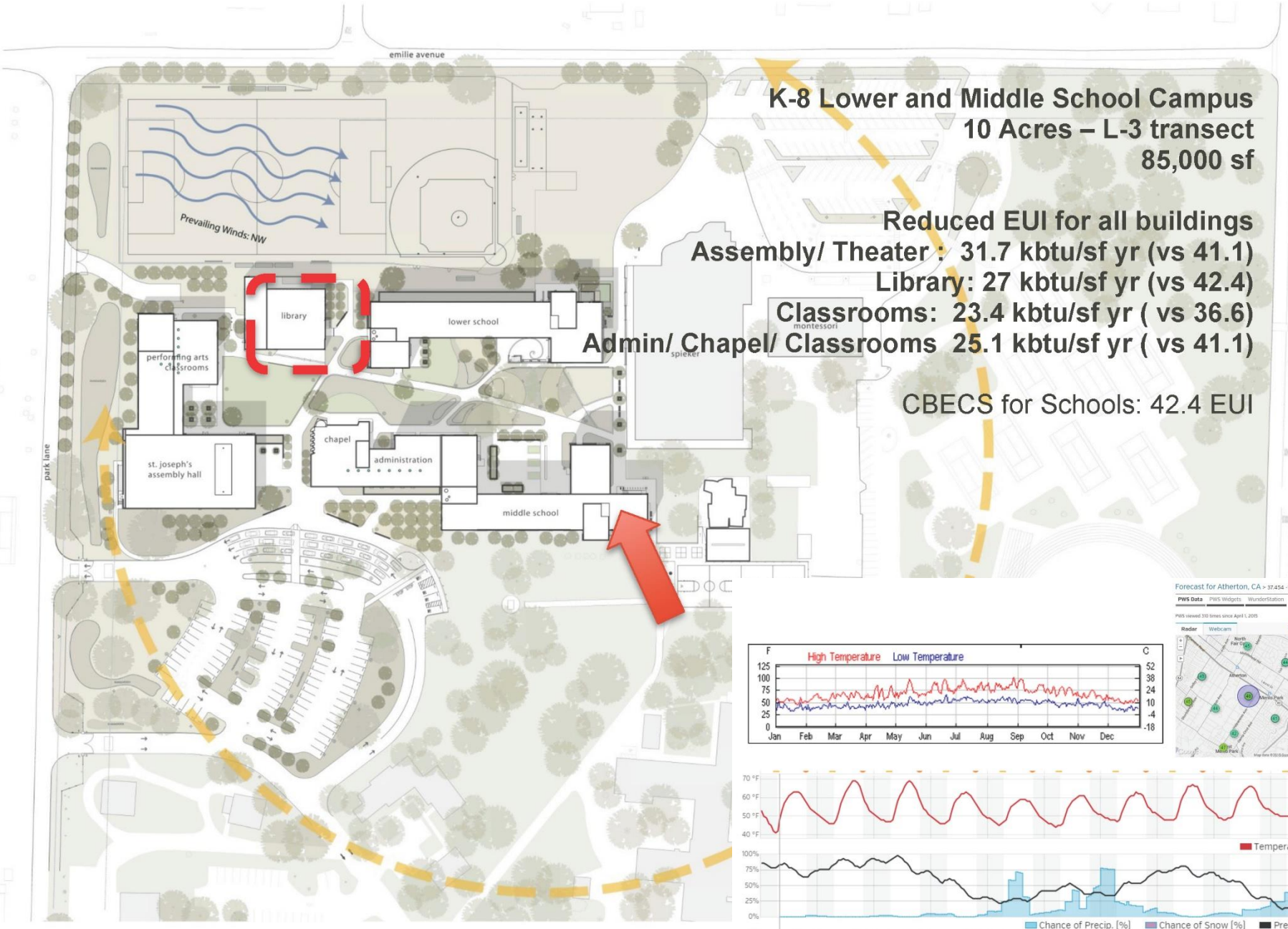
STORMWATER, RAINWATER, GREYWATER COMPOSITE DIAGRAM

WRNS STUDIO



SACRED HEART SCHOOLS
ATHERTON, CA
LOWER & MIDDLE SCHOOLS

WRNS STUDIO



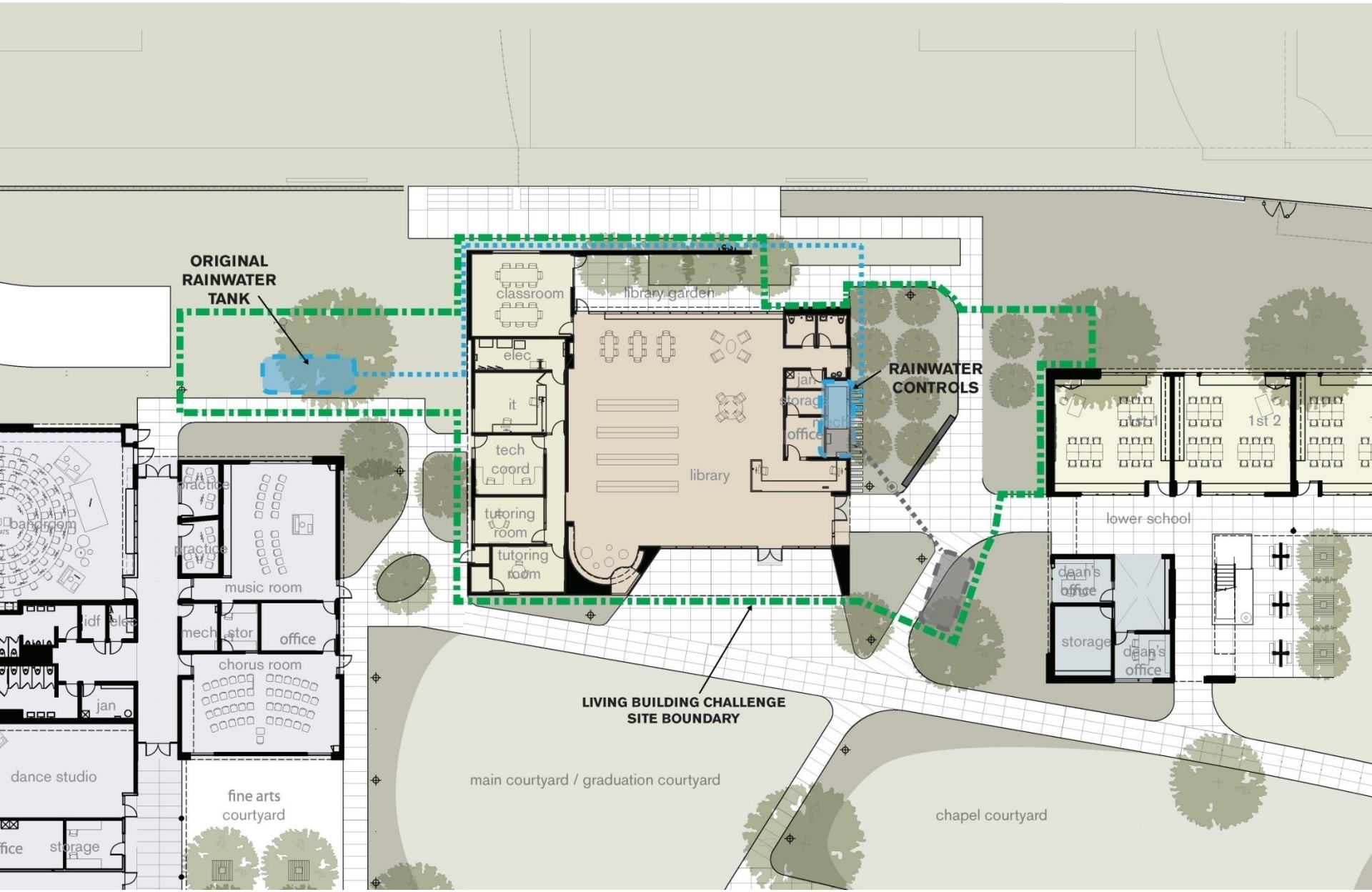
K-8 Lower and Middle School Campus
10 Acres – L-3 transect
85,000 sf

Reduced EUI for all buildings
Assembly/ Theater : 31.7 kbtu/sf yr (vs 41.1)
Library: 27 kbtu/sf yr (vs 42.4)
Classrooms: 23.4 kbtu/sf yr (vs 36.6)
Admin/ Chapel/ Classrooms 25.1 kbtu/sf yr (vs 41.1)

CBECS for Schools: 42.4 EUI

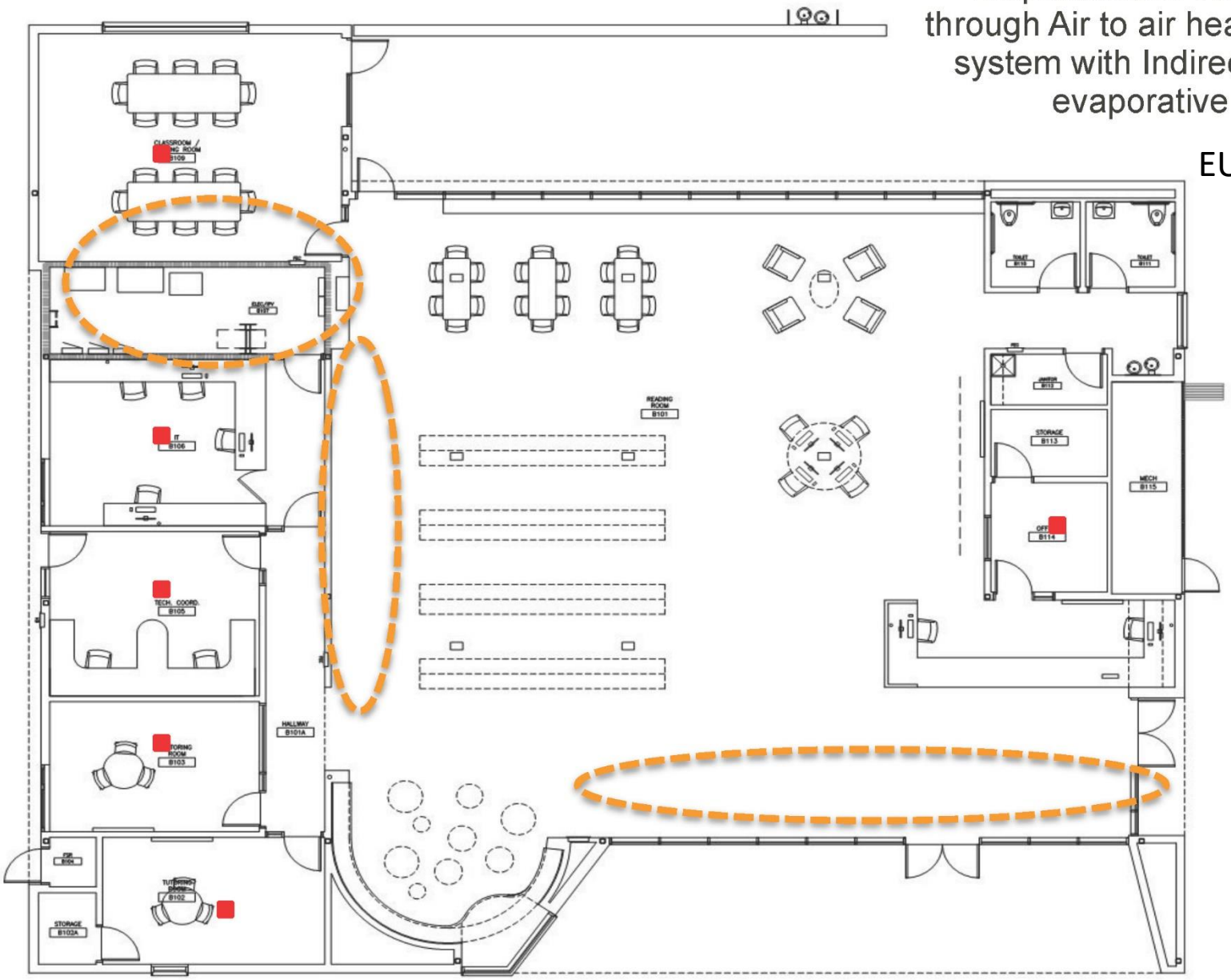
SHS
SACRED HEART SCHOOLS
ATHERTON

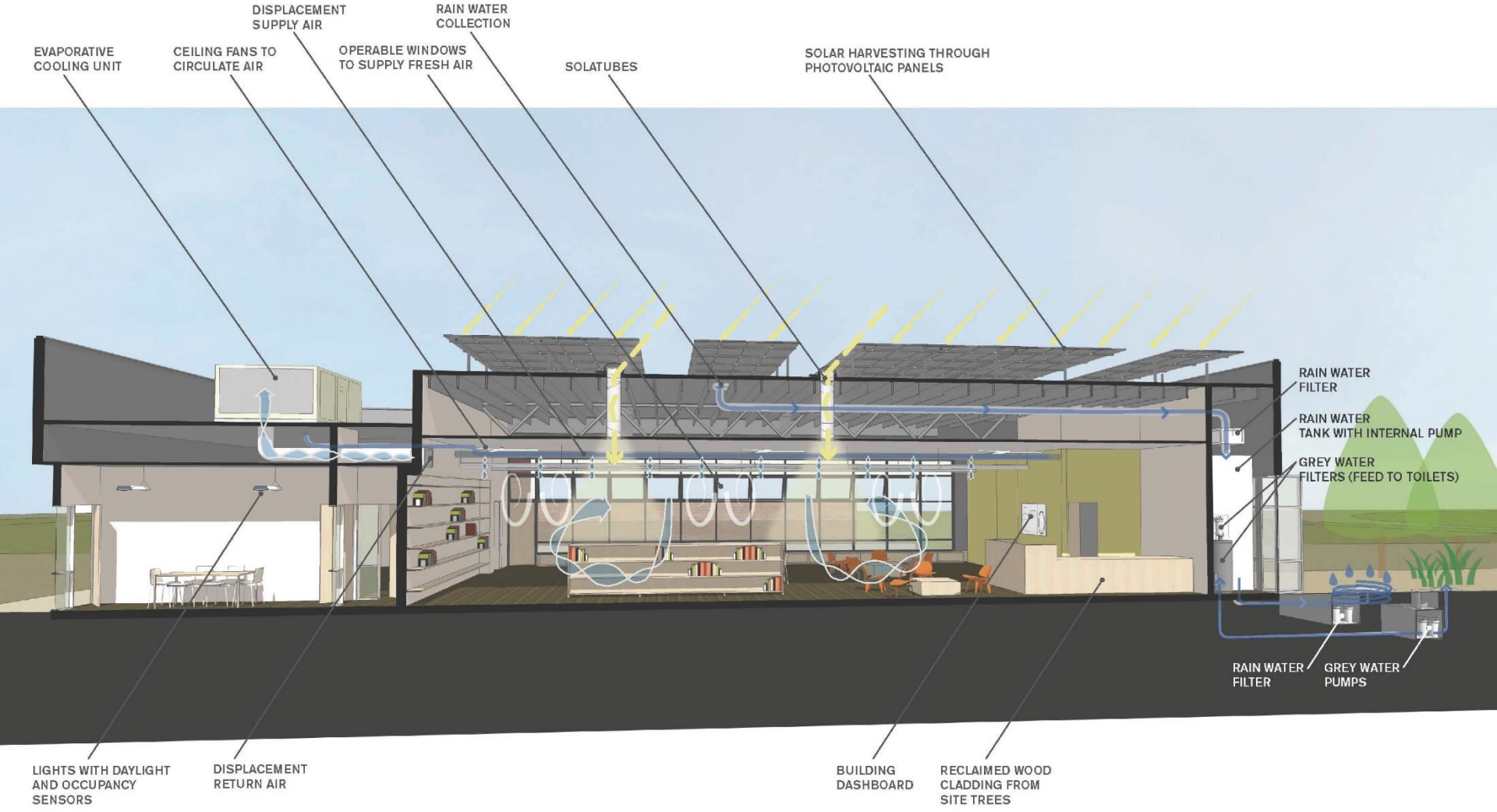
Lower & Middle School - Site Plan

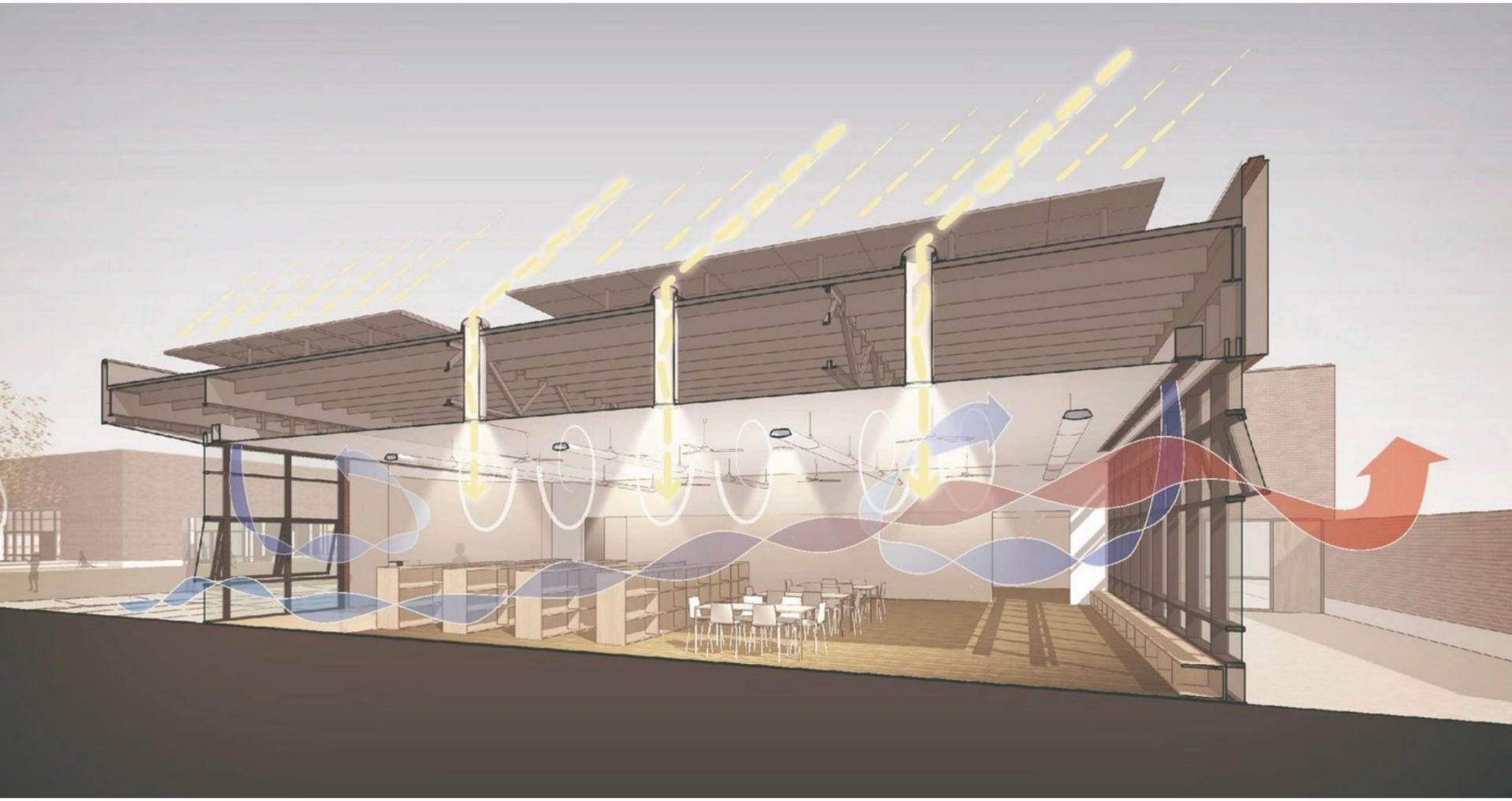

ORIGINAL RAINWATER TANK
RAINWATER CONTROLS
LIVING BUILDING CHALLENGE SITE BOUNDARY
classroom
library garden
elec
it
tech coord
tutoring room
tutoring room
library
jan storage
office
practice
practice
music room
mech
stor
office
chorus room
ballroom
jan
dance studio
storage
fine arts courtyard
main courtyard / graduation courtyard
chapel courtyard
lower school
1st 1
1st 2
dean's office
storage
dean's office

