



# Sustainable Design, Building and Resilience





# Sustainable Design, Building and Resilience

**Adaptation Planning in the  
Town of Nags Head:**

**Vulnerability, Consequences, Adaptation, Planning  
Scenarios (VCAPS) Report**



*Photo by Matt Lusk*



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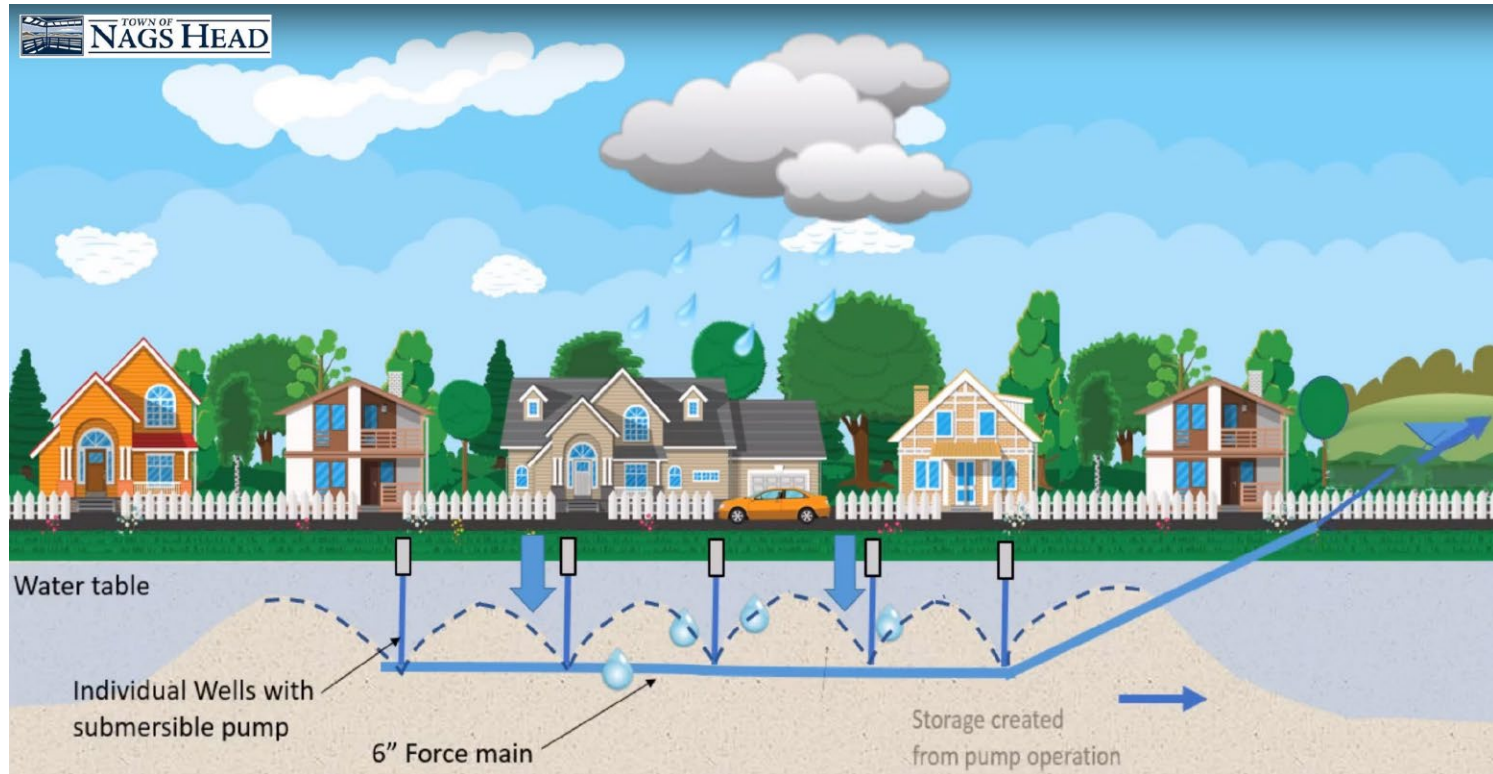


