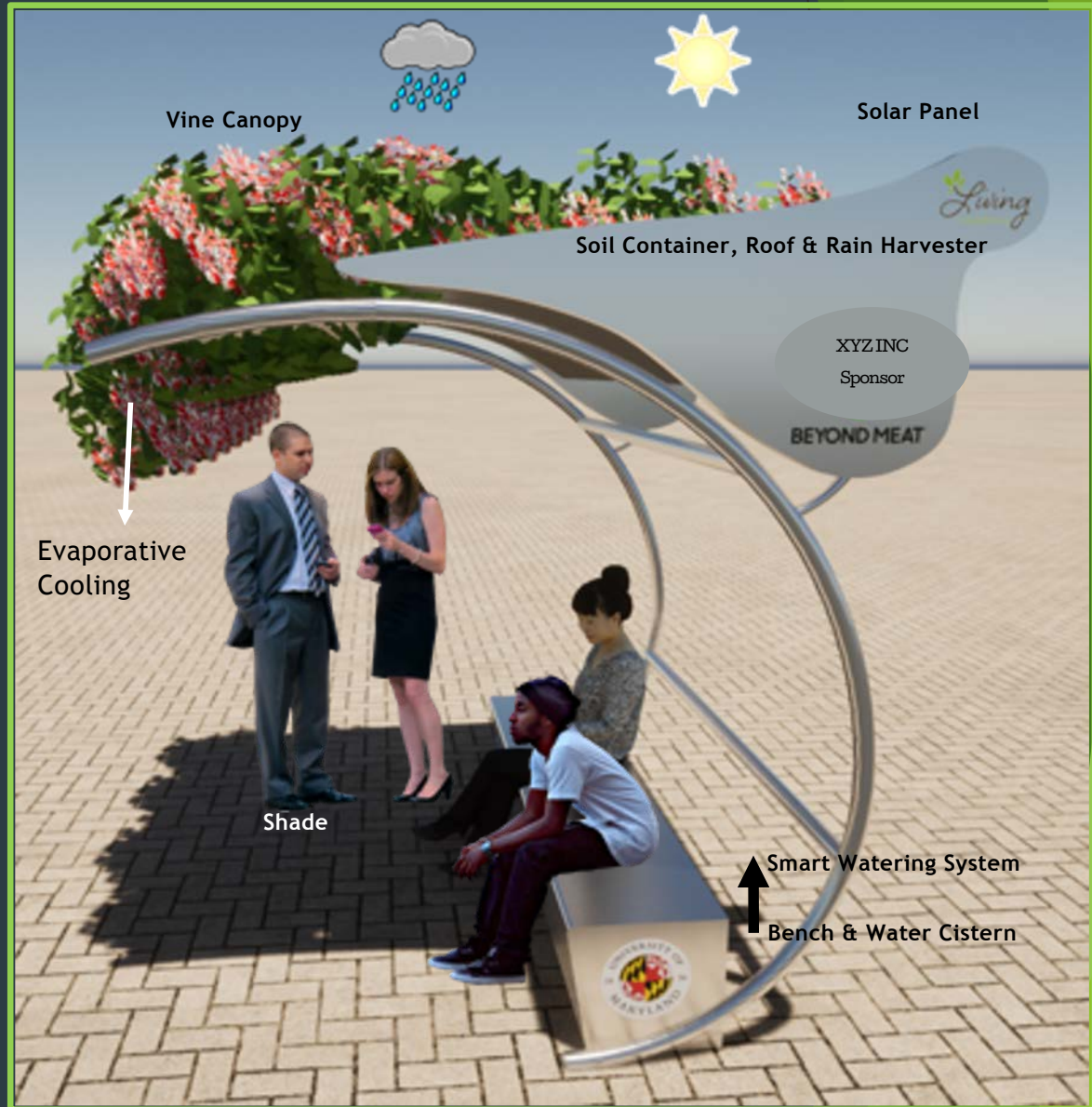


# Concepts for Cool Green Shelters for Hyattsville Neighborhood Bus Stops

Living Canopies Ltd  
&  
University of Maryland  
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Xiaojin Ren  
Kurt Lawrence  
Kyle Sonneveldt  
Nick Gray  
Kelly Fleming  
Nick Cloyd  
Jonathan Mallory