Displacement Ventilation through Air to air heat pump system with Indirect direct evaporative cooling

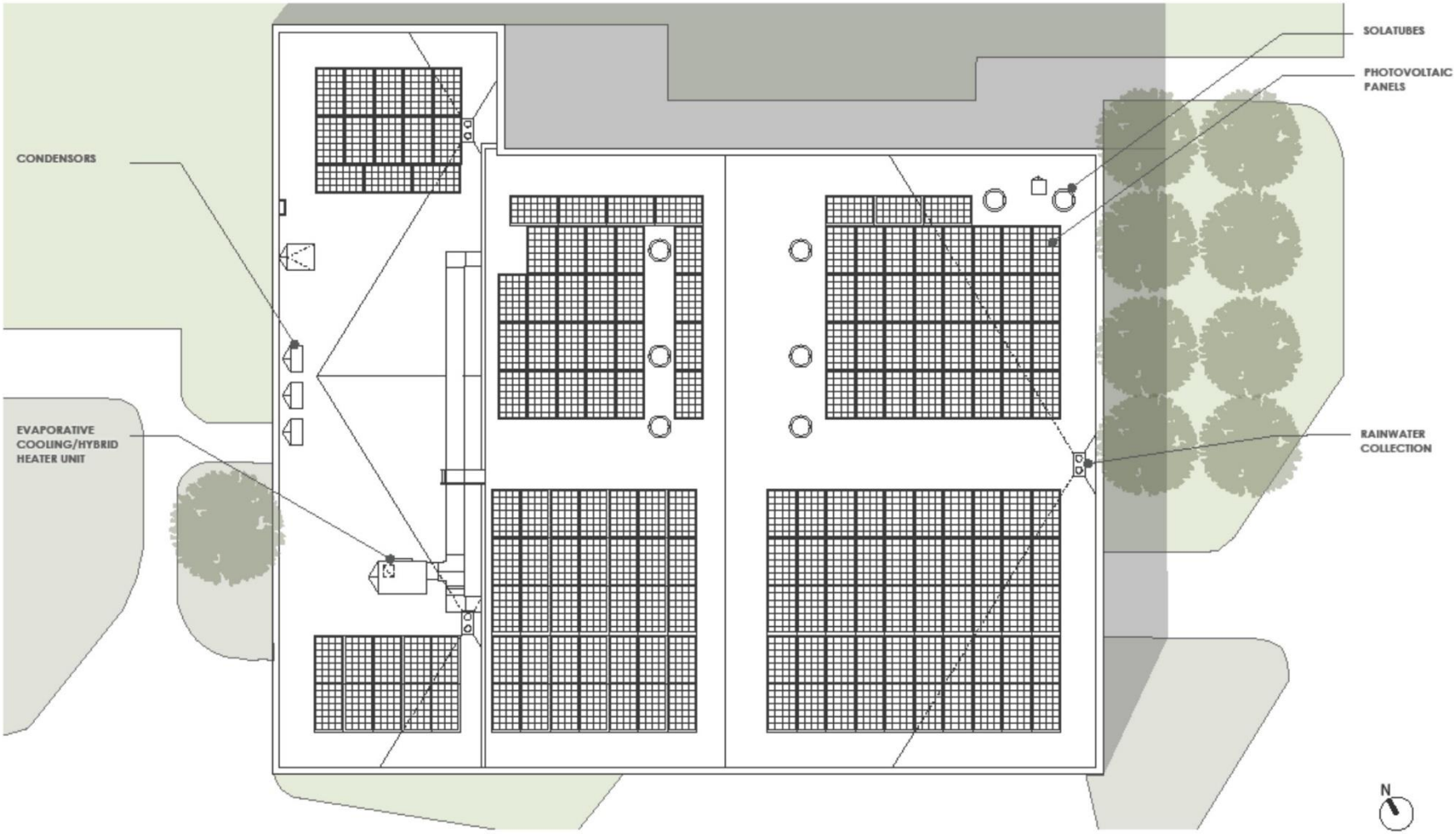
EUI at 16




EVAPORATIVE COOLING UNIT
CEILING FANS TO CIRCULATE AIR
DISPLACEMENT SUPPLY AIR
OPERABLE WINDOWS TO SUPPLY FRESH AIR
RAIN WATER COLLECTION
SOLATUBES
SOLAR HARVESTING THROUGH PHOTOVOLTAIC PANELS
RAIN WATER FILTER
RAIN WATER TANK WITH INTERNAL PUMP
GREY WATER FILTERS (FEED TO TOILETS)
RAIN WATER FILTER
GREY WATER PUMPS
LIGHTS WITH DAYLIGHT AND OCCUPANCY SENSORS
DISPLACEMENT RETURN AIR
BUILDING DASHBOARD
RECLAIMED WOOD CLADDING FROM SITE TREES



Maximized panels on roof area
170 panels @ 250 w/panel – 40 kw sized 15% over
Flat panels vs tilted resulted in a 13% reduction - required for city planning requirement



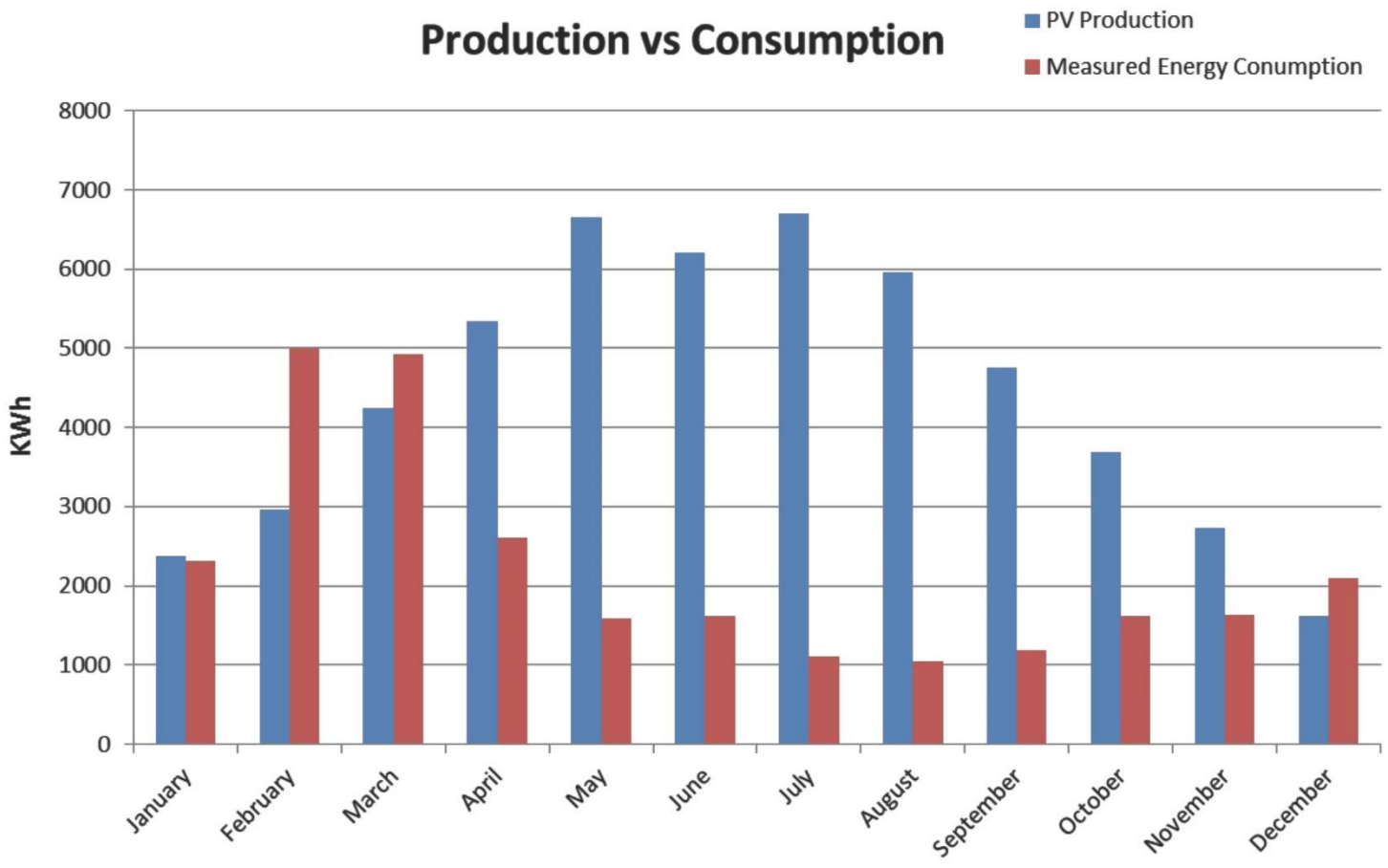
SACRED HEART LIBRARY
ROOF PLAN

WRNS STUDIO
March 27, 2013

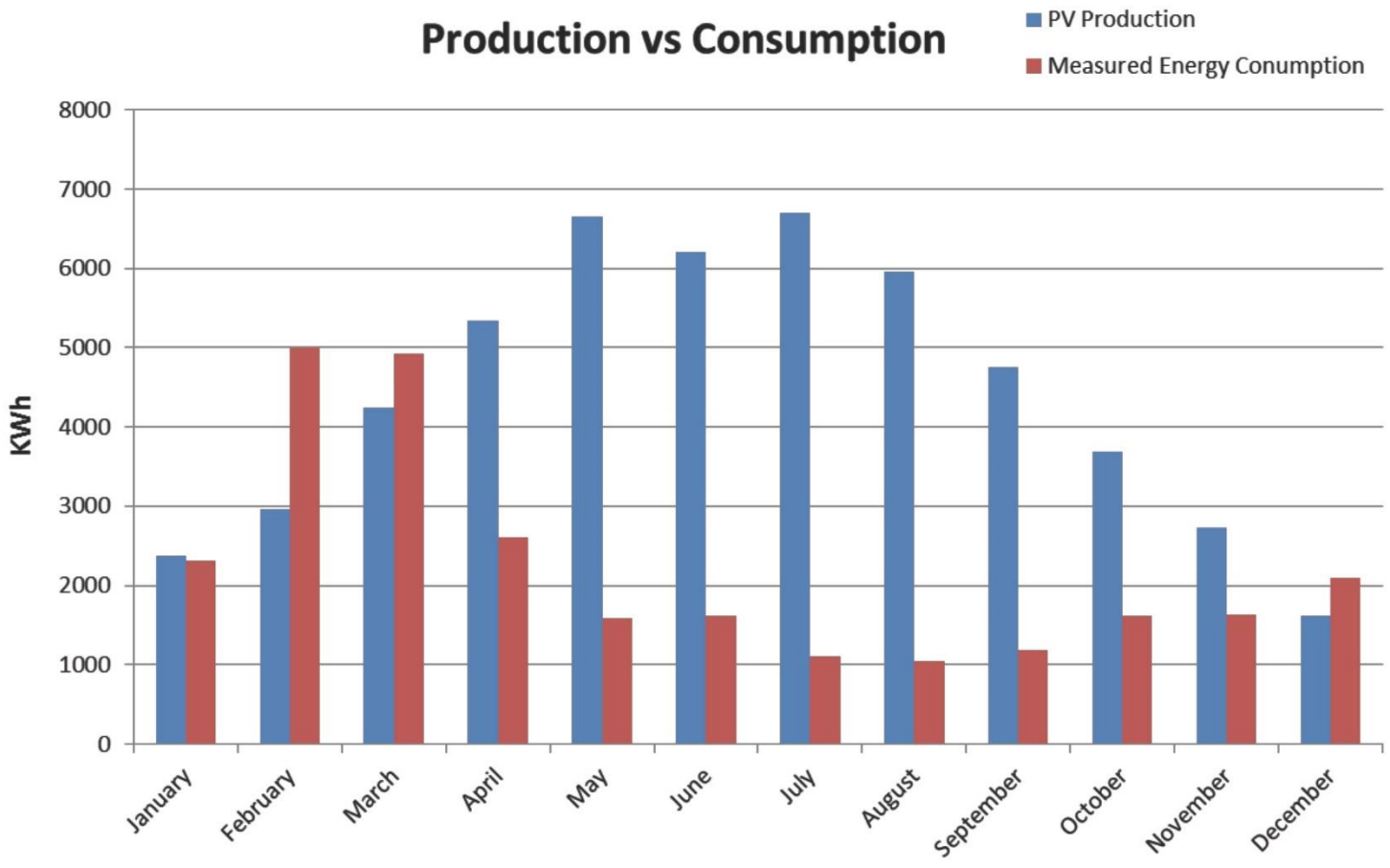
LIVING BUILDING CHALLENGE℠

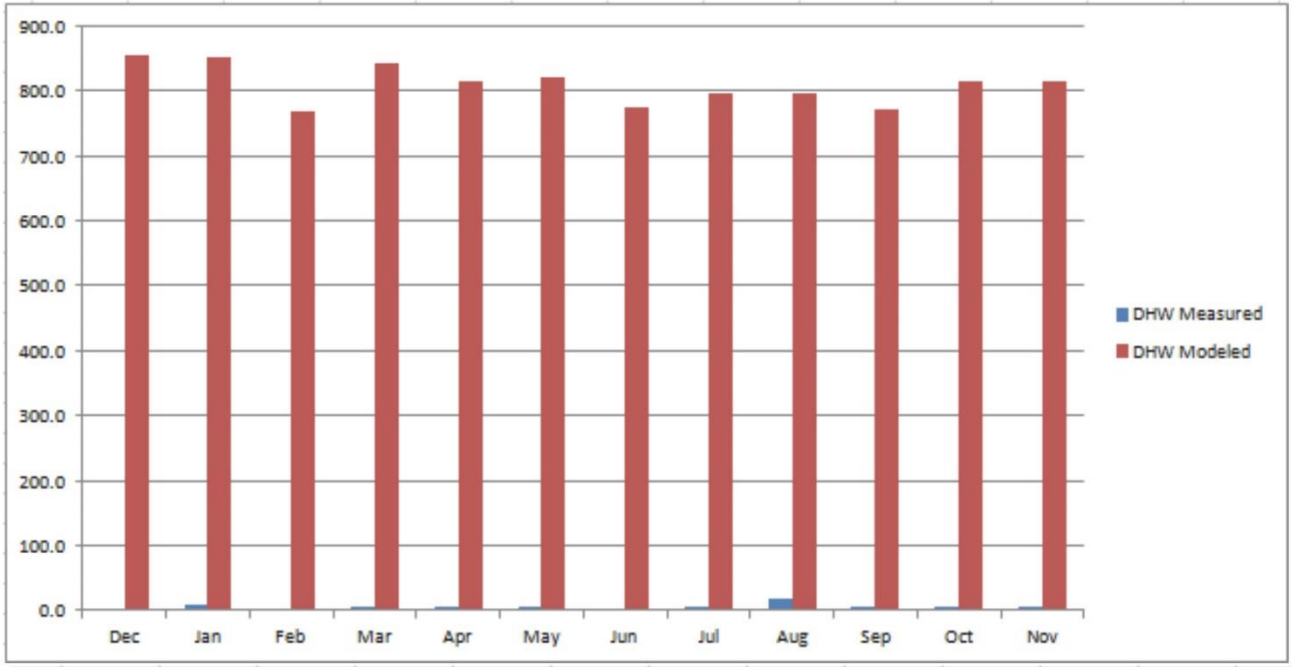
Stir the pot.
Infuse with inspiration and poetry.
Embrace the psychology of the end game.
Lead the market forward.
Create models for the future.
Achieve the Living Building Challenge℠

PV predicted at 50832 kWh
PV measured 56,811kWh
x



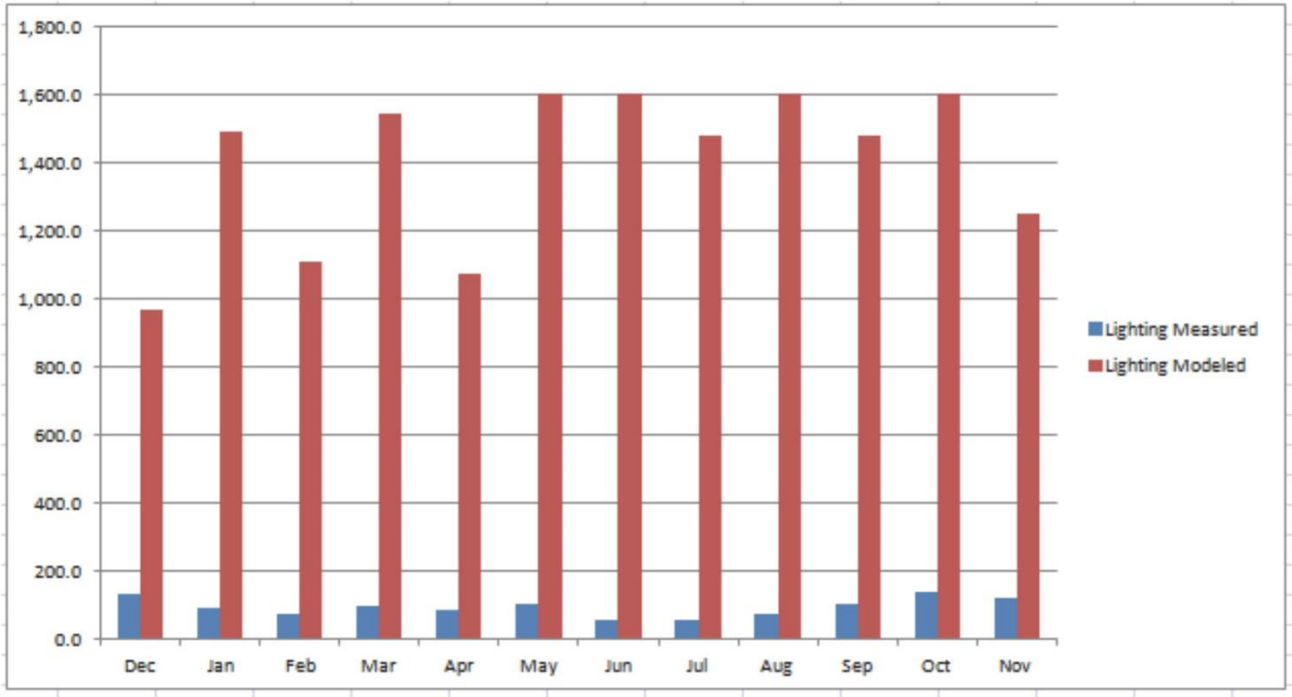
PV predicted at 50832 kWh
PV measured 56811kWh
Demand measured 24394 kWh





DHW

	Measured	Modeled
Dec	2.5	856.0
Jan	7.9	853.0
Feb	3.3	768.0
Mar	5.0	842.0
Apr	6.8	815.0
May	7.4	820.0
Jun	1.4	775.0
Jul	5.4	795.0
Aug	17.9	797.0
Sep	7.4	771.0
Oct	6.4	815.0
Nov	5.5	816



Lighting

	Lighting	
	Measured	Modeled
Dec	129.9	969.0
Jan	86.6	1,488.0
Feb	71.5	1,109.0
Mar	94.0	1,546.0
Apr	81.2	1,073.0
May	103.9	1,604.0
Jun	53.9	1,604.0
Jul	54.2	1,477.0
Aug	73.6	1,604.0
Sep	103.0	1,477.0
Oct	135.3	1,604.0
Nov	120	1246