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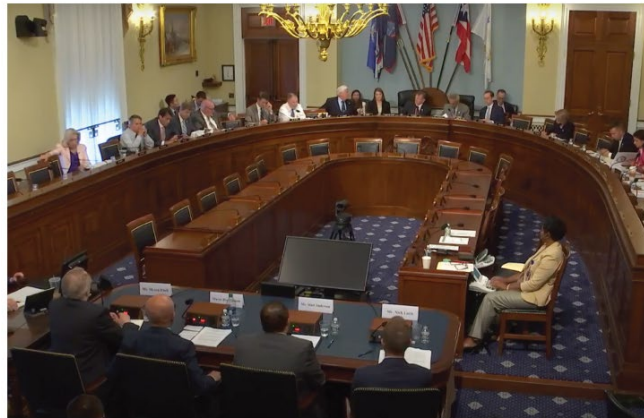


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1. Home
2. Crosswalk
3. Grocery Store
4. Bank
5. Coffee Shop
6. Hardware Store
7. Office
8. Shopping Center with (3) Restaurants
9. YMCA
10. Municipal Park
11. Public Beach Access



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## CLIMATE CHANGE **AMPLIFIES** HURRICANE **IMPACTS**

### **STORM SURGE**

Sea level rise has elevated and dramatically extended the storm surge driven by hurricanes

### **EXTREME RAINFALL**

Warmer air holds more moisture, feeding more precipitation into all storms

### **POTENTIAL WIND SPEED**

As climate change warms sea surfaces, the heat available to power hurricanes has increased

Source (left to right): Walsh, K. J.E., et al. (2016), "Tropical cyclones and climate change." | Chen, Xiyan, et al. (2017), "The Increasing rate of global mean sea-level rise during 1993–2014." | Wahl, Thomas, et al. (2015), "Increasing risk of compound flooding from storm surge and rainfall for major US cities"







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“It’s not our idea to build the perfect hurricane-proof structure. It is instead to show what we were doing wrong and what improvements we can make’, Cahoon said.”

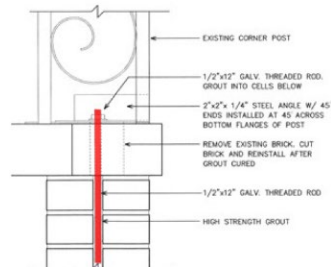
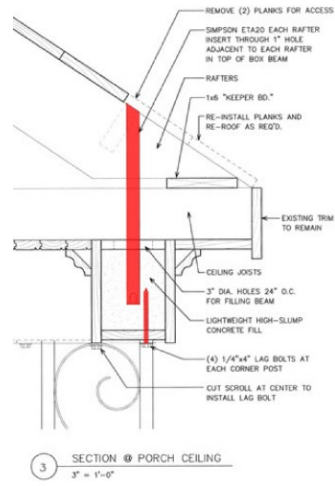
*Houses That Stand Up to Hurricanes, The Washington Post: Washington Home Magazine, October 12, 1995*



The Blue Sky Model Building and Training Center (bottom center) mimicked surrounding residential and commercial buildings while incorporating numerous innovative construction features.



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1. Super-elevated
2. Abundant green space
3. On-site stormwater management
4. High-level sewage treatment
5. Previously developed site.