Hyattsville Town Council  
April 4, 2022



# Criteria for Concepts

## MUST HAVES

1. Protect people: summer sun and heat. Winter wind and rain.
2. Regulatory Compliance: ADA Wheel chair access
3. Plants: Native perennials. Vines, grasses and herbs.
4. Rainfall Capture & Reused with smart irrigation
5. Solar power, battery storage and charging for devices
6. Dimensions: 9'w x 4'd x 7'h
7. Sustainable materials: regional lumber, recycled metals
8. LED Lighting
9. Signage for advertising, sponsorship, wayfinding maps

# Criteria for Concepts

## THEMES

1. Neighborhood Fit (see photos of Hyattsville Sites)
2. Sustainable materials
3. Remarkable design
4. Modern but not “too modern”
5. See Hollywood Gateway Park in College Park for inspiration

# Criteria for Concepts

## **FUTURE HAVES:** Next Generation

1. Smart, Digital Advertising signage
2. 5G micro-cell tower as Hot Spot
3. Environmental Sensors (e.g., air quality, flooding)
4. Delivery/Exchange Lockers for books, produce, packages
5. Vending machine for battery replacement (phones)
6. Human interactivity
7. Rain Garden Connections
8. Pervious concrete



# POSSIBLE LOCATIONS in Hyattsville



3800 Jefferson St.



3500 Hamilton St.



3700 Hamilton St.



3600 Hamilton St.



3900 Hamilton St.



3801 Hamilton St.



5400 38th Ave



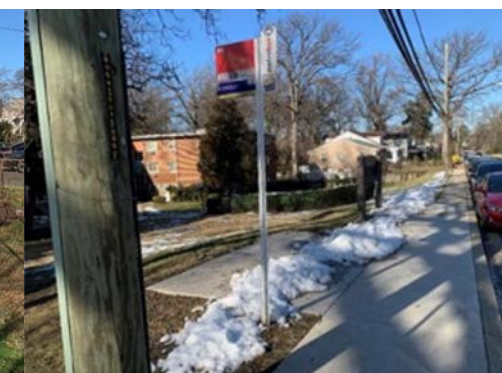
4114 Jefferson St.



5910 40th Ave



5716 40th Ave



6100 42nd Ave



Jefferson St. x 40th Ave



# PRECEDENT RESEARCH

## Downtown Urban

### Bus Stop Shelter



Bus stop shelters are part of the Coordinated Street Furniture Franchise that is managed by JCDecaux. The award-winning, stainless-steel and glass design provides seating and protection for bus users. Bus stop shelters are supported by advertising and generate revenue for the city.