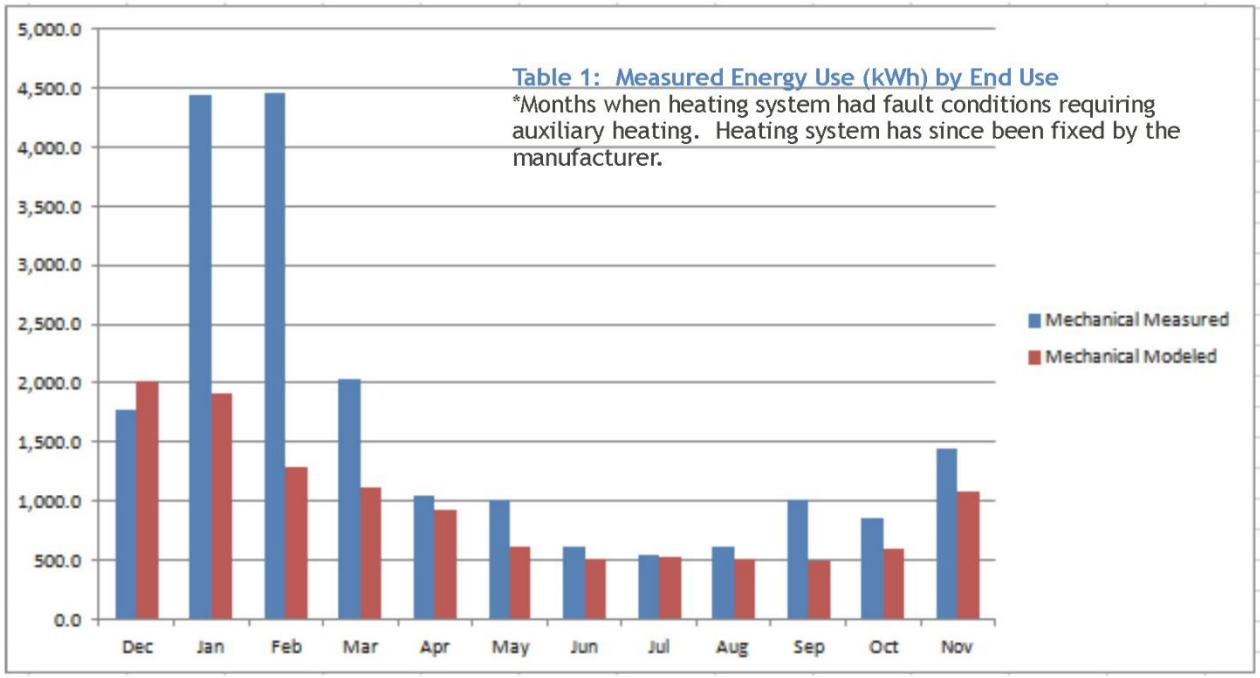
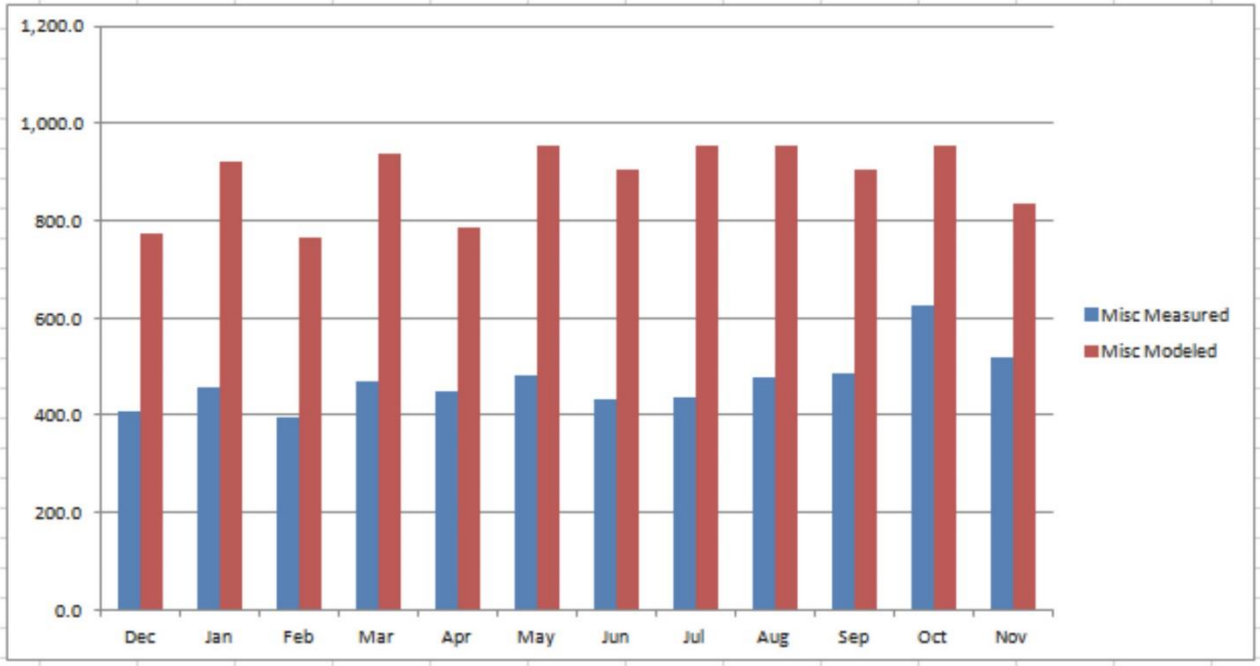


Table 1: Measured Energy Use (kWh) by End Use

*Months when heating system had fault conditions requiring auxiliary heating. Heating system has since been fixed by the manufacturer.

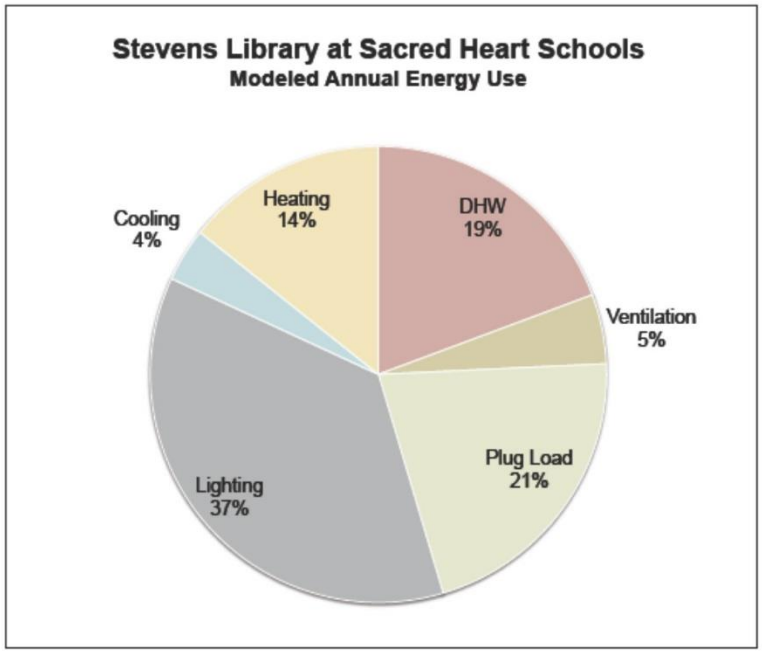
Mechanical

	Mechanical	
	Measured	Modeled
Dec	1,773.9	2018
Jan	4,442.5	1,914.0
Feb	4,457.6	1,283.0
Mar	2,032.1	1,115.0
Apr	1,040.7	928.0
May	1,018.2	617.0
Jun	616.1	506.0
Jul	547.3	527.0
Aug	609.1	520.0
Sep	1,013.8	499.0
Oct	863.3	601.0
Nov	1446.5	1086



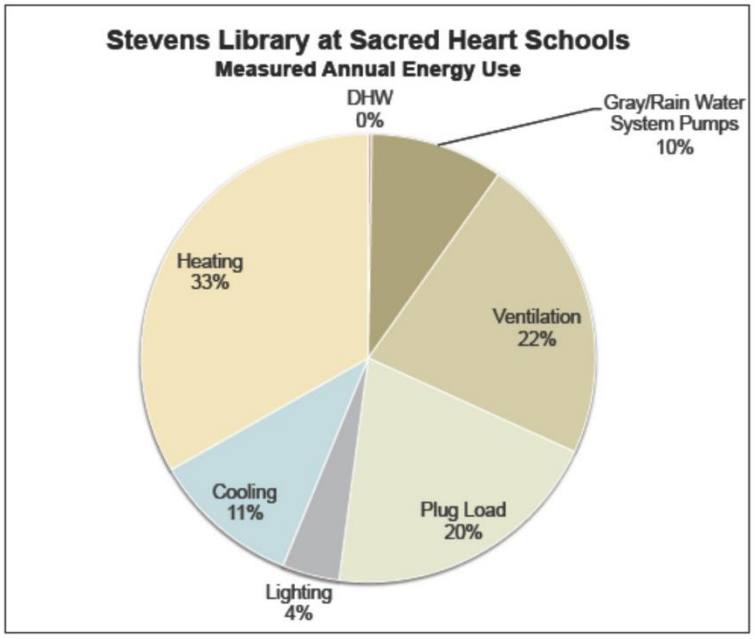
Misc

	Measured	Modeled
Dec	407.3	772.0
Jan	455.7	922.0
Feb	396.3	765.0
Mar	469.3	938.0
Apr	450.7	786.0
May	481.4	955.0
Jun	434.4	903.0
Jul	435.1	955.0
Aug	479.2	955.0
Sep	486.5	903.0
Oct	626.0	955.0
Nov	519.63	836



Modeled Energy Use

50 MWhr per Year
Modeled EUI = 27.0



Measured Energy Use

31.1 MWhr per Year
Actual EUI = 16.9

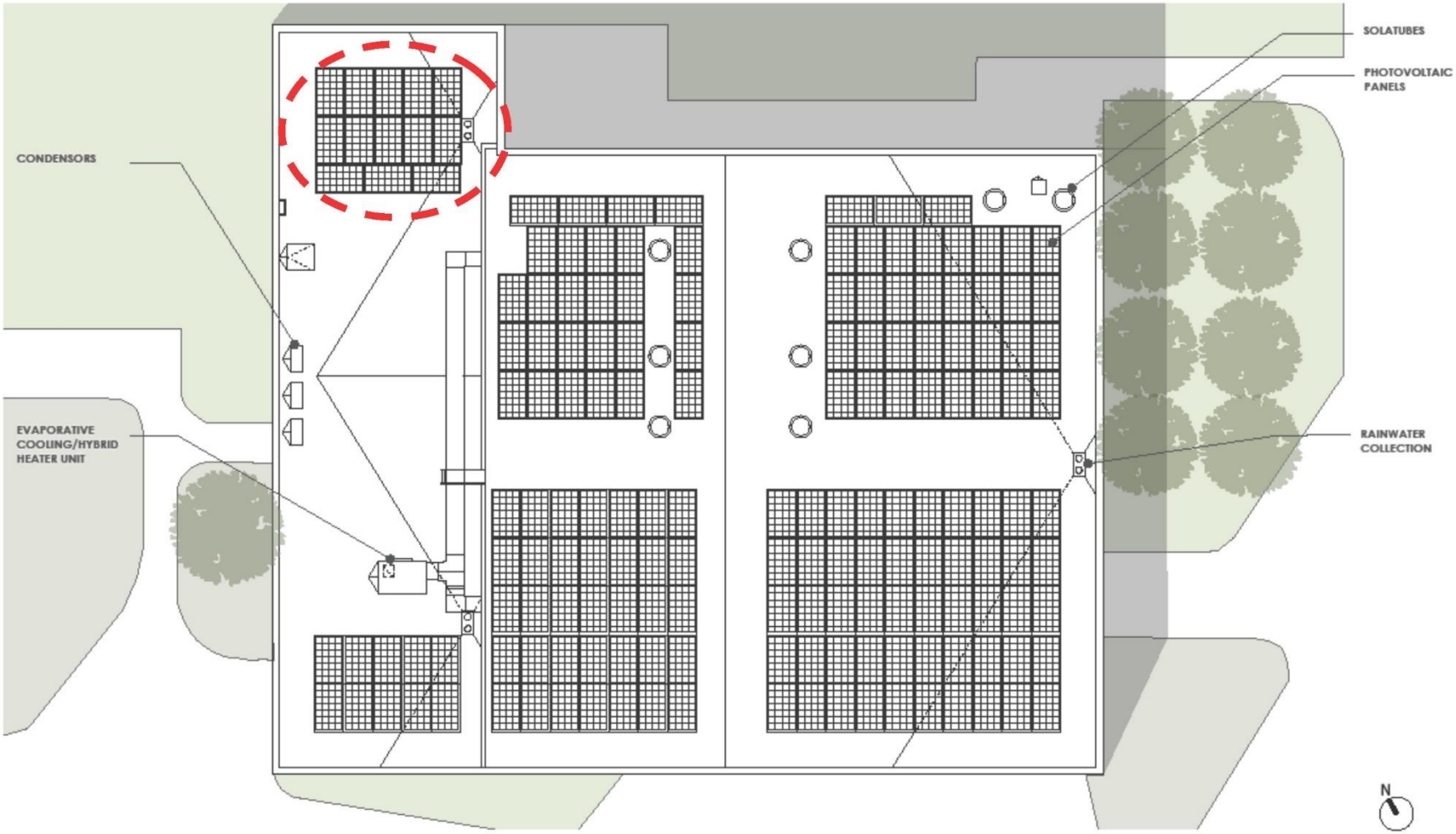
37 % predicted

4% actual

Approximately 8000 kWh difference


how much

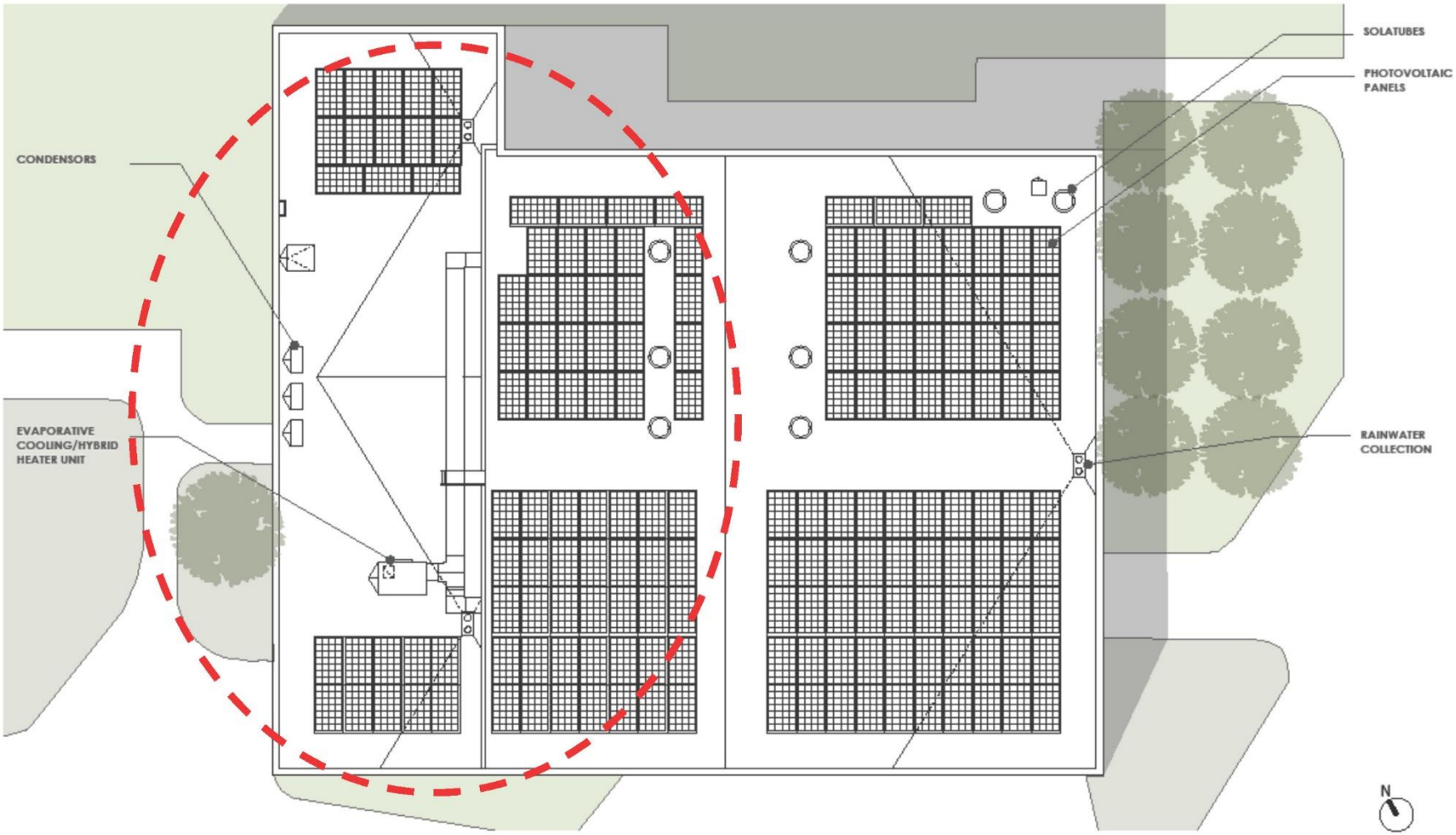
170 panels @ 250 w/panel – 40 kw sized 15% over covers graywater system, 4,408 kwh



SACRED HEART LIBRARY
ROOF PLAN

WRNS STUDIO
March 27, 2013

Too much?



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March 27, 2013


Too Good?


EXIT

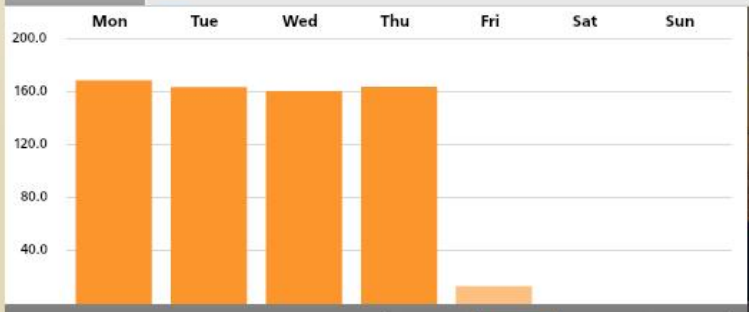
SCHOOL
Sacred Heart

ACADEMIC
Stevens Library

Find buildings

Electricity | Photovoltaic | Water | Rainwater

LAYERS | Electricity Use (kWh)



Homepage | Comparison | PV Array | Green Features

PV ARRAY

RIGHT NOW:

0 kW

MAX OUTPUT: 0 kW

KILOWATT-HOURS PRODUCED:

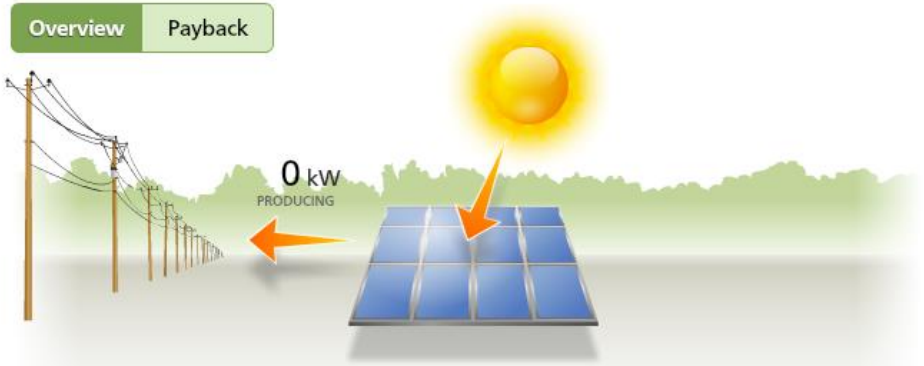
TODAY: 0

THIS MONTH: 1,964

ALL TIME: 28,032

kWh | CO2 | Money

Overview | Payback



Overview

TOTAL SOLAR ENERGY PRODUCED IS EQUIVALENT TO:

1,121,263

Hours of 25-Watt compact fluorescent lightbulb use

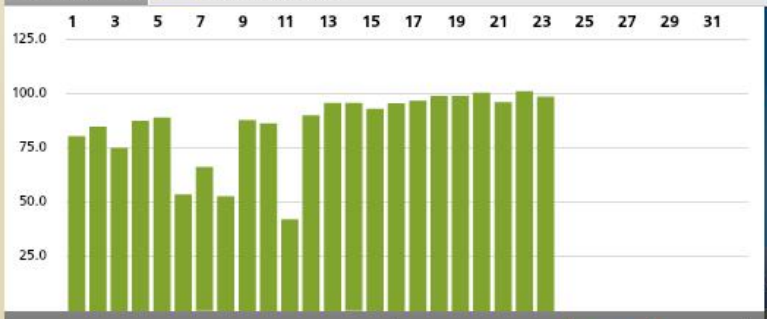
SCHOOL
Sacred Heart

ACADEMIC
Stevens Library

Find buildings

Electricity | Photovoltaic | Water | Rainwater

LAYERS — PV Output Power (kWh)



0.00
Kilowatts

1,963
Kilowatt-hours so far this month

kWh

Homepage | Comparison | PV Array | Green Features

PV ARRAY

RIGHT NOW:

0 kW

MAX OUTPUT: 0 kW

KILOWATT-HOURS PRODUCED:

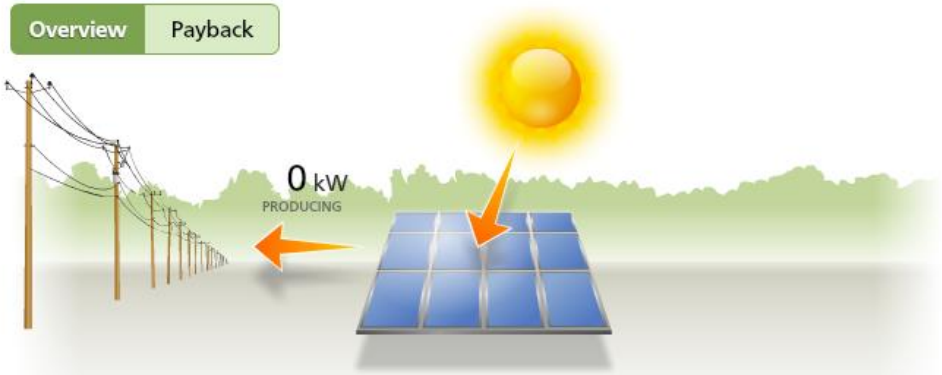
TODAY: 0

THIS MONTH: 1,964

ALL TIME: 28,031

kWh | CO2 | Money

Overview | Payback

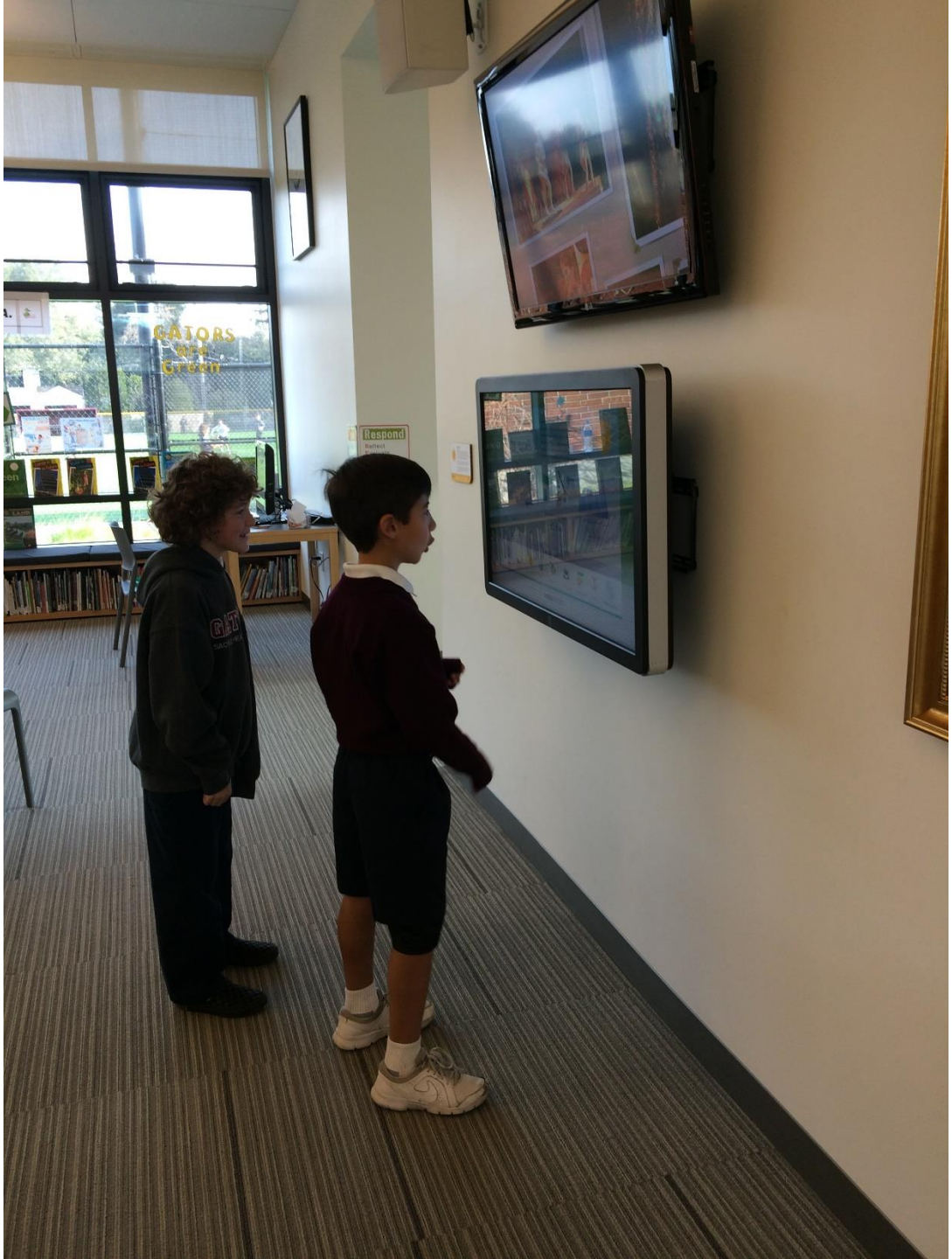


Overview

TOTAL SOLAR ENERGY PRODUCED IS EQUIVALENT TO:

1,121,248

Hours of 25-Watt compact fluorescent lightbulb use


GATORS
Respond


PROUD to be GREEN.


educate children to become exceptional leaders
the story line grows

Atherton Civic Center

8000 sf library; 22,000 sf city hall and police facility; 10 acre site

Public project; 5 main user groups

Moderate construction budget

LOW - Moderate fees

Mixed interest in driving sustainability through project

Pursuing LEED Platinum on the library

Targeting Net Zero Energy Certified through ILFI

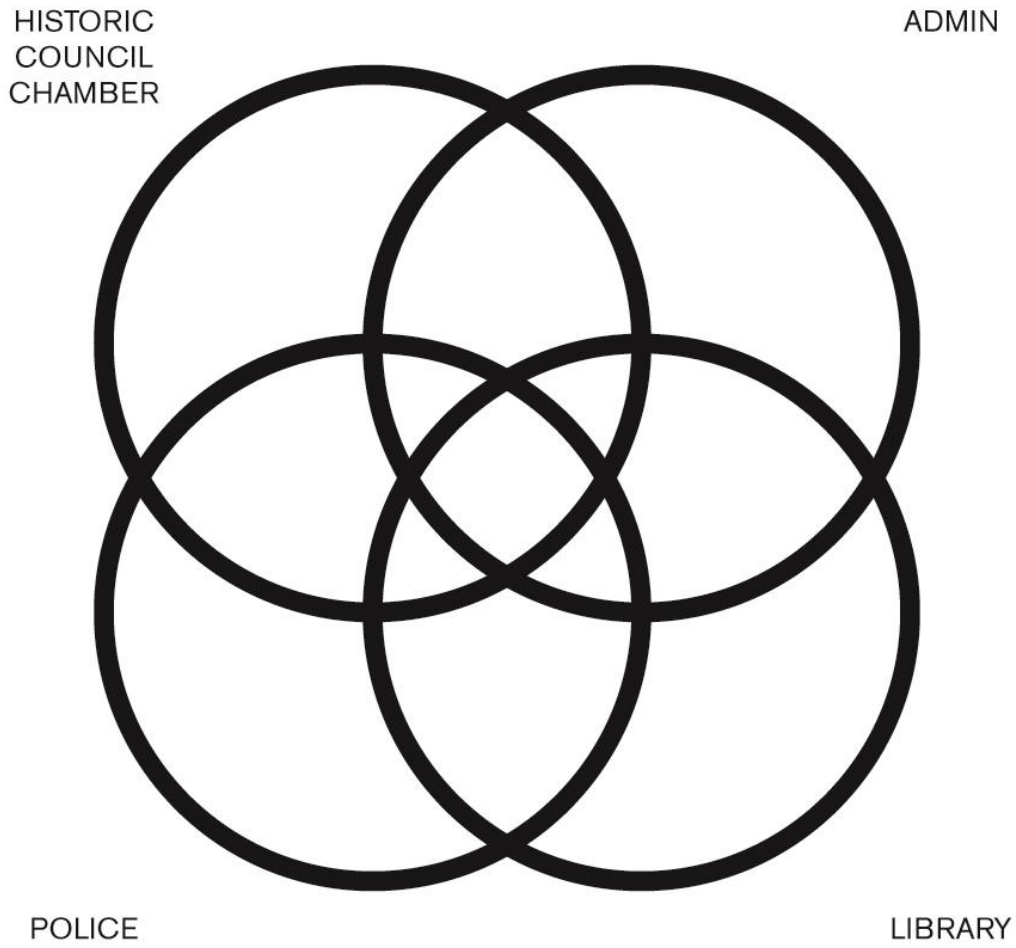
AGENDA – Sustainable Design at neutral cost impact

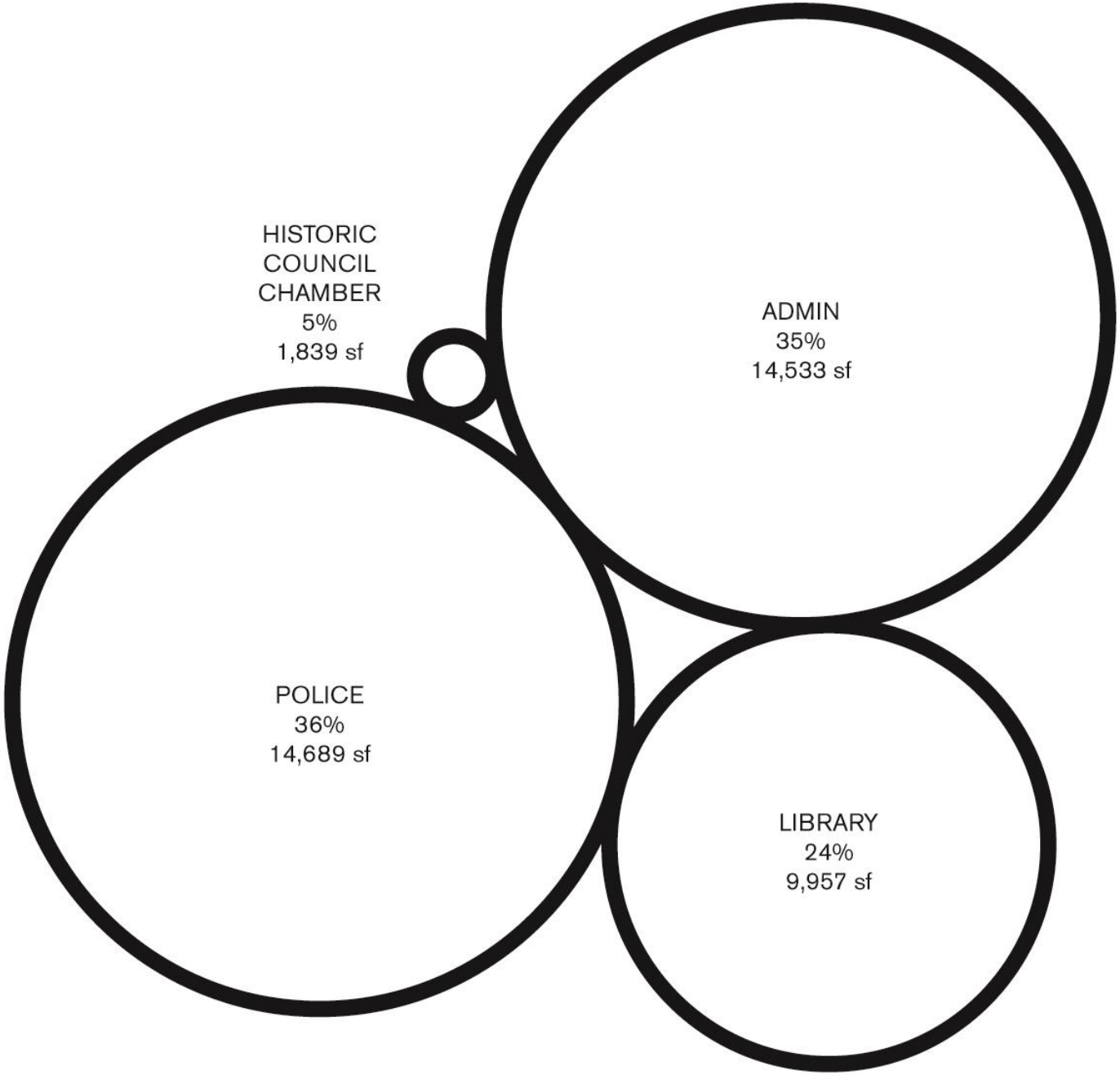
RESILIENCY – ENERGY AND WATER
CONNECTION TO SITE – HABITAT AND WELL BEING
HEALTH - DAYLIGHT AUTONOMY THERMAL AUTONOMY
CARBON – SYSTEM AND EMBODIED

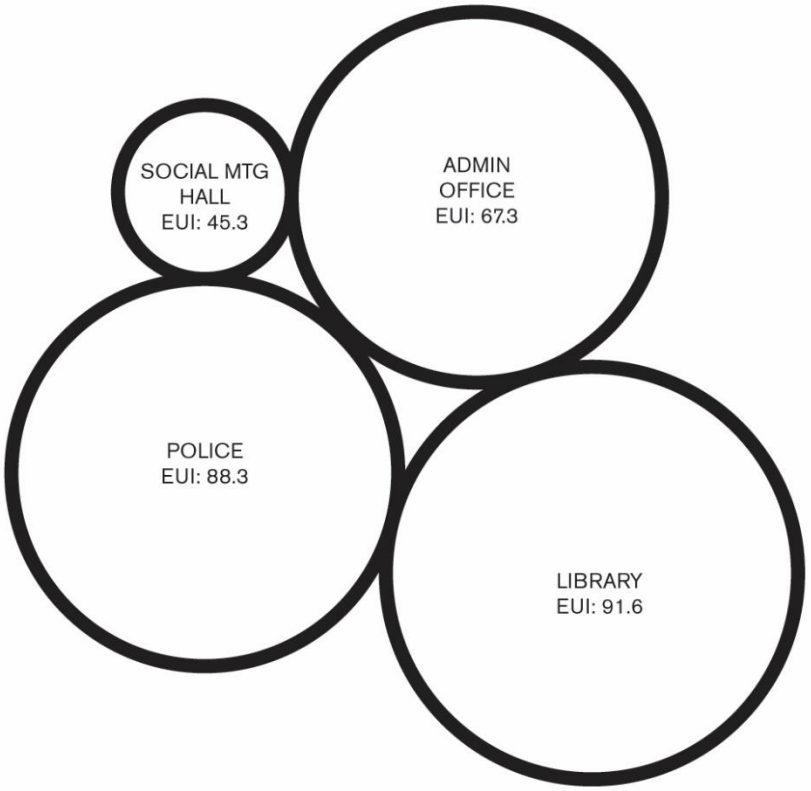
PASSIVE STRATEGIES – PLANNING AND BUILDING ENVELOPE

SITE
- **SITE AND LANDSCAPE SYNERGY**
- **WATER**
- **ENERGY**

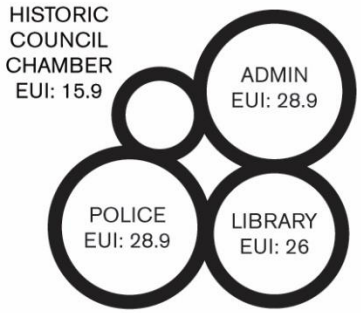
SUSTAINABLE BUILDING SYSTEMS / MATERIALS
- **MECHANICAL**
- **ELECTRICAL**
- **MATERIALS**