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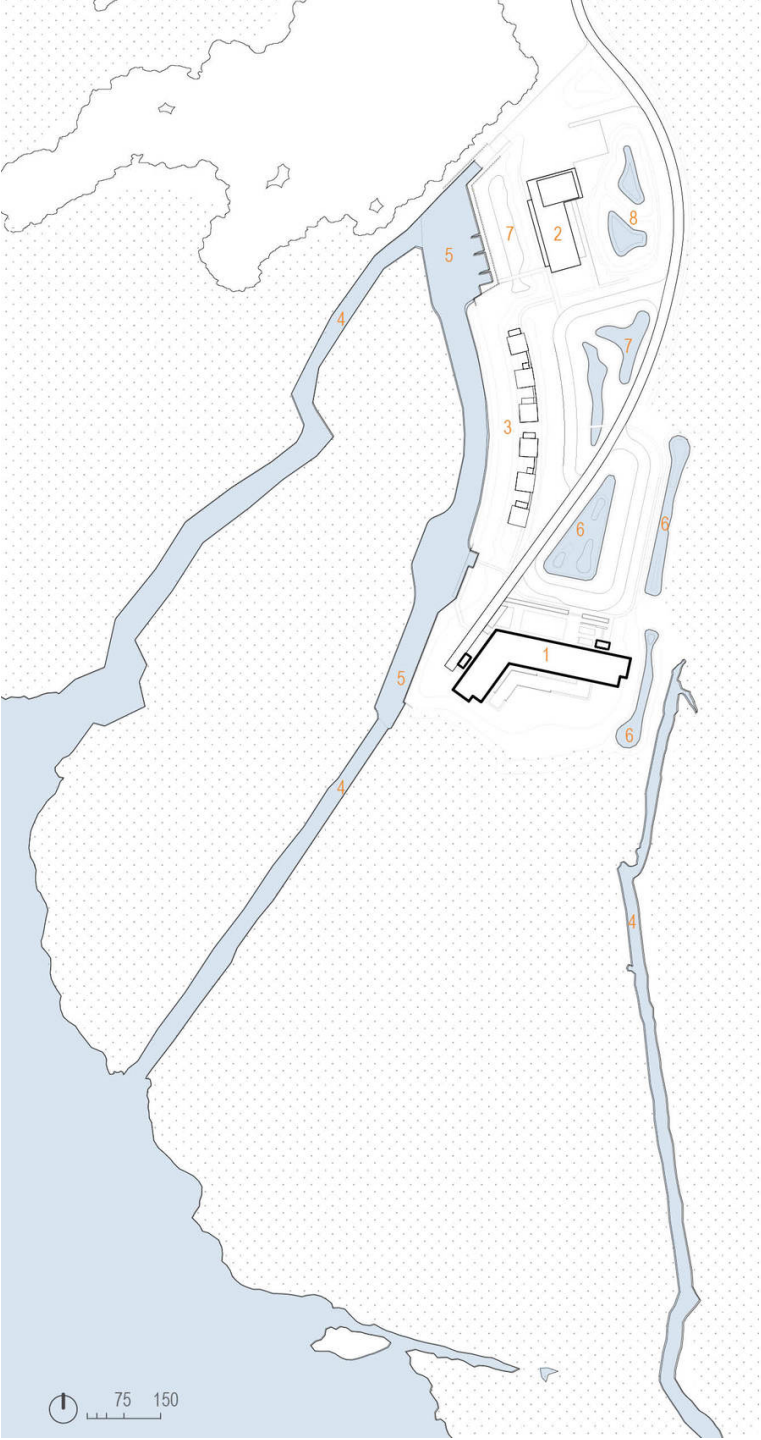




# COASTAL STUDIES INSTITUTE (CSI), Wanchese, NC

Led by East Carolina University – CSI is a multi-institutional research and educational partnership of the UNC System

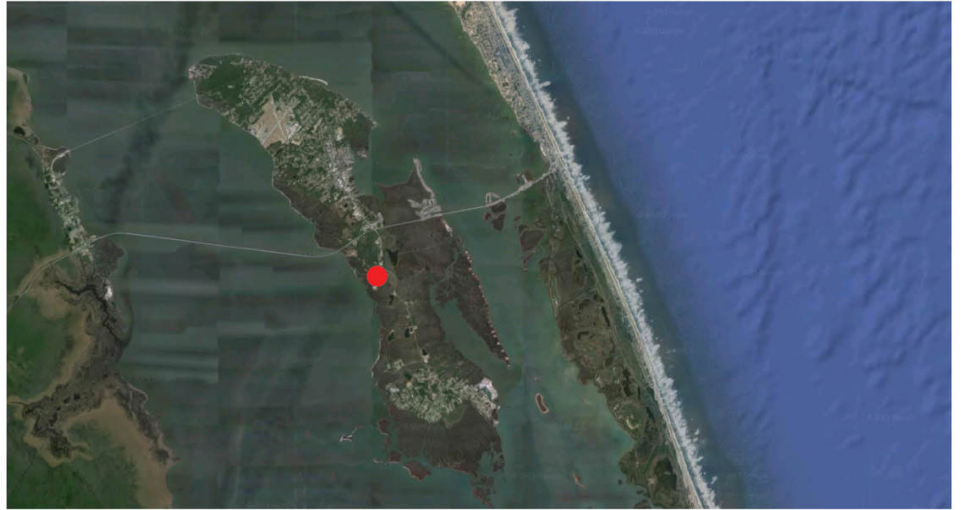
- Coastal and Marine Sciences programs at ECU
- Interdisciplinary scientific exploration
- Sustainable uses and conservation of coastal resources