*Bedford Avenue, Brooklyn*



Hyattsville - University Park:  
Adelphi Rd. near Public  
Library

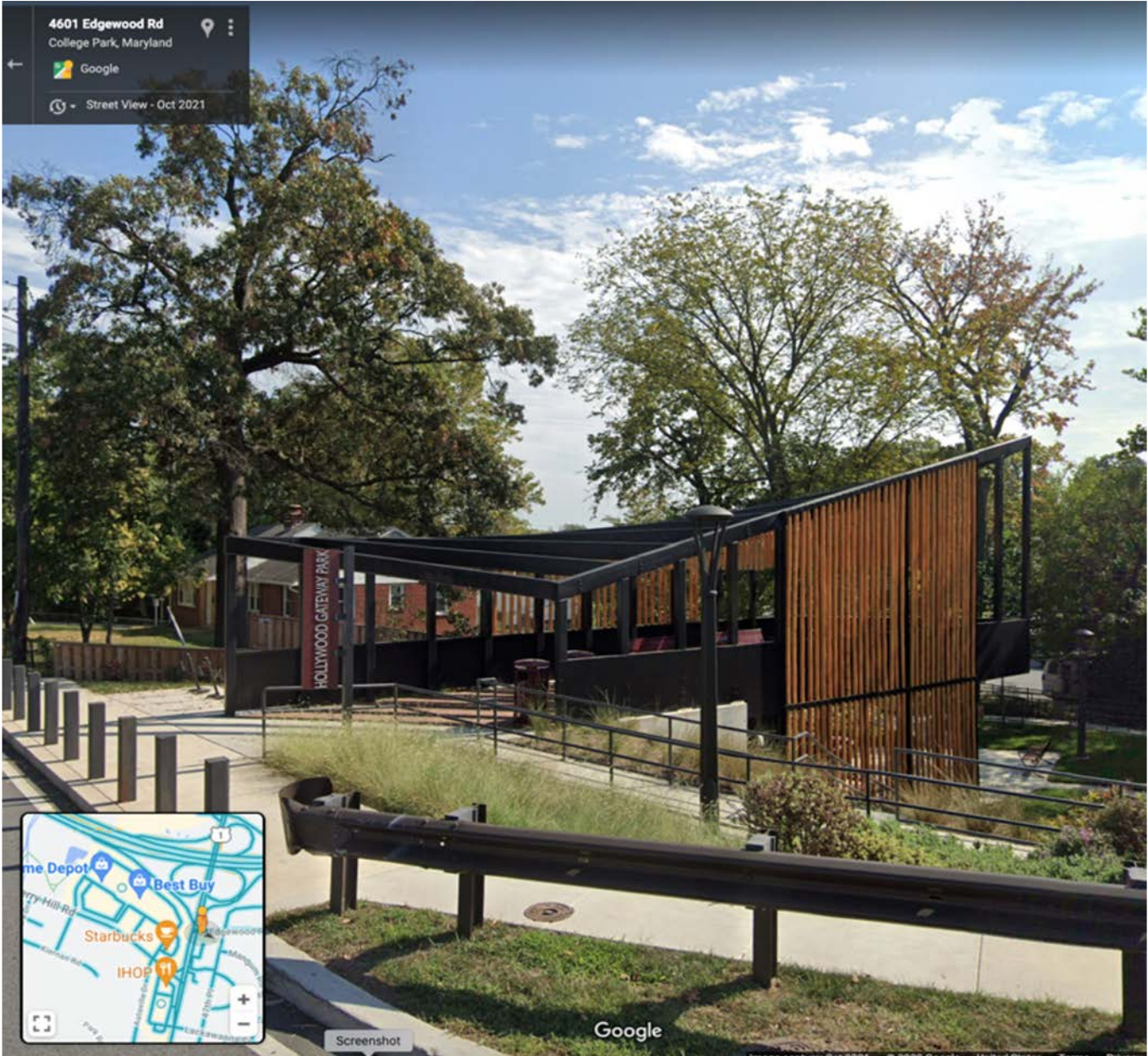