HISTORIC
COUNCIL
CHAMBER
ADMIN
POLICE
LIBRARY

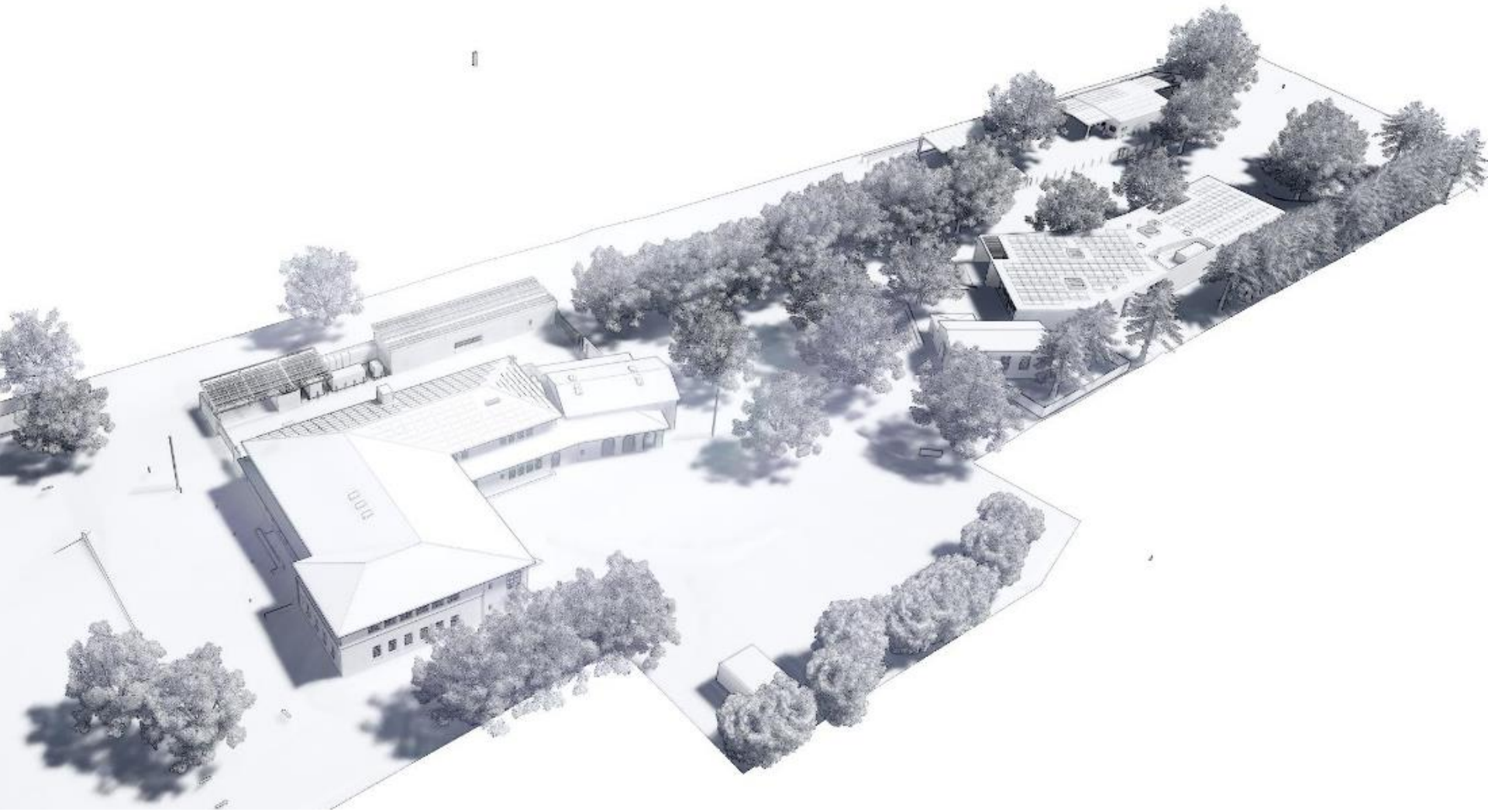

HISTORIC
COUNCIL
CHAMBER
5%
1,839 sf
ADMIN
35%
14,533 sf
POLICE
36%
14,689 sf
LIBRARY
24%
9,957 sf



BASELINE EUI



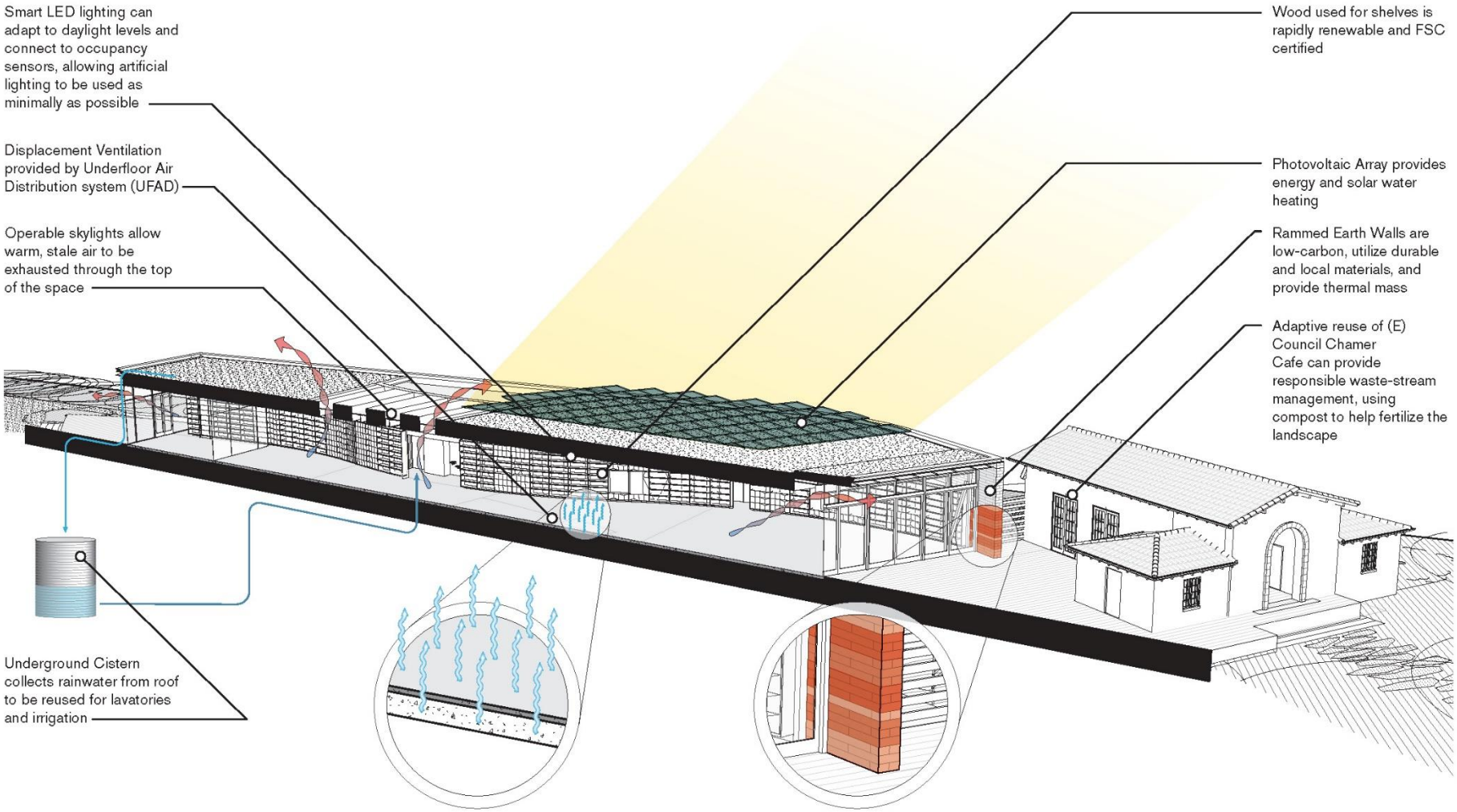
PROPOSED EUI



ATHERTON CIVIC CENTER – SITE AERIAL

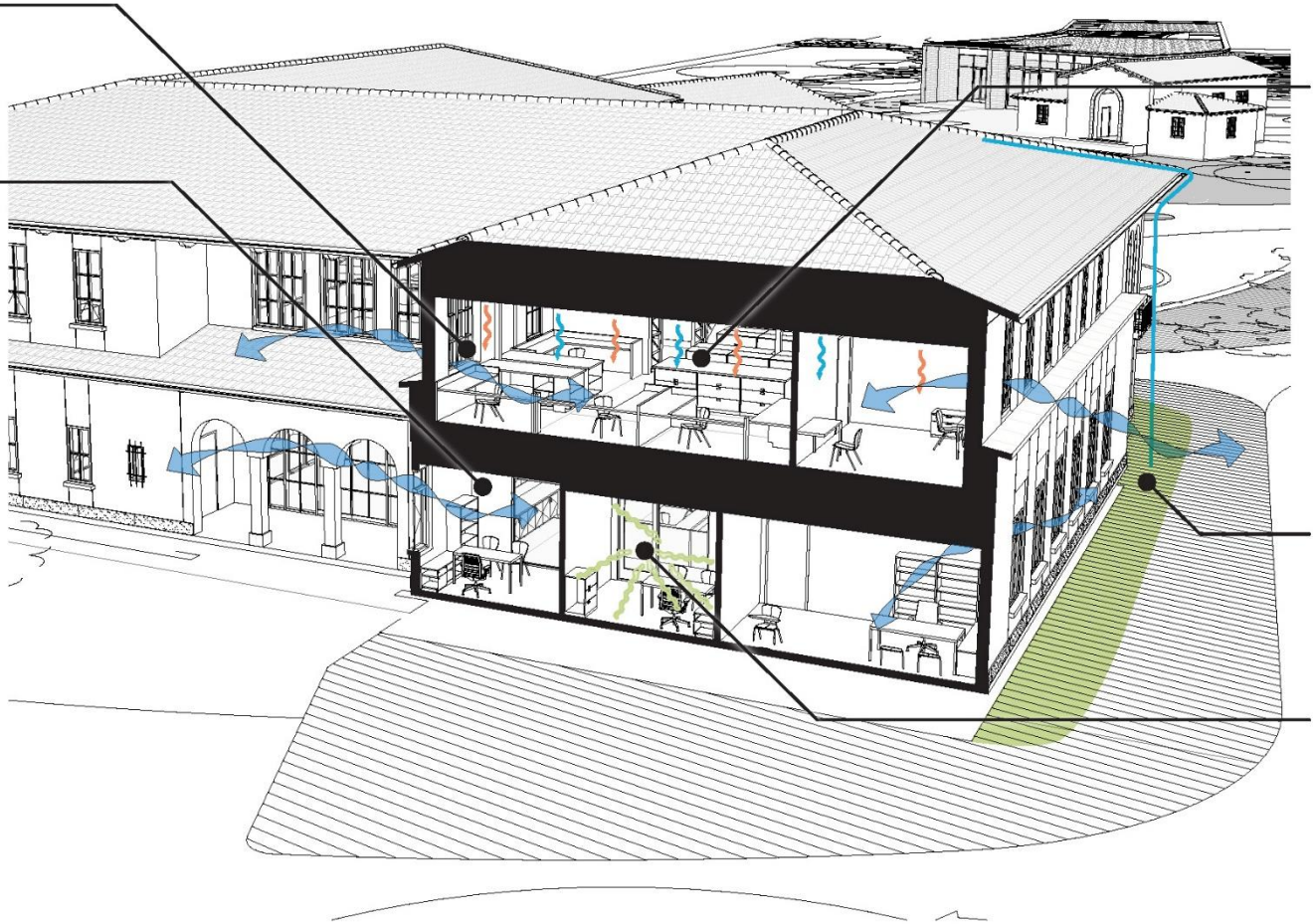
MONTH DAY, 2017

WRNS STUDIO


Smart LED lighting can adapt to daylight levels and connect to occupancy sensors, allowing artificial lighting to be used as minimally as possible
Displacement Ventilation provided by Underfloor Air Distribution system (UFAD)
Operable skylights allow warm, stale air to be exhausted through the top of the space
Underground Cistern collects rainwater from roof to be reused for lavatories and irrigation
Wood used for shelves is rapidly renewable and FSC certified
Photovoltaic Array provides energy and solar water heating
Rammed Earth Walls are low-carbon, utilize durable and local materials, and provide thermal mass
Adaptive reuse of (E) Council Chamer Cafe can provide responsible waste-stream management, using compost to help fertilize the landscape

Operable Windows provide daylight and views to the outdoors, as well as user-controlled natural ventilation

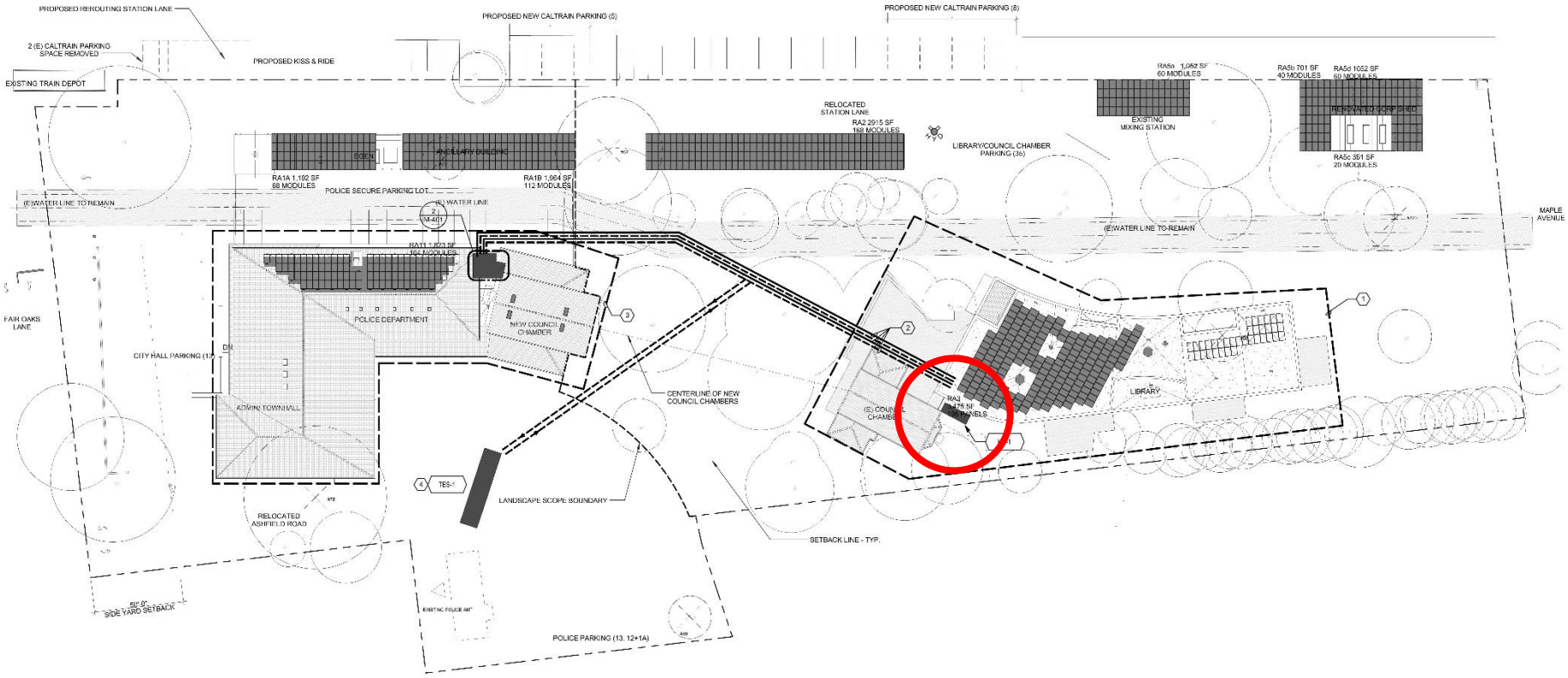
Smart LED lighting can adapt to daylight levels and connect to occupancy sensors, allowing artificial lighting to be used as minimally as possible

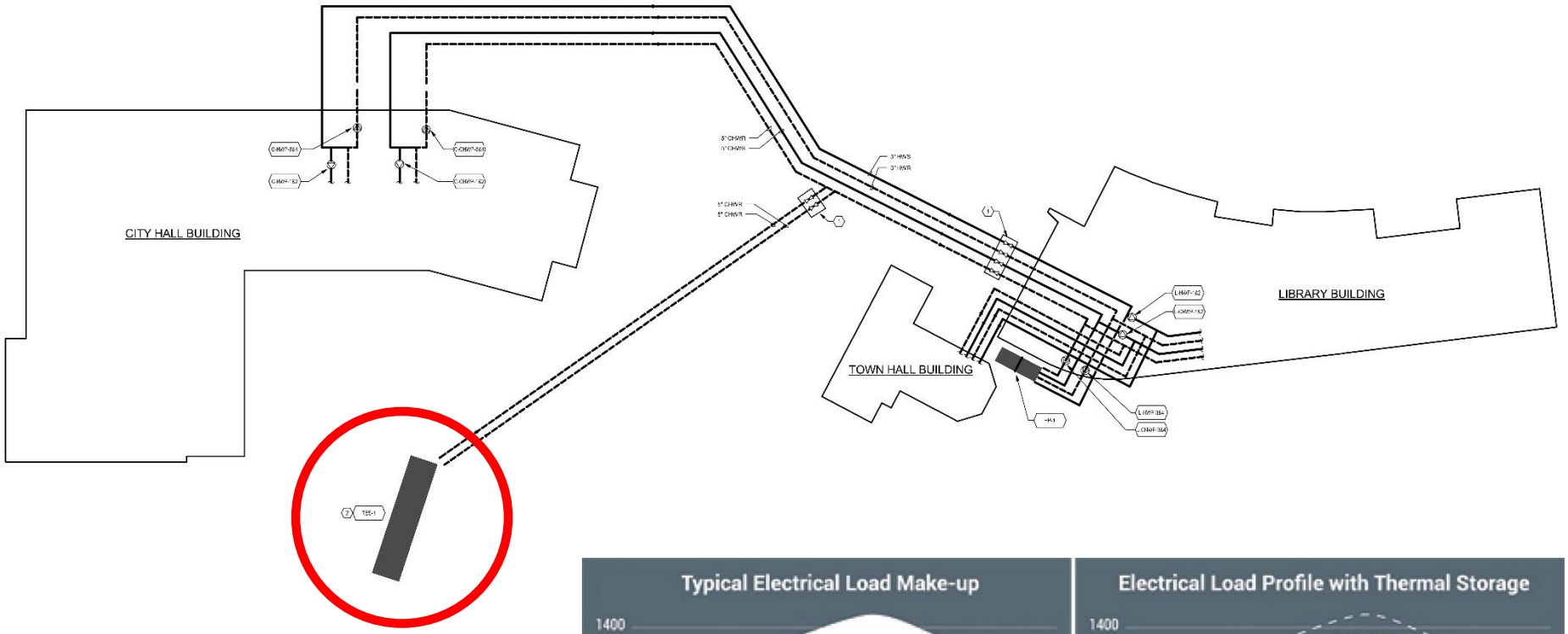


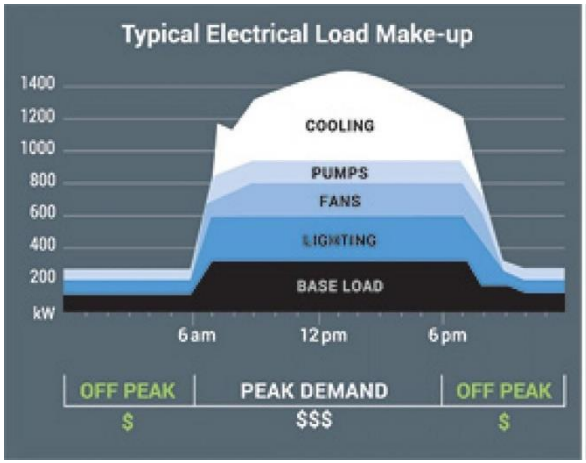
Radiant surfaces provide space-efficient heating and cooling that is more easily felt by occupants

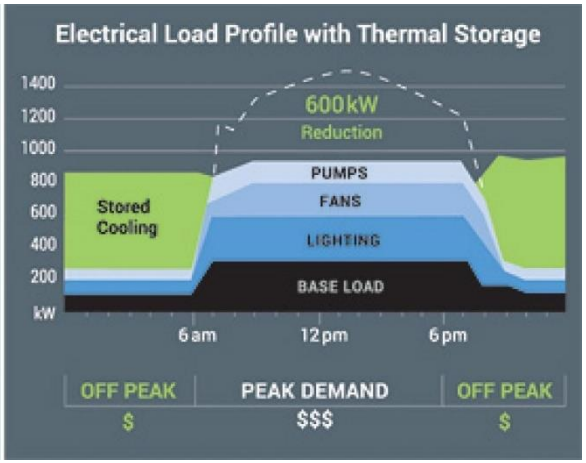
Rain Gardens and Landcaping are used to treat and retain water before it filters into the aquifer

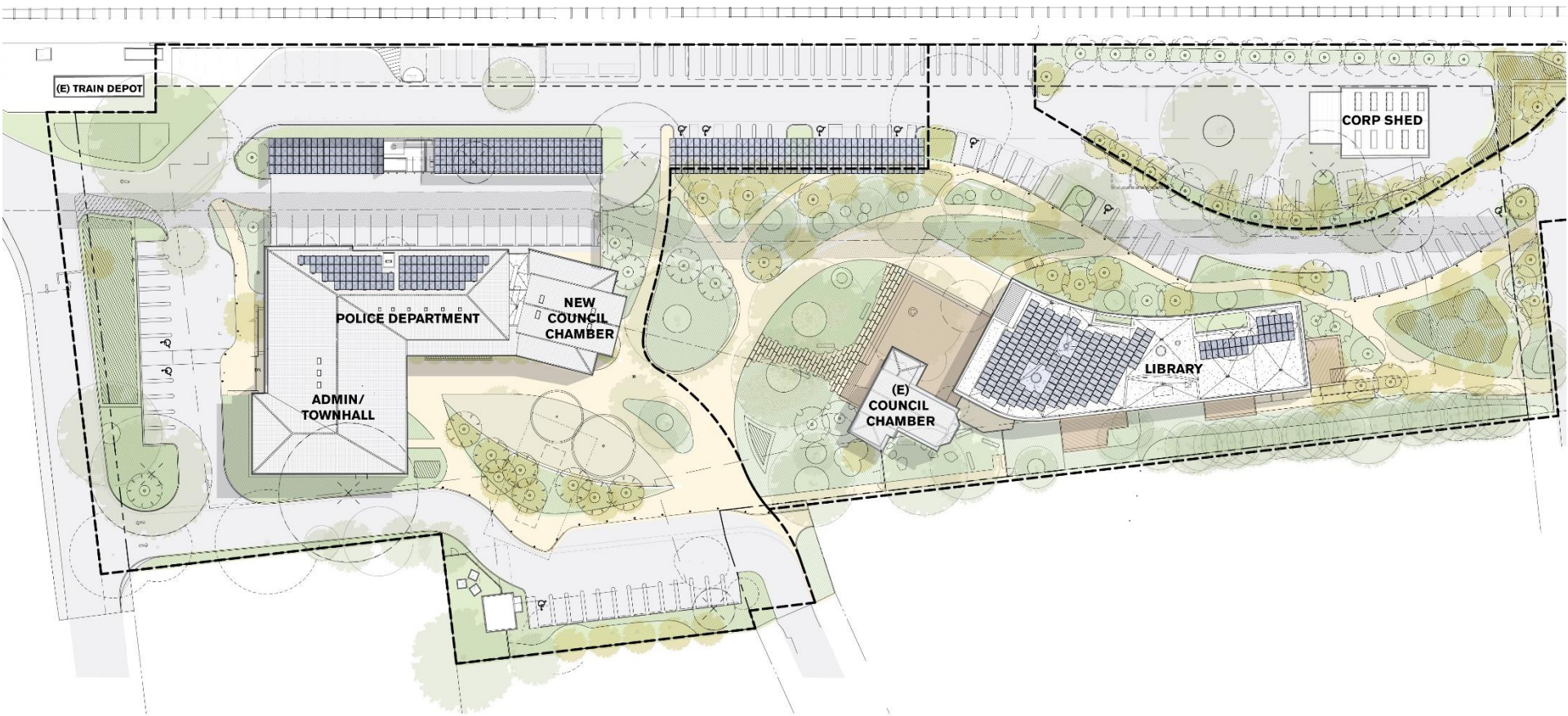
Low-VOC materials provide a healthy indoor environment for employees and visitors