75 150



view from northeast wetland



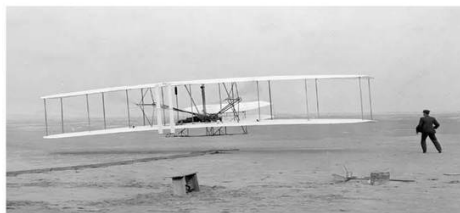
satellite view of Roanoke island and Outerbanks

- 1 csi research and education building
- 2 marina building
- 3 future residential
- 4 existing canal
- 5 new connecting canal
- 6 created wetland
- 7 bioretention pond
- 8 waste water effluent pond

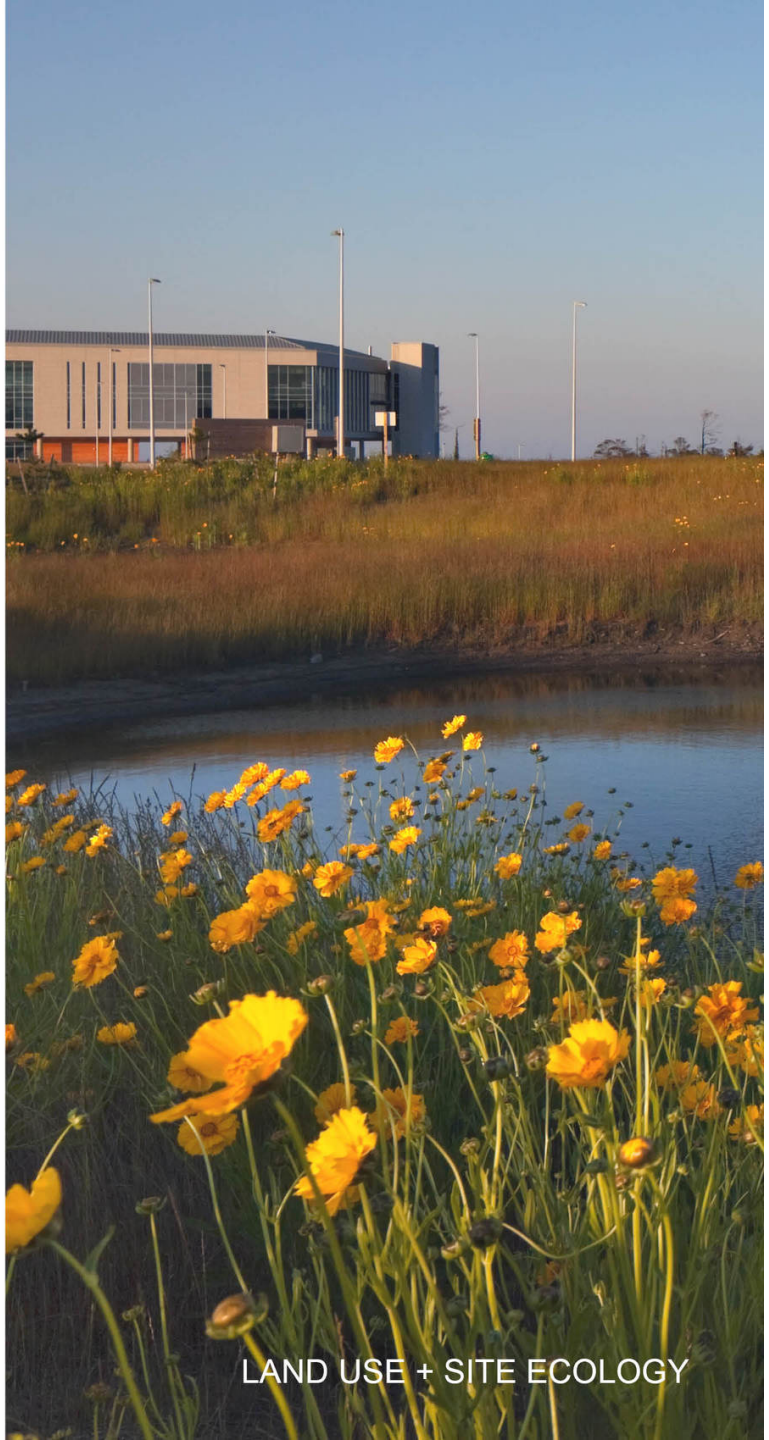
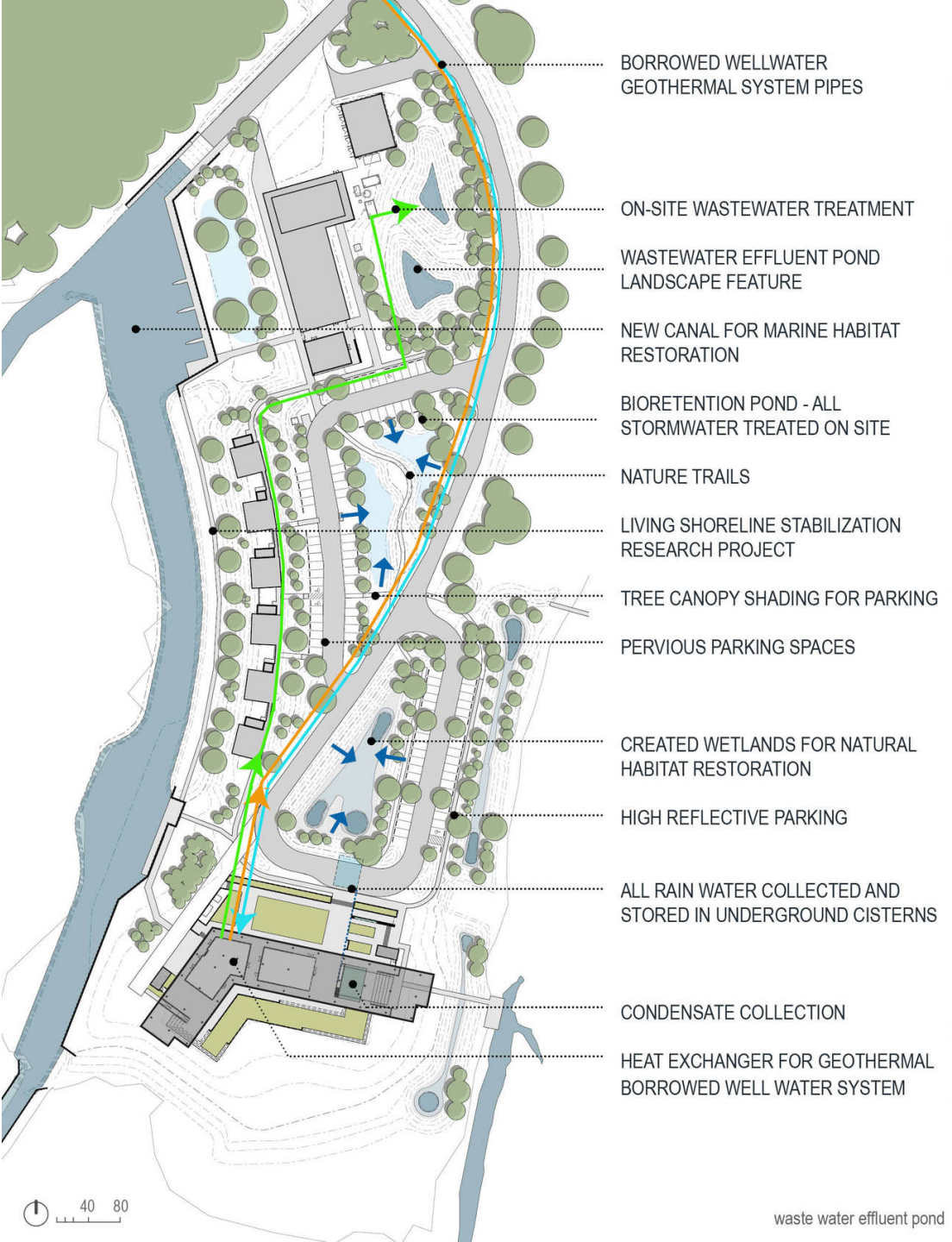