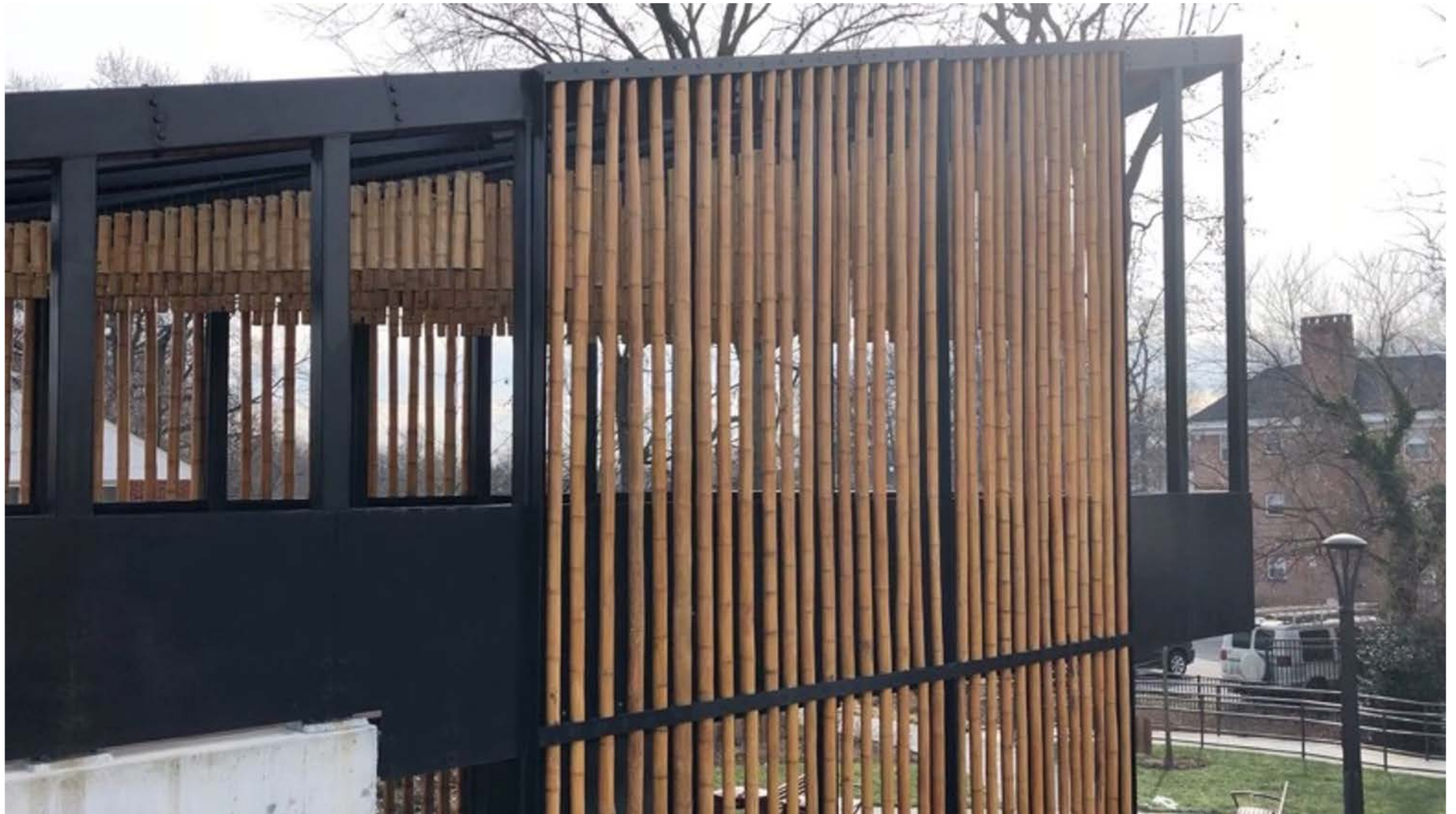
**Riverdale Park Station in front of Whole Foods  
on US 1**