PROPOSED REROUTING STATION LANE
2 (E) CALTRAIN PARKING SPACE REMOVED
EXISTING TRAIN DEPOT
PROPOSED KISS & RIDE
PROPOSED NEW CALTRAIN PARKING (5)
PROPOSED NEW CALTRAIN PARKING (8)
RELOCATED STATION LANE
RA2 2915 SF
168 MODULES
RA5a 1,052 SF
60 MODULES
RA5b 701 SF
40 MODULES
RA5d 1052 SF
60 MODULES
EXISTING MIXING STATION
RELOCATED FOOT SHED
RA5c 351 SF
20 MODULES
LIBRARY/COUNCIL CHAMBER PARKING (35)
EDEN
ANCILLARY BUILDING
RA1A 1,102 SF
68 MODULES
RA1B 1,964 SF
112 MODULES
POLICE SECURE PARKING LOT
(E) WATER LINE
(E)WATER LINE TO REMAIN
MAPLE AVENUE
RA1 1,823 SF
104 MODULES
POLICE DEPARTMENT
NEW COUNCIL CHAMBER
FAIR OAKS LANE
CITY HALL PARKING (17)
ADMIN/ TOWNHALL
CENTERLINE OF NEW COUNCIL CHAMBERS
(E) COUNCIL CHAMBER
RA1 475 SF 28 PANELS
LIBRARY
TES-1
LANDSCAPE SCOPE BOUNDARY
RELOCATED ASHFIELD ROAD
SETBACK LINE - TYP.
BUILDING SIDE YARD SETBACK
POLICE PARKING (13. 12+1A)


CITY HALL BUILDING
TOWN HALL BUILDING
LIBRARY BUILDING

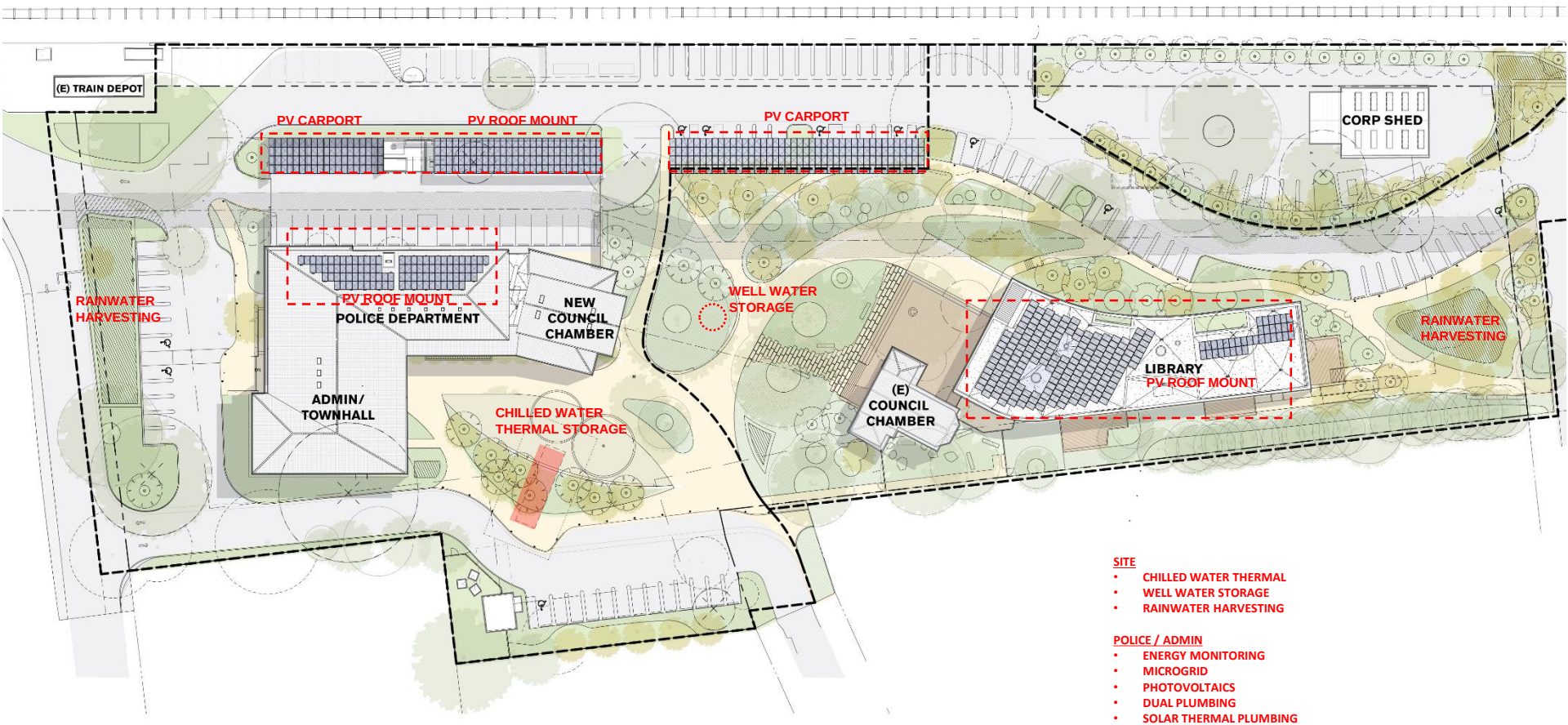

Typical Electrical Load Make-up
1400
1200
1000
800
600
400
200
kW
COOLING
PUMPS
FANS
LIGHTING
BASE LOAD
6 am
12 pm
6 pm
OFF PEAK
PEAK DEMAND
OFF PEAK
$
$$$
$


Electrical Load Profile with Thermal Storage
1400
1200
1000
800
600
400
200
kW
600kW
Reduction
Stored
Cooling
PUMPS
FANS
LIGHTING
BASE LOAD
6 am
12 pm
6 pm
OFF PEAK
PEAK DEMAND
OFF PEAK
$
$$$
$



ATHERTON CIVIC CENTER – OVERALL SITE PLAN

WRNS STUDIO LLP



SITE
- CHILLED WATER THERMAL
- WELL WATER STORAGE
- RAINWATER HARVESTING

POLICE / ADMIN
- ENERGY MONITORING
- MICROGRID
- PHOTOVOLTAICS
- DUAL PLUMBING
- SOLAR THERMAL PLUMBING

LIBRARY
- ENERGY MONITORING
- MICROGRID
- PHOTOVOLTAICS
- DUAL PLUMBING
- GRAYWATER SYSTEM

ATHERTON CIVIC CENTER – OVERALL SITE PLAN SUSTAINABILITY FEATURES

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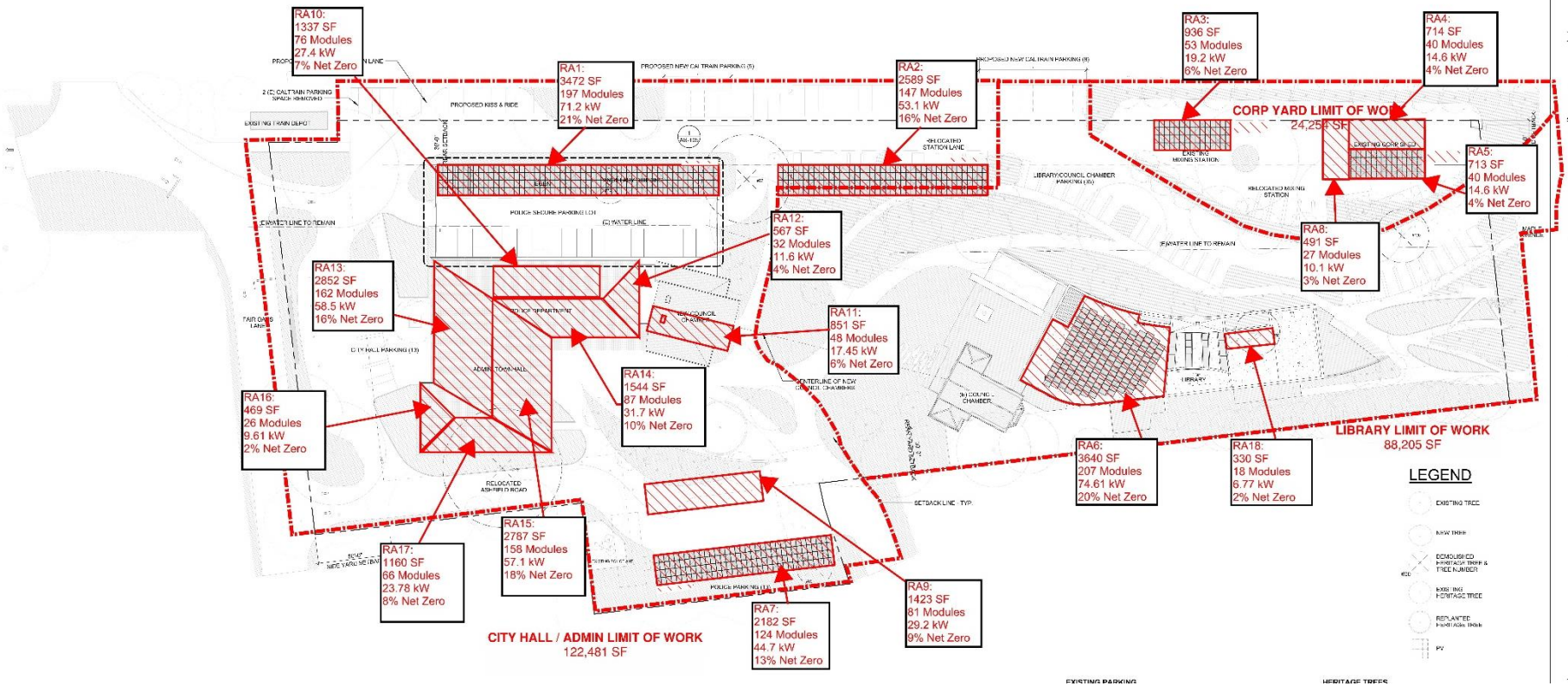
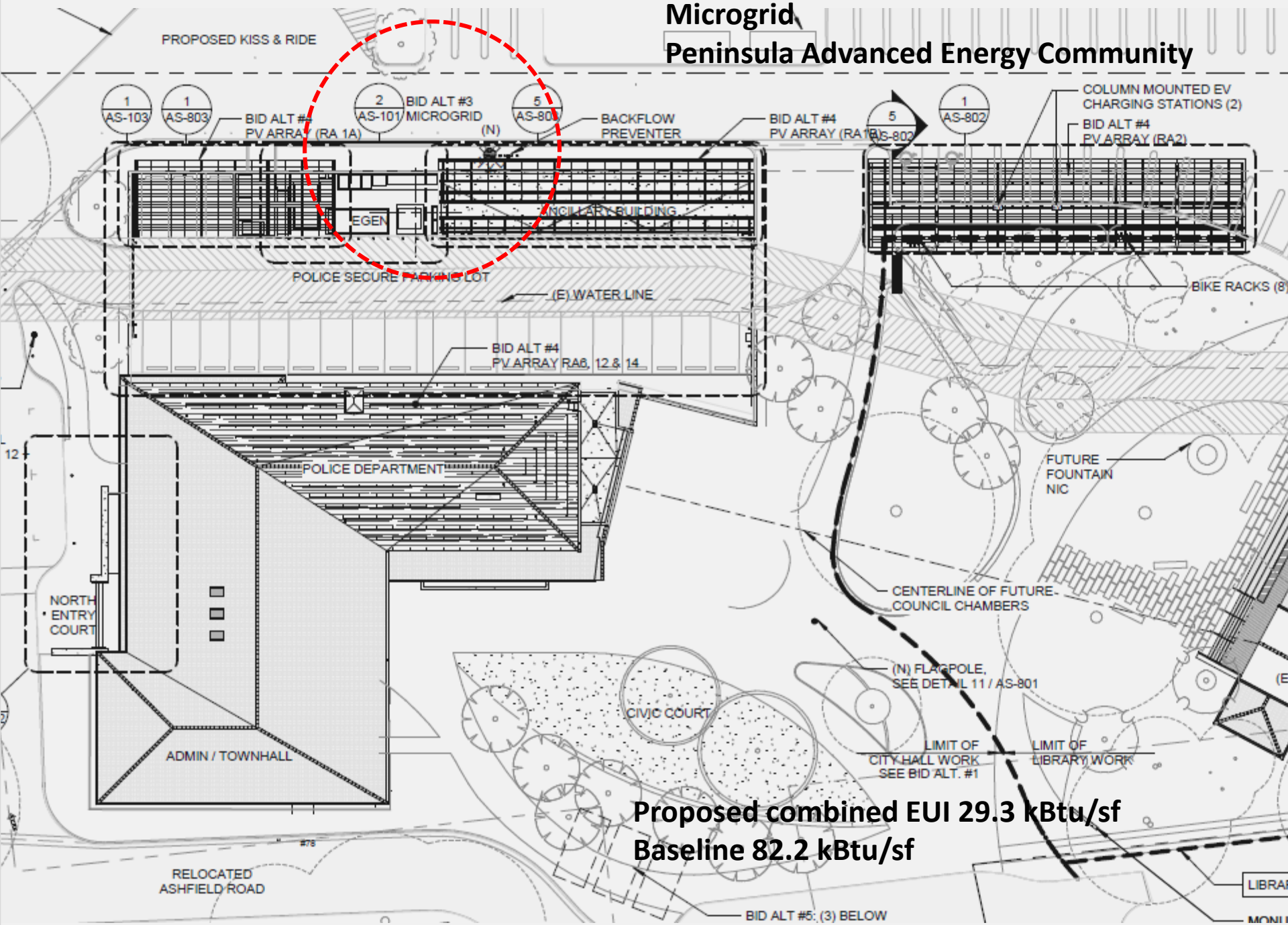
PV Array Designations:



Microgrid
Peninsula Advanced Energy Community



Proposed combined EUI 29.3 kBtu/sf
Baseline 82.2 kBtu/sf

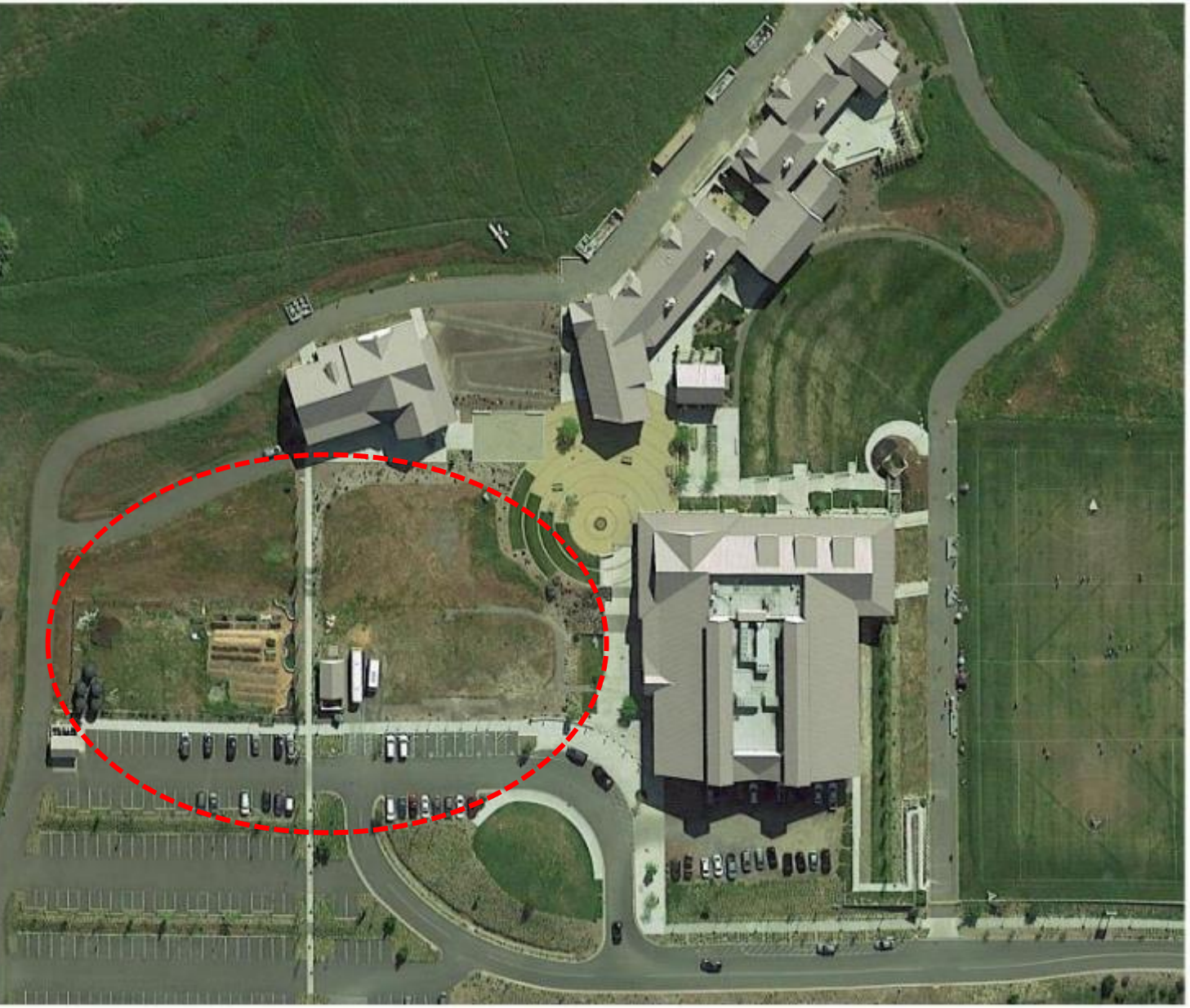
The challeges with competing resources – green roofs and PVs

Sonoma Academy

21,000 Maker and Dining
Independent School
Moderate construction budget
Moderate fees (recession)
High interest in sustainability and LEED
FAST paced Design + Construction (6 mo. design; 14 mo. build)

LEED Platinum targeted
LBC
Well Education Pilot

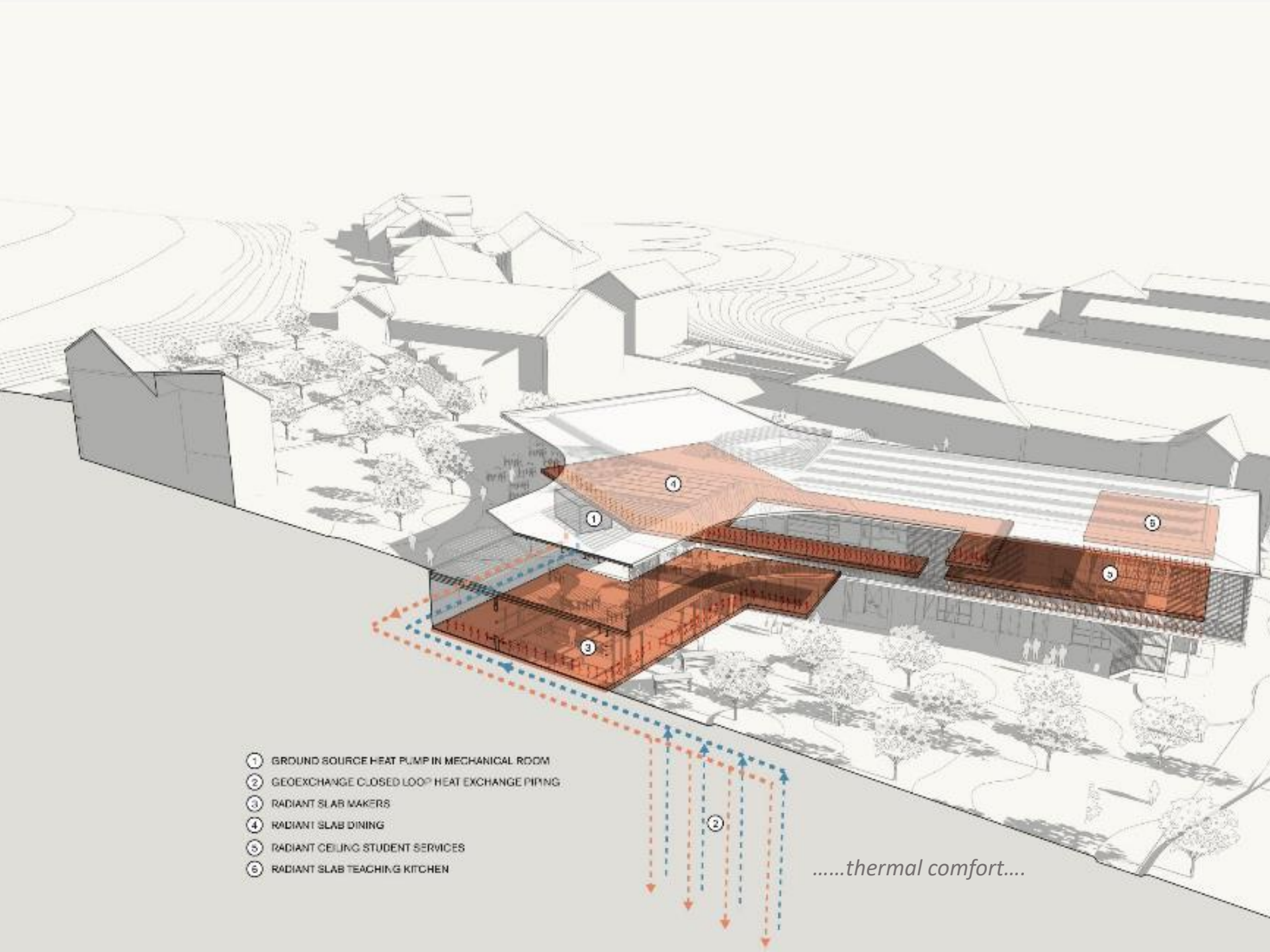
SOUTH




CLASS ROOMS
LIBRARY
GALLERY
FITZSIMMONS
UPPER TERRACE
GRANGE / MAKER
EXISTING GARDEN
LOWER GARDEN
GYMNASIUM / ADMIN
ATHLETIC FIELD


Mass becomes arch…
Thin, Orientation,


MPUS LVL 3
EXISTING BLACK BOX
THEATER/MUSIC
BUILDING
NEW UPPER GARDEN
CAMPUS LVL 2
NEW GRANGE AND
STUDIOS BUILDING
NEW TEACHING GARDEN
CAMPUS LVL 1


1 GROUND SOURCE HEAT PUMP IN MECHANICAL ROOM
2 GEOEXCHANGE CLOSED LOOP HEAT EXCHANGE PIPING
3 RADIANT SLAB MAKERS
4 RADIANT SLAB DINING
5 RADIANT CEILING STUDENT SERVICES
6 RADIANT SLAB TEACHING KITCHEN
1
2
3
4
5
6
……thermal comfort….