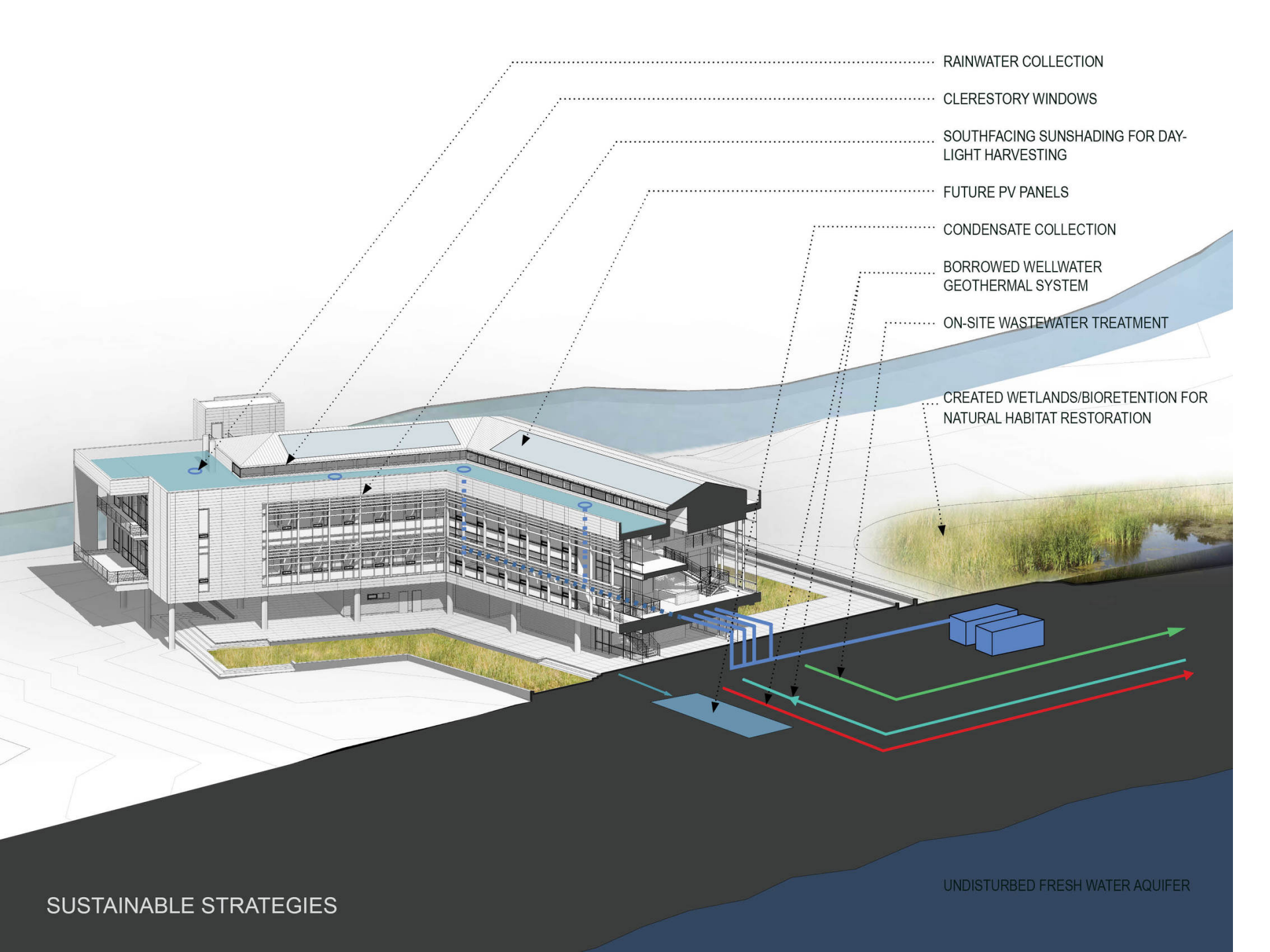
view from northwest along new canal



REGIONAL / COMMUNITY DESIGN

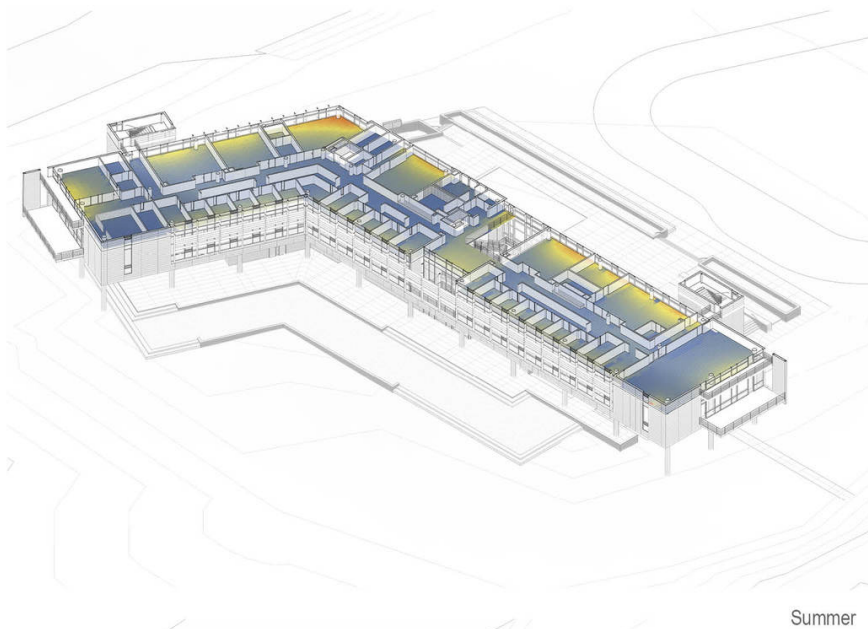


LAND USE + SITE ECOLOGY

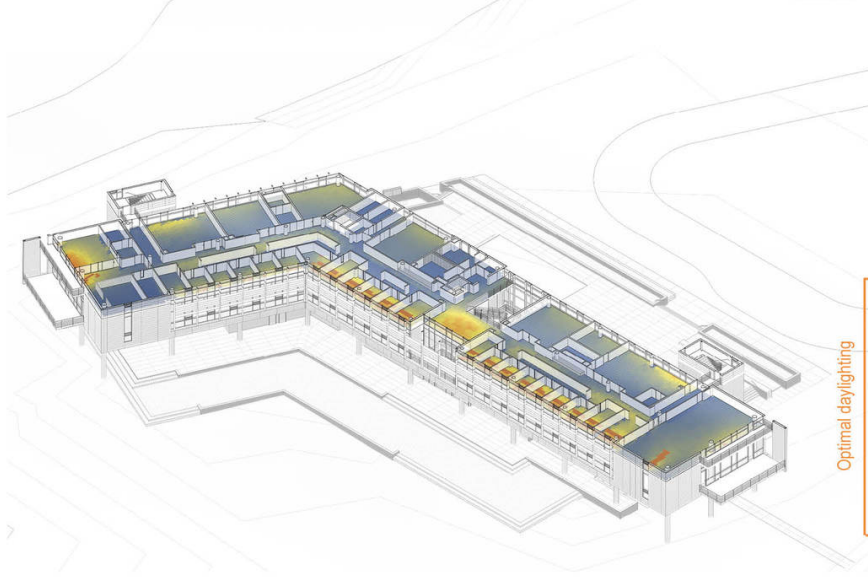


SUSTAINABLE STRATEGIES

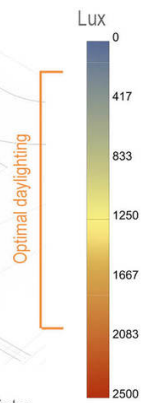




Summer



Winter



view of lobby looking south



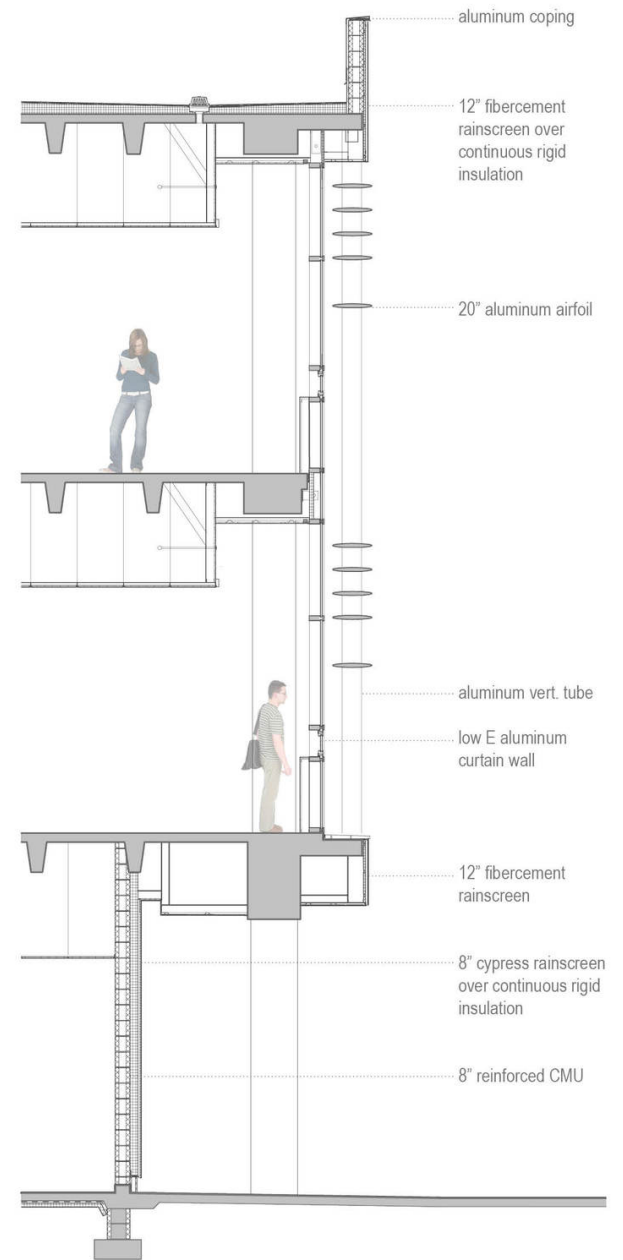
view of mapping/ meeting room



south elevation



flex classroom





A scientist in a white lab coat is seated at a workstation, writing on a piece of paper. The workstation is equipped with a microscope and other laboratory equipment. The scientist is wearing a white lab coat and is focused on their work.

A white office chair is positioned at the workstation. The chair has a black base with wheels and a white backrest. It is facing the workstation.

The lab bench is cluttered with various pieces of laboratory equipment. On the right side, there are several white plastic jugs, some with red caps, and a row of pipettes. In the background, there are more lab benches with microscopes and other equipment. The lab is well-lit and organized.