# College Park/Hollywood Gateway Park Material (metal and bamboo) and style inspiration.



# Hollywood Gateway Park CP





# UMD's "WaterShed": Solar Decathlon House Butterfly Roof and Material





# Metal Trellis and Brick Base for Materials

Riverdale Park Station in front of Whole Foods on US 1







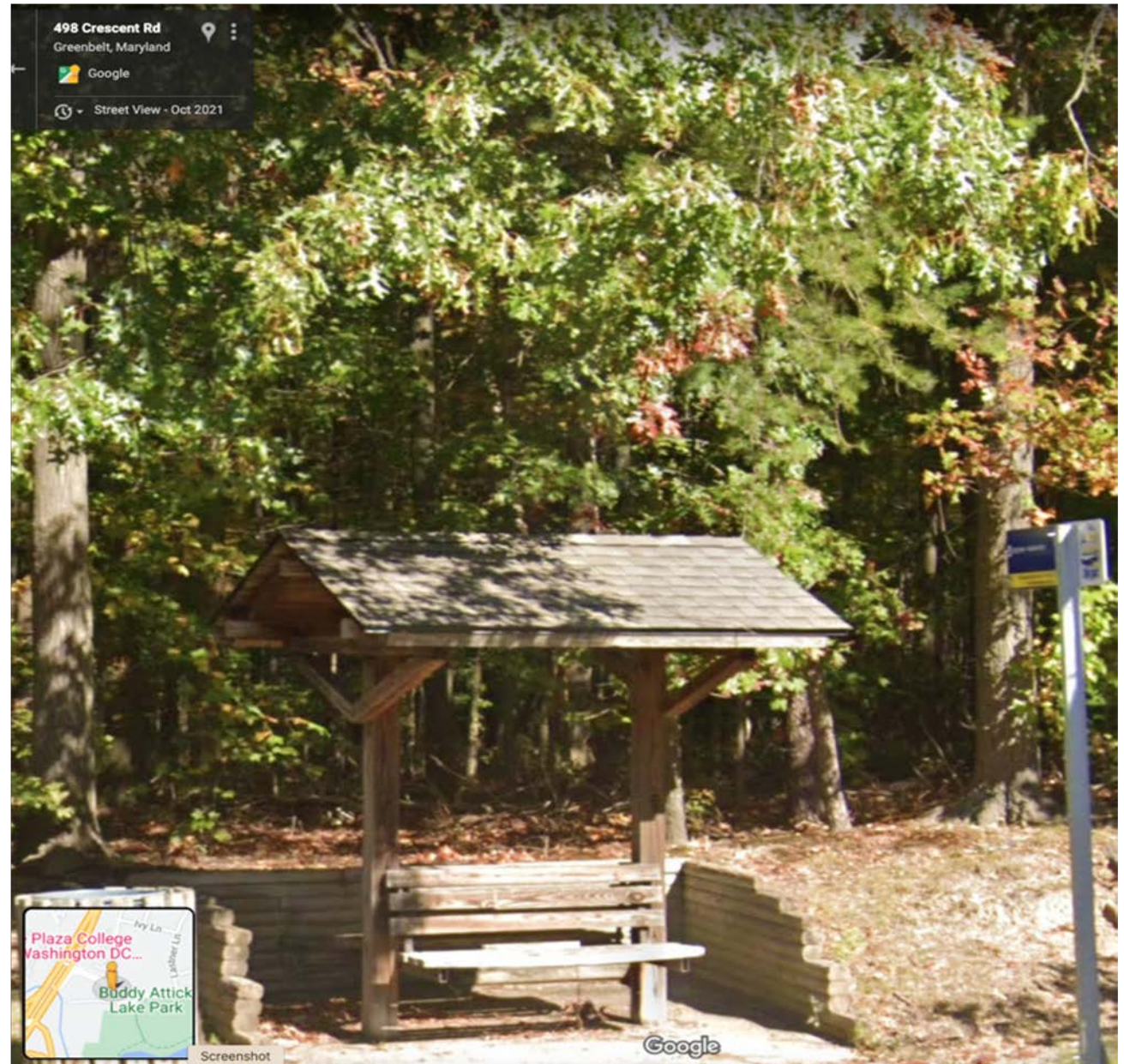