GREEN ROOF: Plants and Pollinators

GRASSLAND GARDEN ECOTONE:

Diversity is abundant where two distinct plant communities collide. Sonoma Academy sits in a transitional zone between the garden landscape and the grassland / oak woodland plant communities, where native pollinators find a host of plants that provide habitat and food sources year round. Using this planting analogy on the green roof at the Studios and Grange building, we can create a garden that respects the local ecology while enhancing the biodiversity of the Academy landscape and the effectiveness of the PV Arrays.

Groupings of perennials that flower at different times throughout the year within a the matrix of a grassland/meadow mix provide pollinators with shelter in close proximity to food sources. This approach also creates a visually dynamic garden throughout the seasons.

PLANT LIST

BOTANICAL NAME

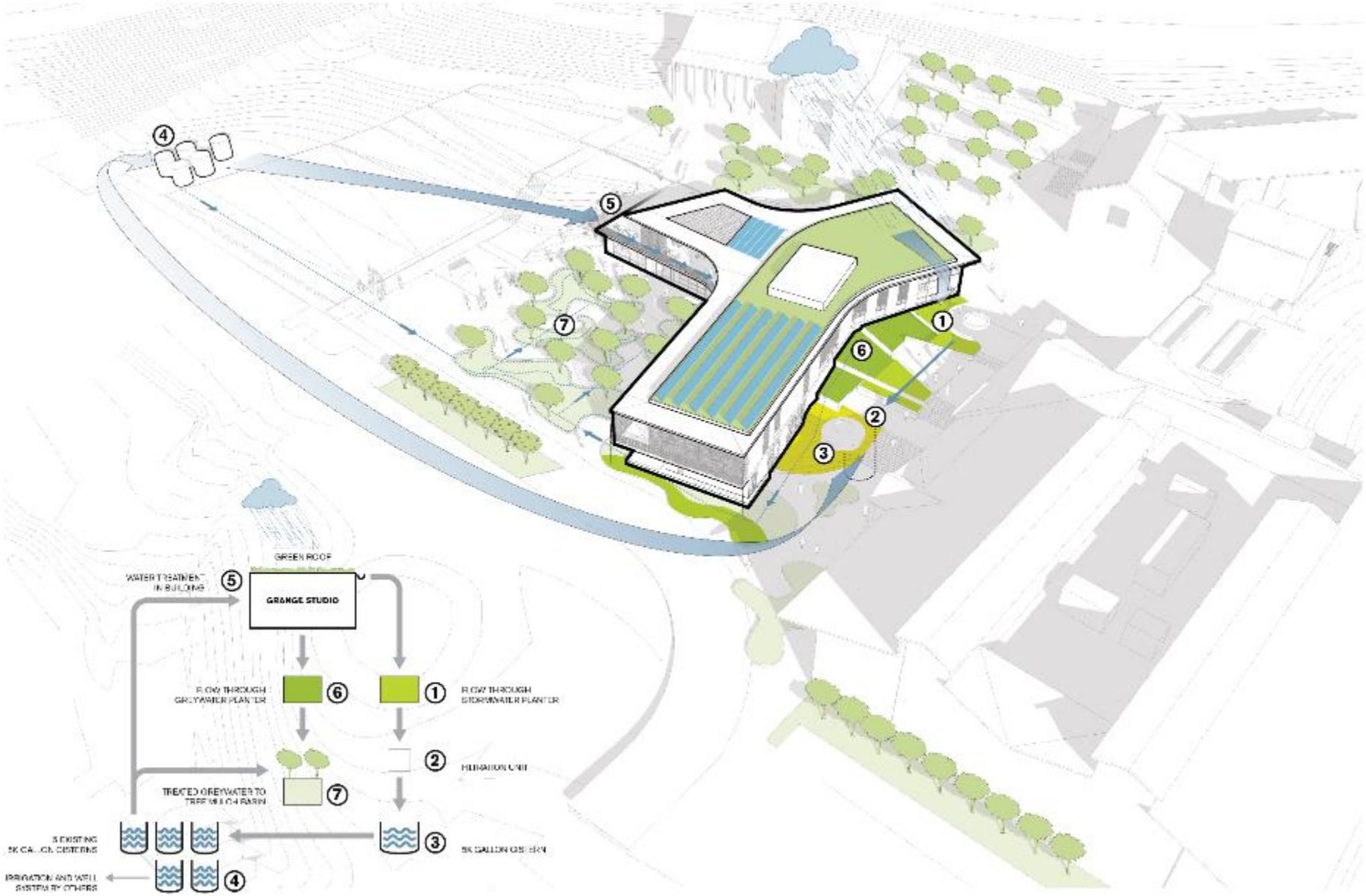
FLOWERING PERENNIALS
ACHILLEA MILLEFOLIUM
ARCTOSTAPHYLOS SP.
ASCLEPIAS FASCICULARIS
BACCHARIS PILULARIS
EPILOBIUM CANUM
ERIOGONUM SP.
ERIOPHYLLUM CONFERTIFLORUM
PENSTEMON 'MIDNIGHT'
PHACELIA CALIFORNICA
SALVIA SONOMENSIS
SCOPHULARIA CALIFORNICA
STACHYS BULLATA

GRASSLAND
AGROSTIS PALLENS
BROMUS CARINATUS
FESTUCA IDAHOENSIS
KOELERIA MACRANTHA
MELICA CALIFORNICA
SISYRINCHIUM BELLUM

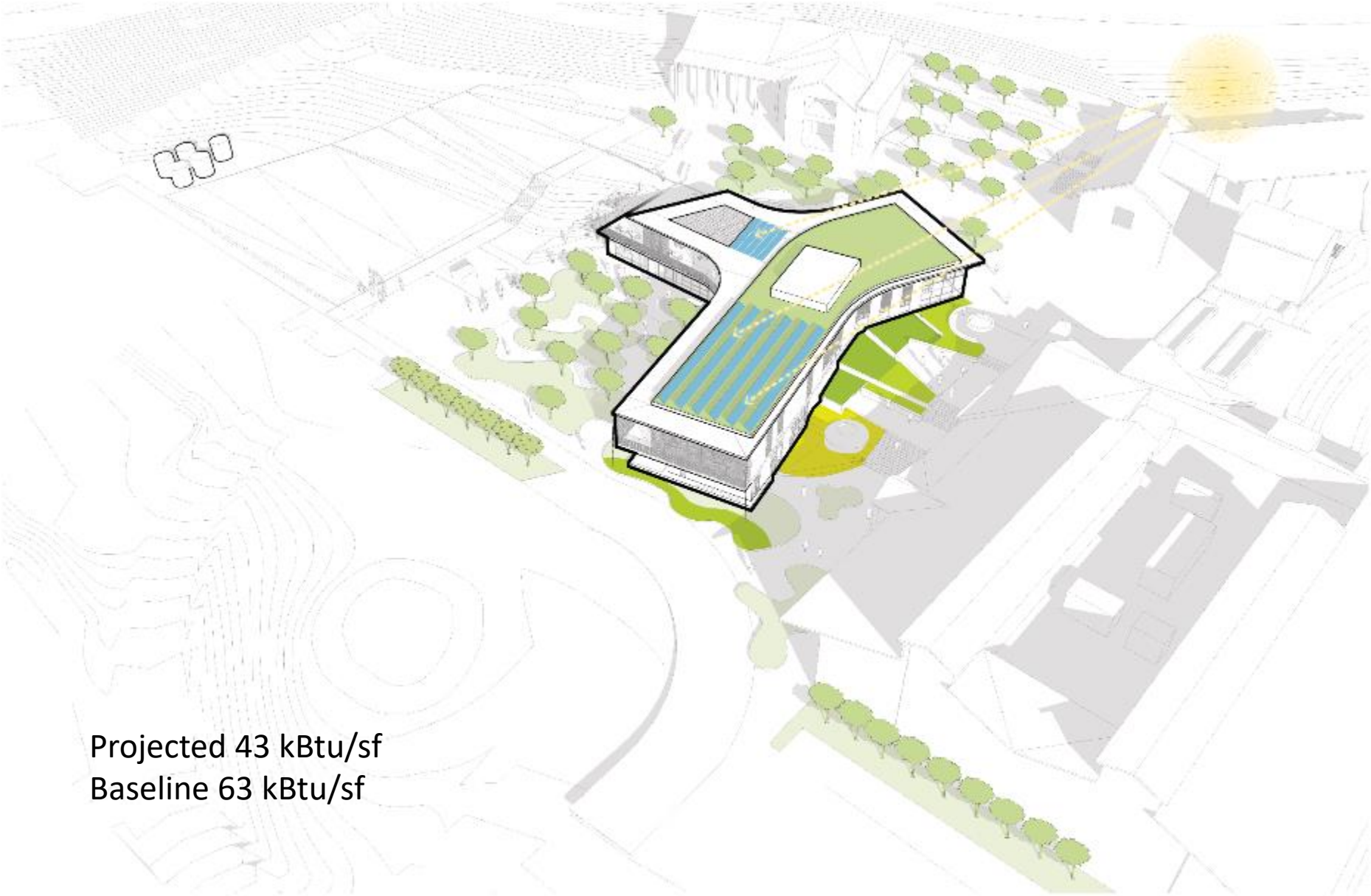
GRASSLAND: BULBS
ALLIUM SP.
DICHELOSTEMMA CAPITATUM
DICHELOSTEMMA CONGESTUM
TRITELEIA SP.

GRASSLAND: ANNUALS
CLARKIA UNGUICULATA
ESCHSCHOLZIA CALIFORNICA
LASTHENIA GRACILIS
LUPINUS NANUS

UNDER PV PANELS
FRAGARIA VESCA
PLANTAGO ERECTA
SATUREJA DOUGLASII
SEDUM SPATHULIFOLIUM

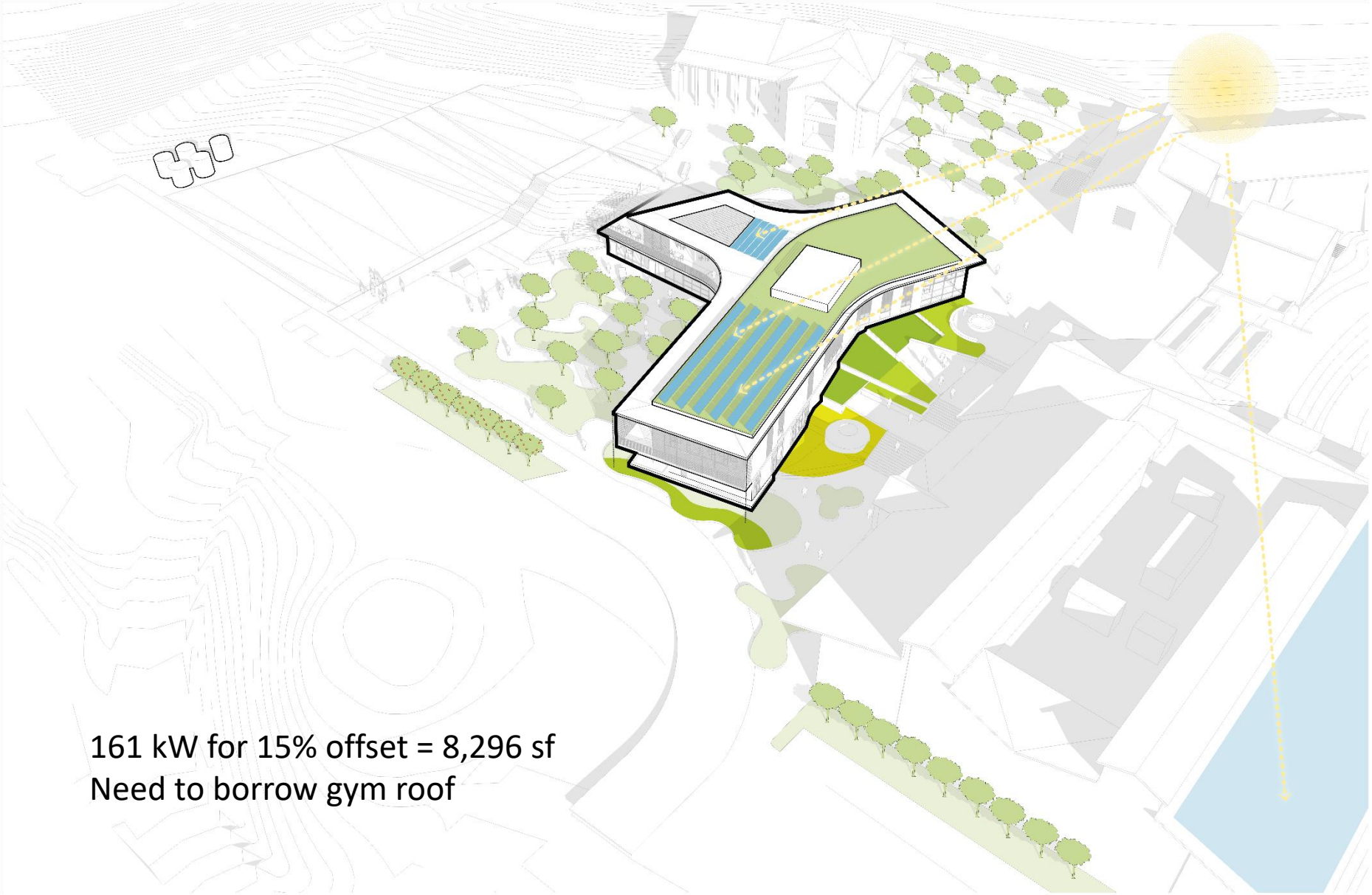


…what falls on our site…

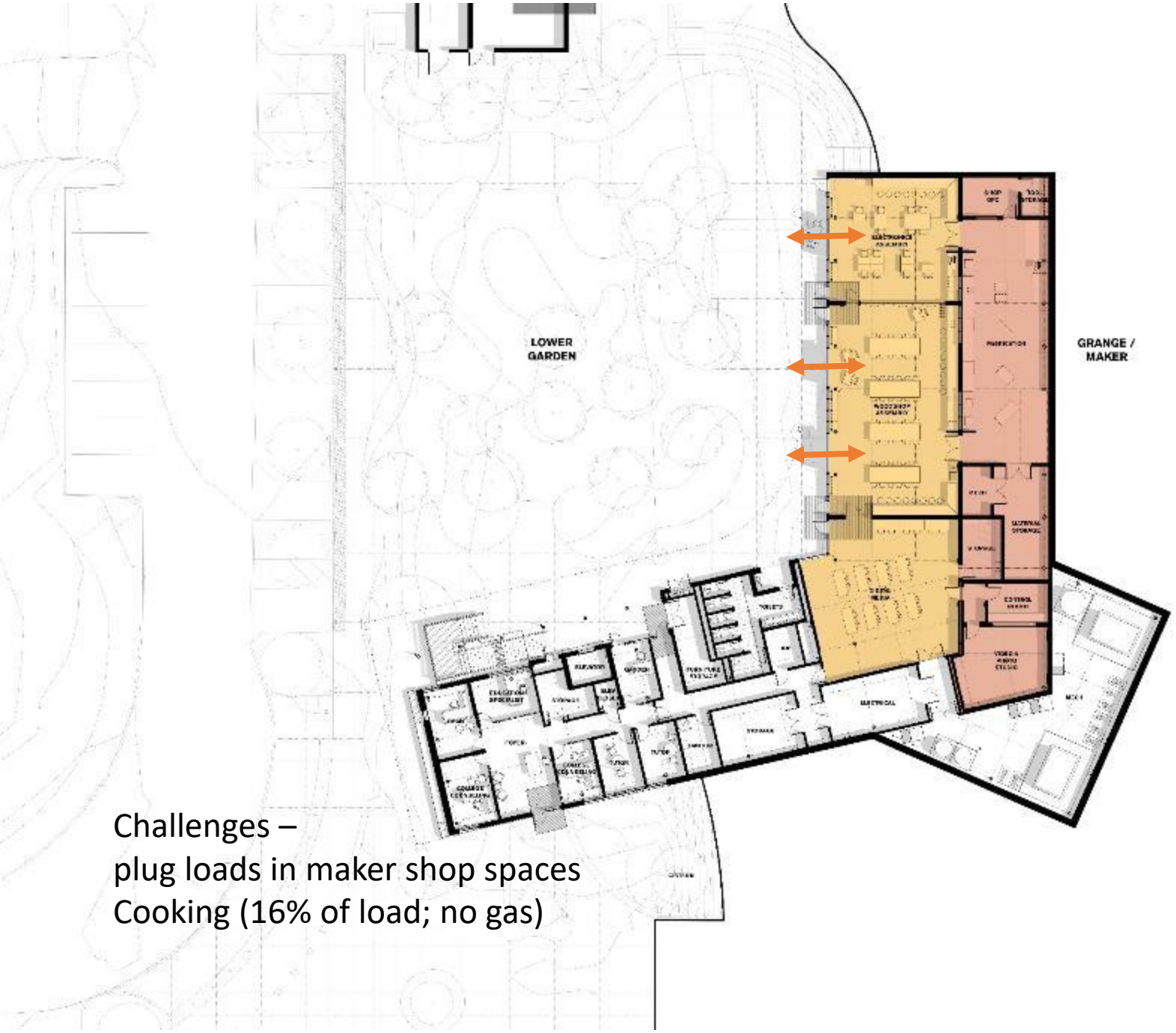


Projected 43 kBtu/sf
Baseline 63 kBtu/sf

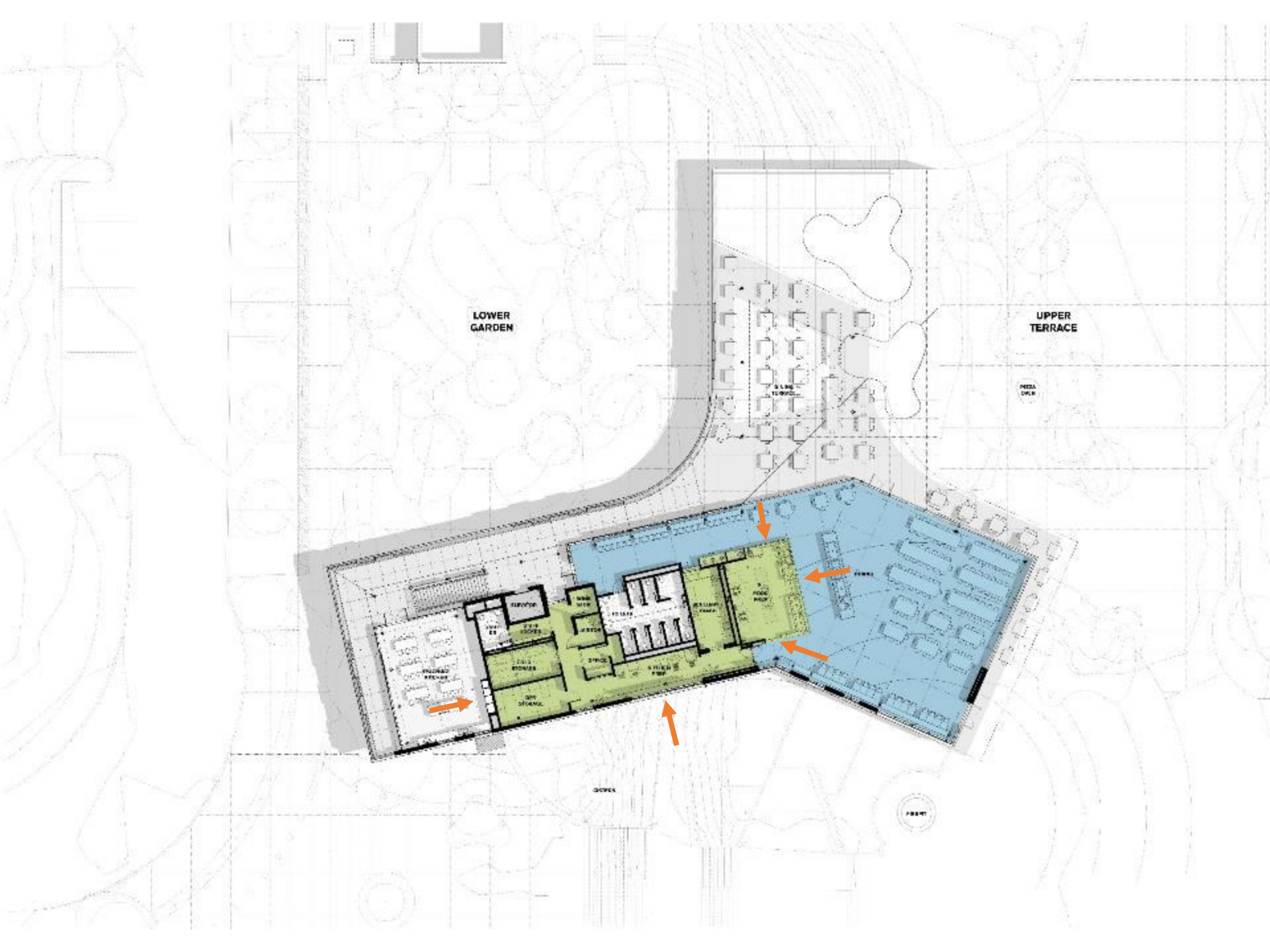
…what falls on our site…



161 kW for 15% offset = 8,296 sf
Need to borrow gym roof



Challenges –
plug loads in maker shop spaces
Cooking (16% of load; no gas)