A sink is located on the left side of the lab bench. The sink is white and has a chrome faucet. There are some orange and black objects on the counter next to the sink.

There are several boxes of supplies on a shelf above the lab bench. The boxes are blue and white, and some have the word "SUPPLY" on them. They are neatly stacked.

A white storage cabinet is located in the middle of the lab bench. It has a few drawers and a door. It is used for storing laboratory supplies.

A computer monitor is visible on the lab bench. It is black and appears to be turned off. It is part of the workstation equipment.

Two large white plastic jugs are prominently displayed on the lab bench. One has a blue label with the word "HALGENE" on it. They are used for storing liquids in the lab.

There are several boxes of supplies on a shelf above the lab bench. The boxes are white and blue, and some have the word "LABORATORY" on them. They are neatly stacked.

Several clear plastic bottles with orange caps are lined up on a shelf above the lab bench. They are likely used for storing reagents or samples.

A microscope is positioned on the lab bench. It is a compound microscope with a white base and a black eyepiece. It is used for viewing small specimens.

Another microscope is visible further down the lab bench. It is similar to the one in the foreground.

A third microscope is visible in the background. It is also a compound microscope.

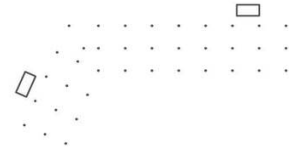
A piece of laboratory equipment, possibly a pipette or a small scale, is visible on the lab bench. It is used for precise measurements.



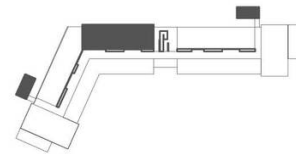
MATERIALS + CONSTRUCTION



building recesses + overhangs



structure

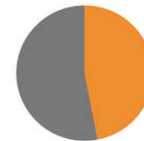


mechanical services / circulation



**22%**  
of material content is recycled

Source: LEED Credit MR4



**47%**  
materials are extracted, harvested and manufactured within 500 miles

Source: LEED Credit MR5

outdoor classroom area





**75%**  
reduction of water  
use in all fixtures  
Source: LEED Credit WE3



**60%**  
of water is graywater  
Source: LEED Credit WE3

WATER CYCLE



view at south teaching lawn