## Art Aesthetic

Riverdale Park Station in  
front of Whole Foods on US  
1



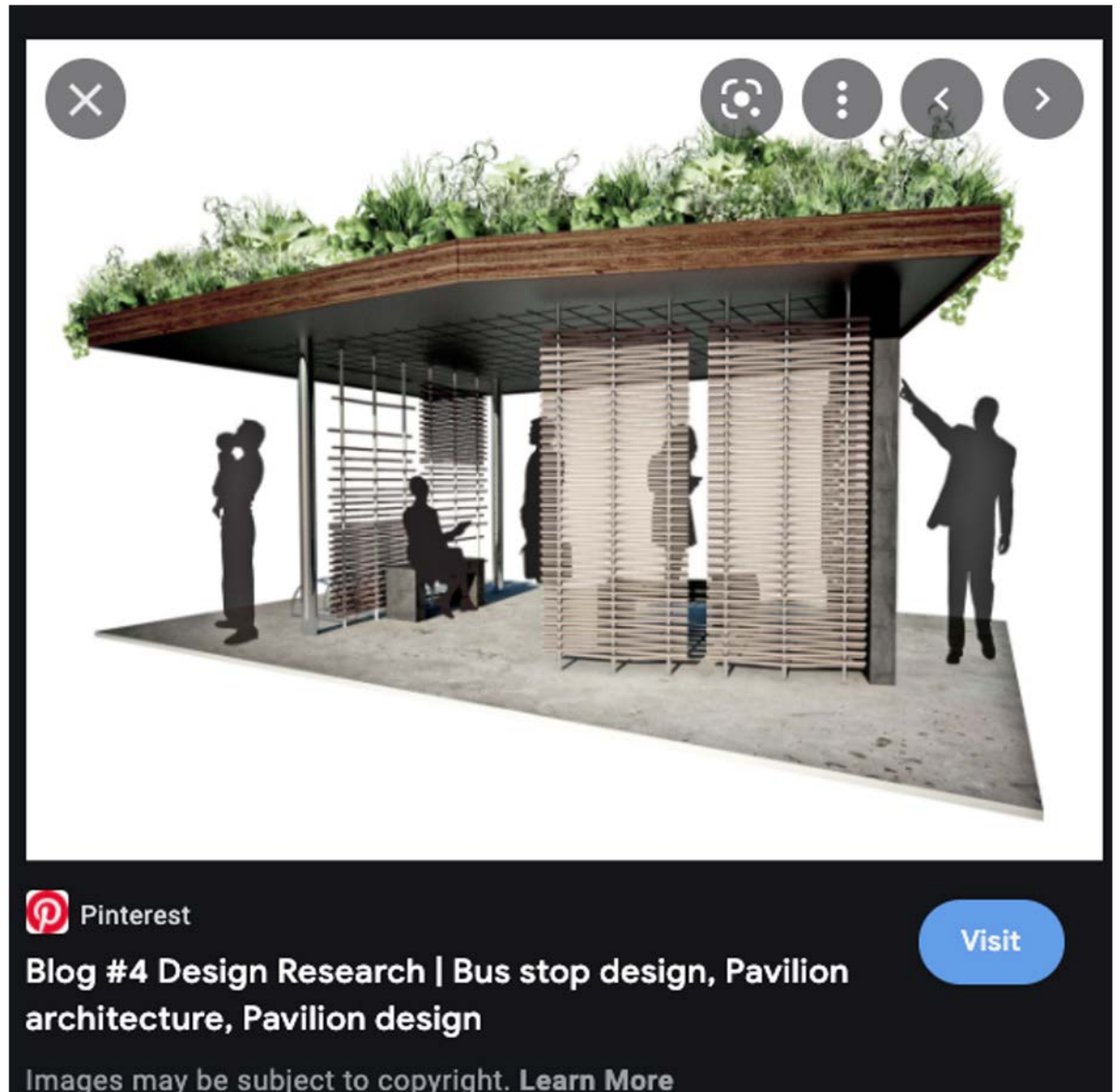


# Greenbelt: wooden “house” shelter





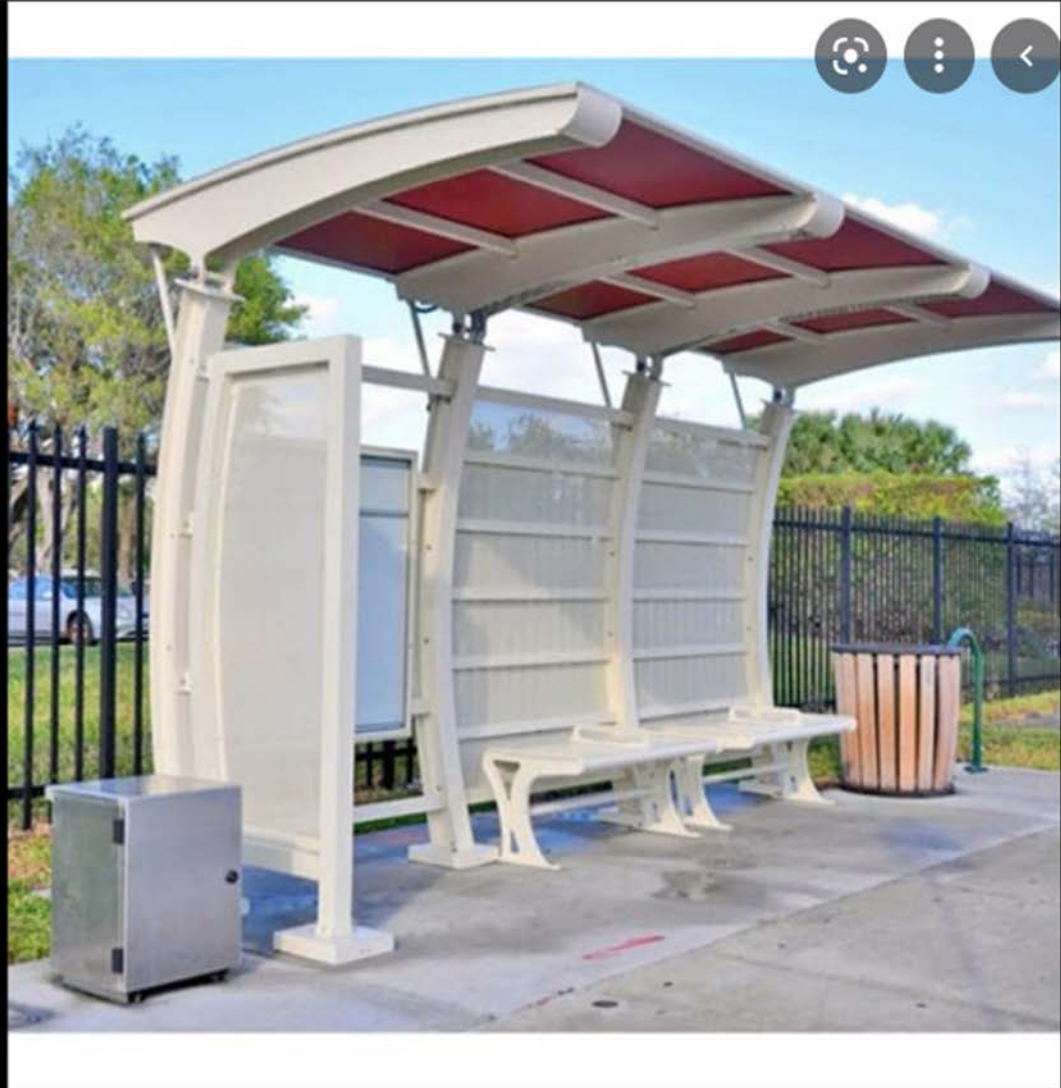
# Inspirational Green/Natural Materials



# The Quaint Hut



# White Steel



 IndiaMART

## Bus Stop Shelter

₹280.00 INR\* · Brand: Gayatri Rolling Shutter & Fabrication

We manufacture qualitative range of PCMC stainless steel bus stops. These stainless steel bus stops are fabricated as per industrial quality norms of ...

\* Check website for latest pricing and availability. Images may be subject to copyright. [Learn More](#)