LOWER
GARDEN
UPPER
TERRACE


MPUS LVL 3
EXISTING BLACK BOX
THEATER/MUSIC
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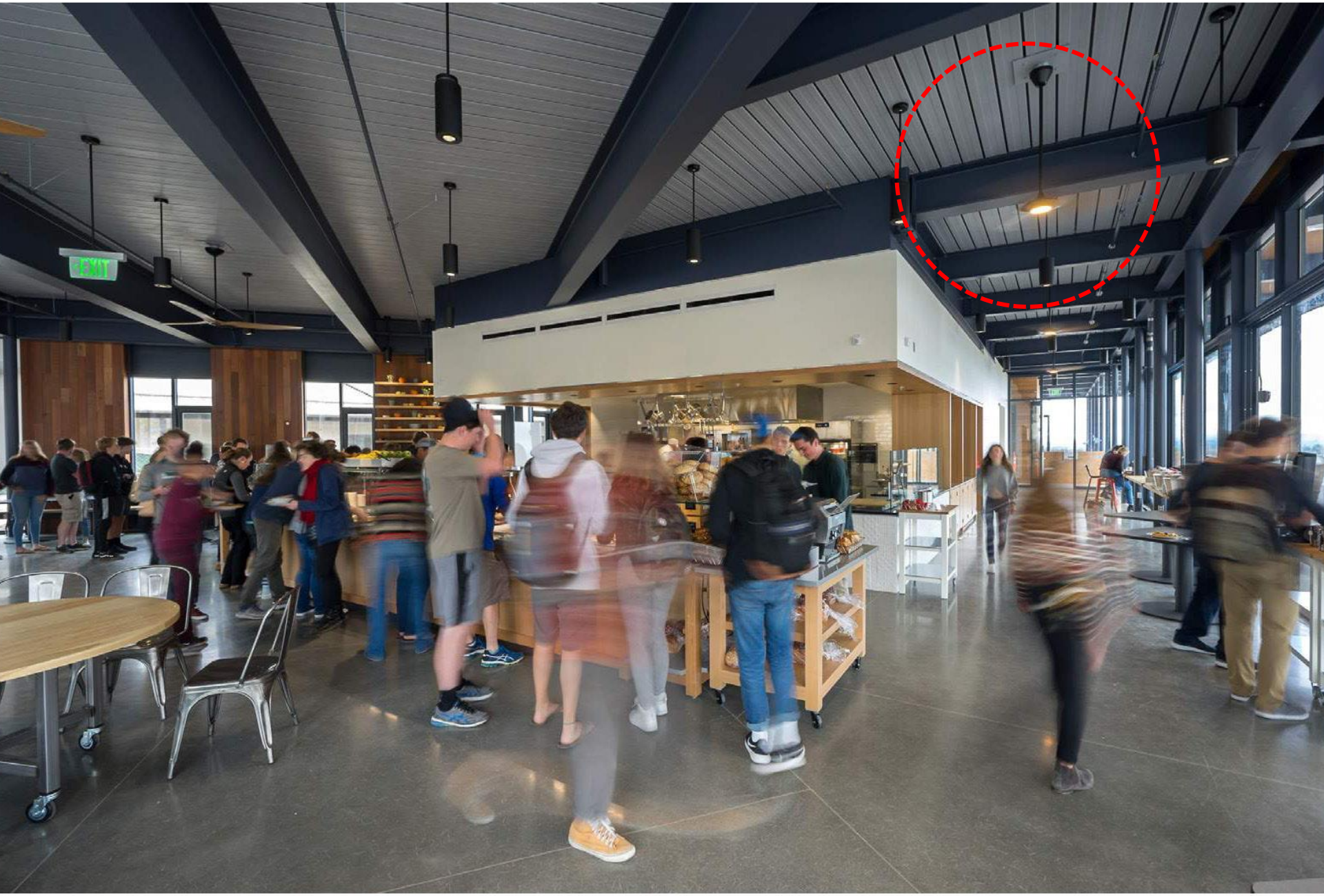
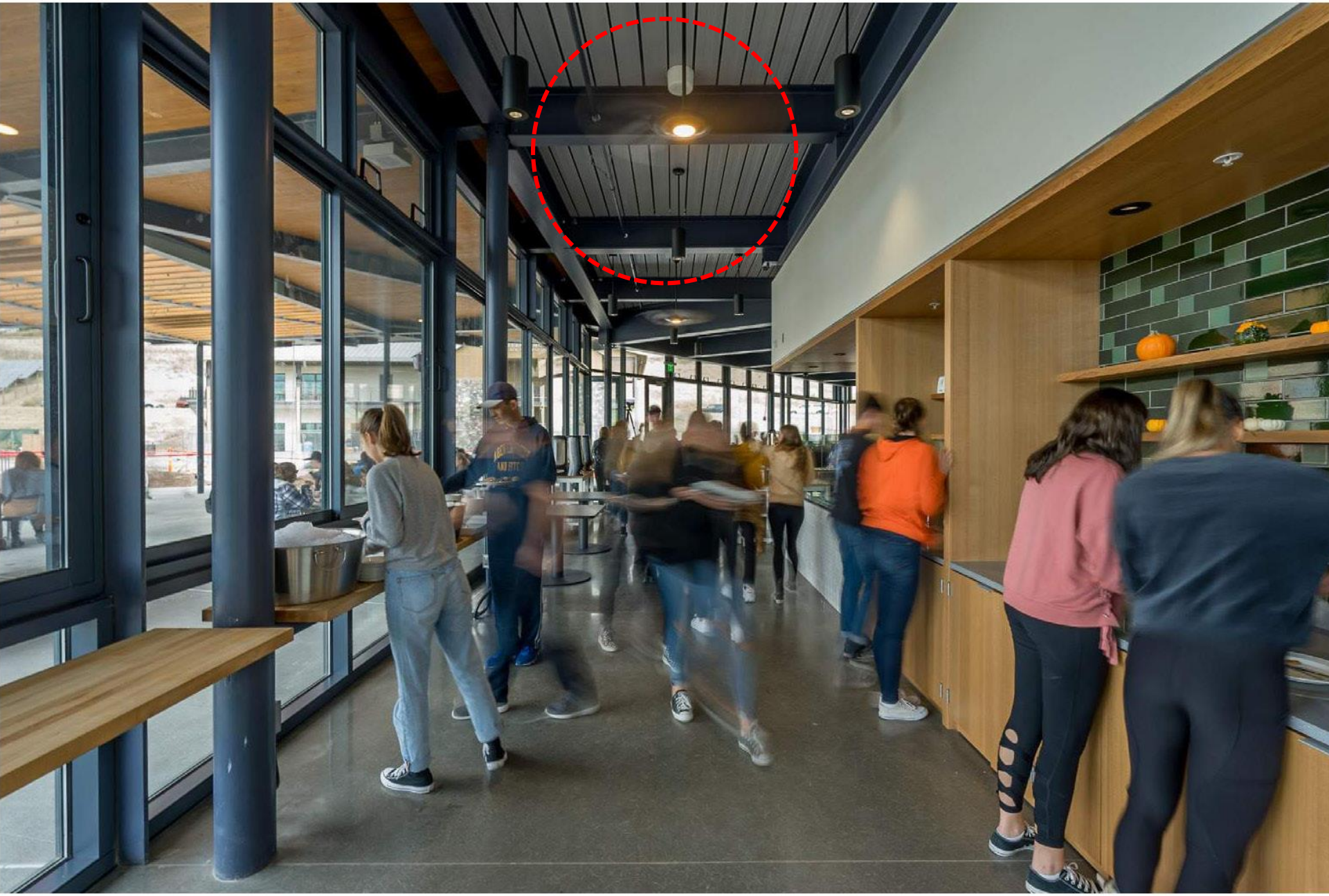
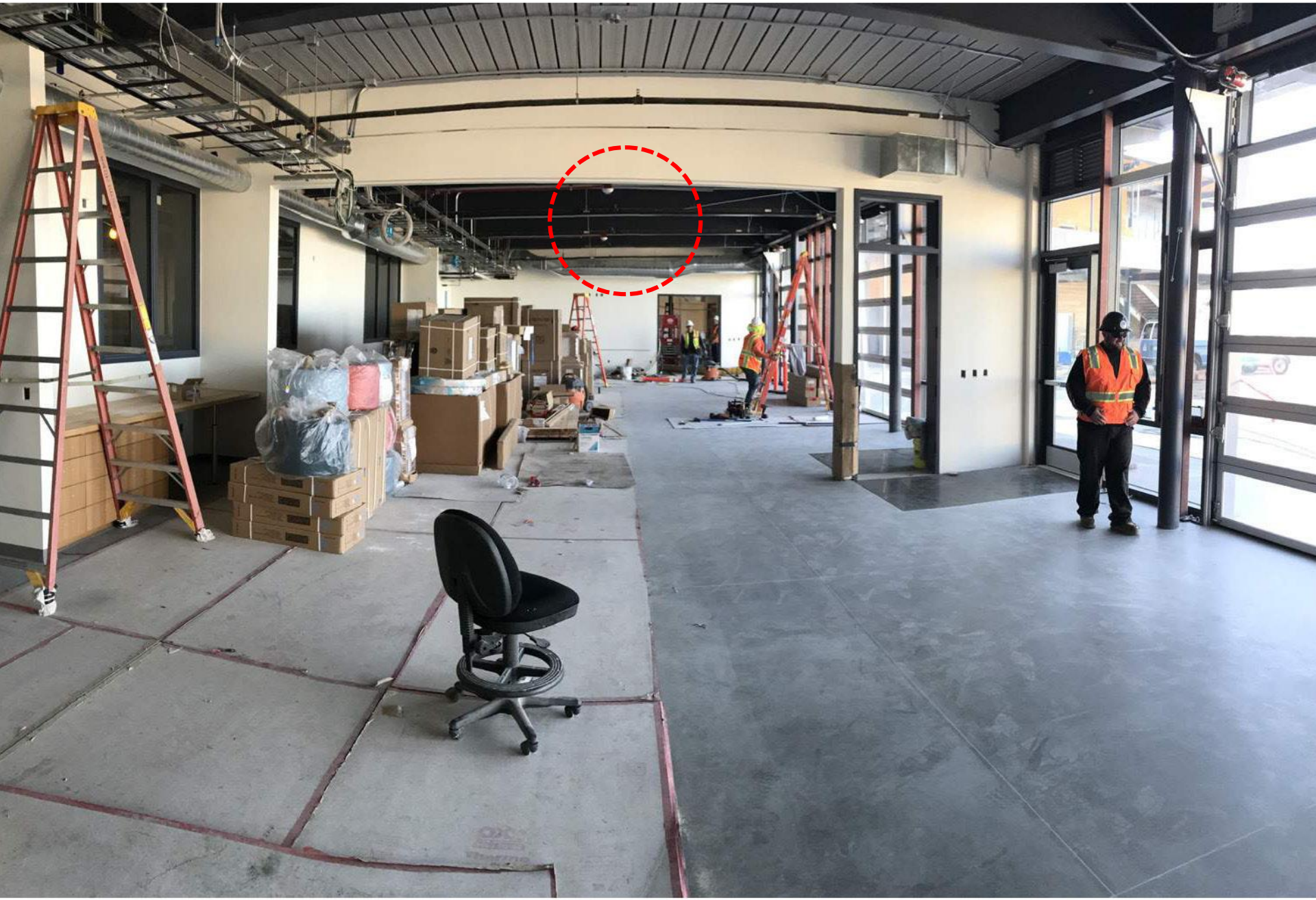
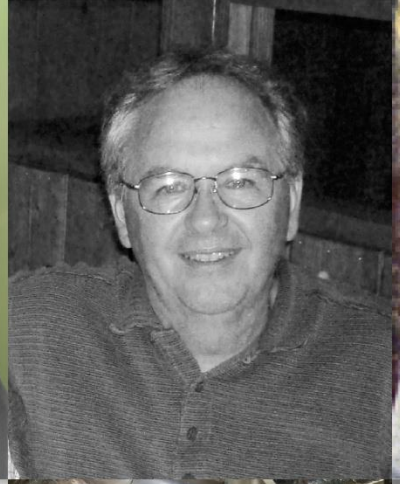

EXIT





Excitement with Zero –

- **Find the Story before all else**
- **Unpack the Paradigm – embrace trickle down**
- **Connect the Dots for the client – synergies**
- **Plan the Dream – the PVs will come**
- **Have a Suitcase of examples and case studies**
- **Stop asking for permission – blaze the trail**

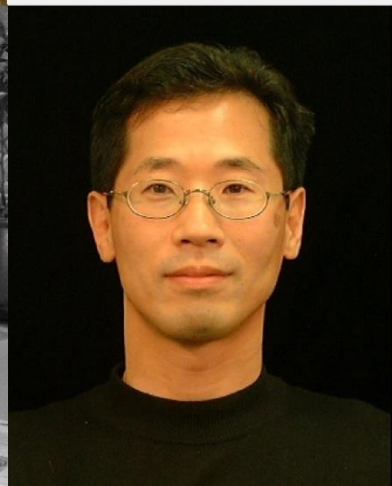





the TEAM







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EMILY
JOHN
JANET
RAY
MEGAN
HORMOZ
CODY
AMELIA
TAMMY
RICK
KITTY
MIKE
MIWA
PETER
JACOB
ALEX
MICHAEL
COURTNEY
DERICE
ADAM
PAULINE
DAVID
MANUELA
TYLER
ANNETTE
STEVE
JEN
DIANA
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RALPH
STEVE
ADREANE

Q + A

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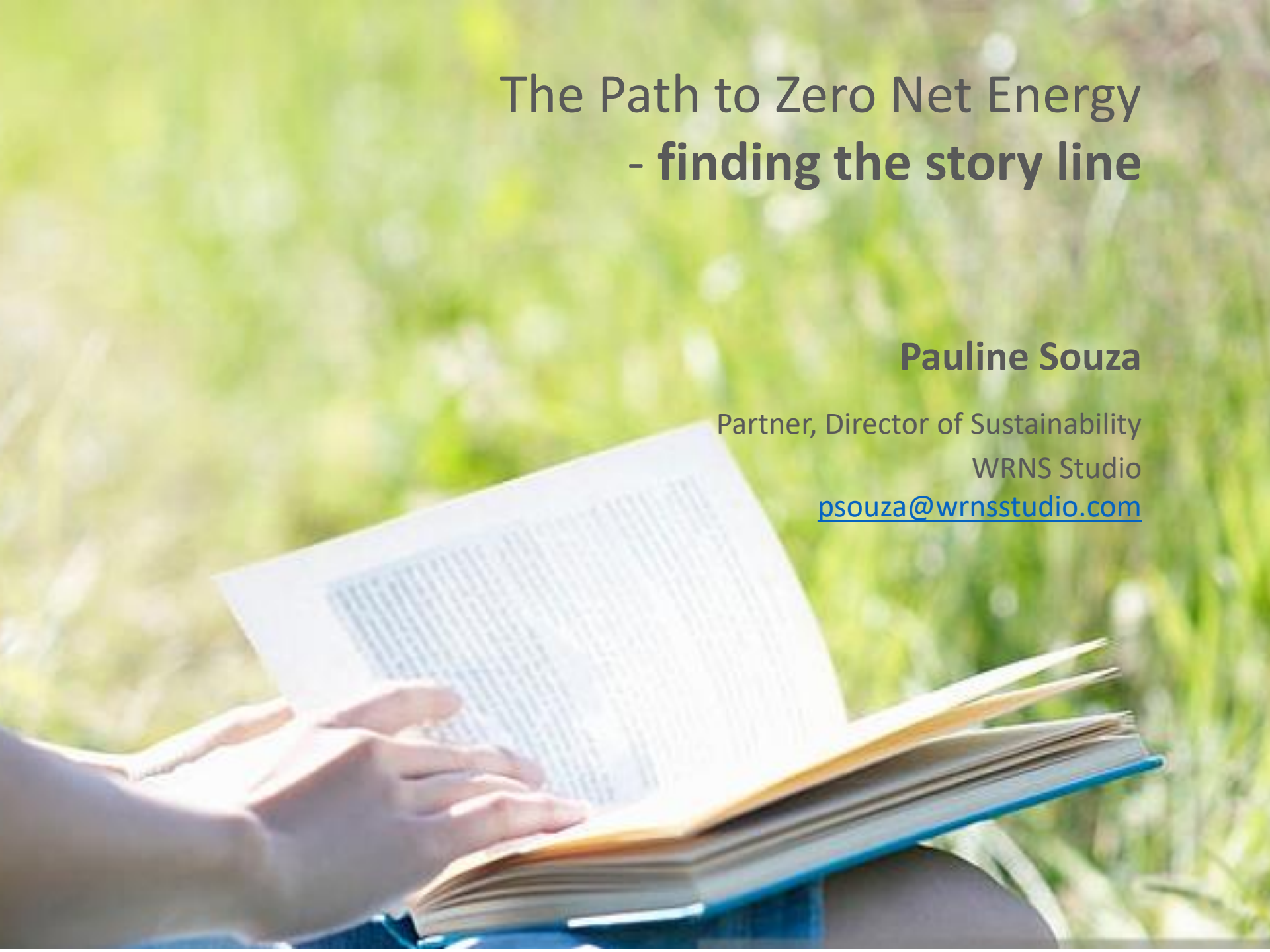
Momentum moving forward

The Path to Zero Net Energy
- **finding the story line**



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