Visit



## Continuous Arc





Modern  
Orlando





# Plant Integration



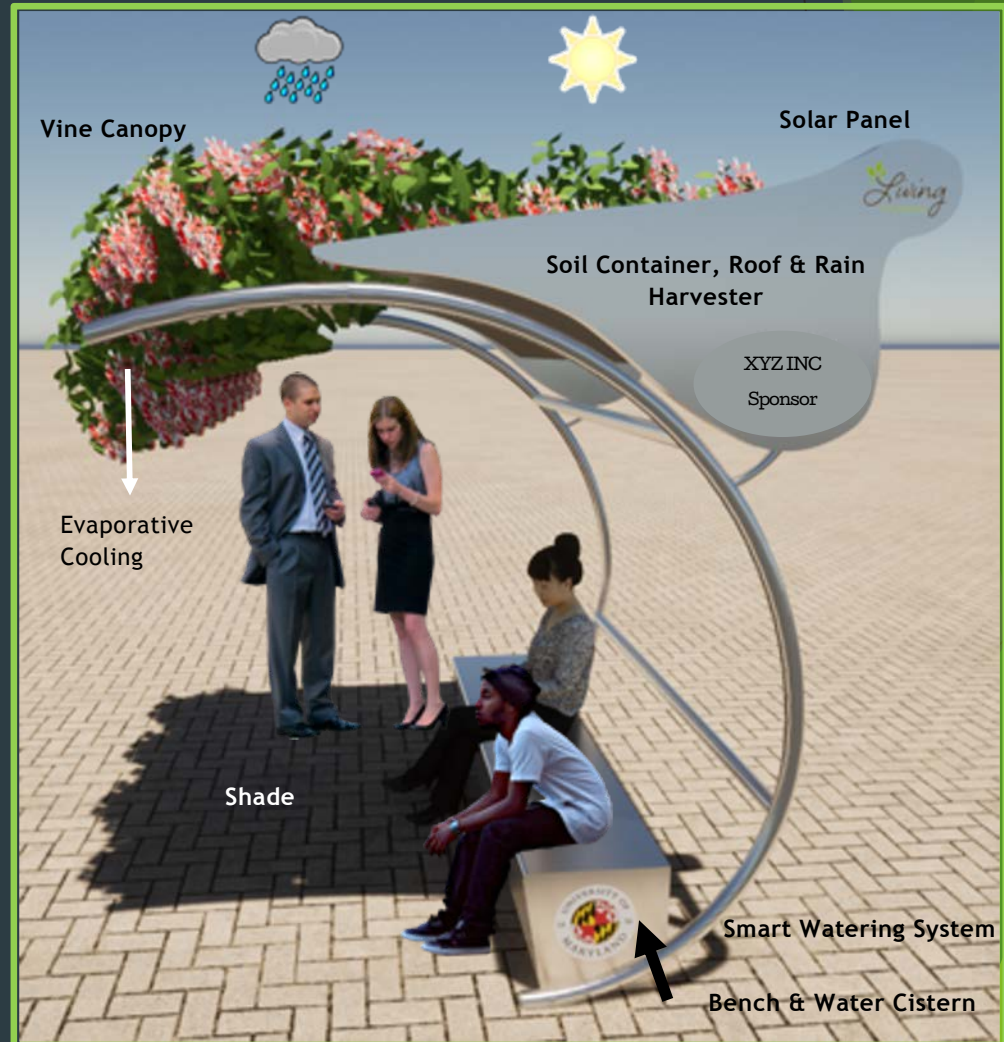


# The Green Shelter

## Concept #1

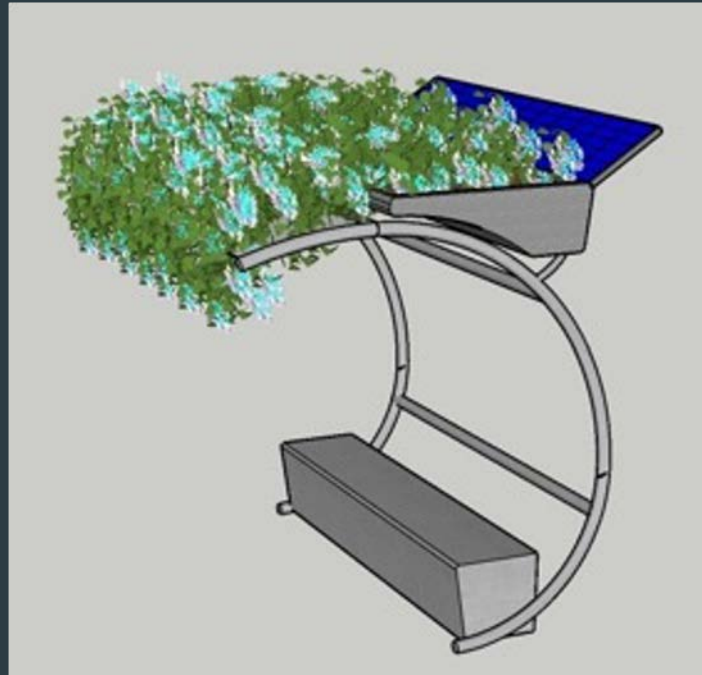
### The Silver Curve

3 meter width



# The Silver Curve

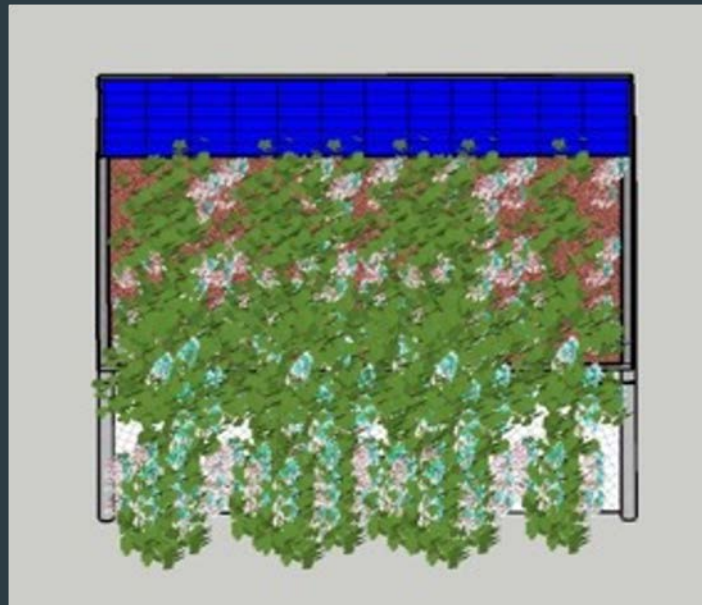
Views



Perspective



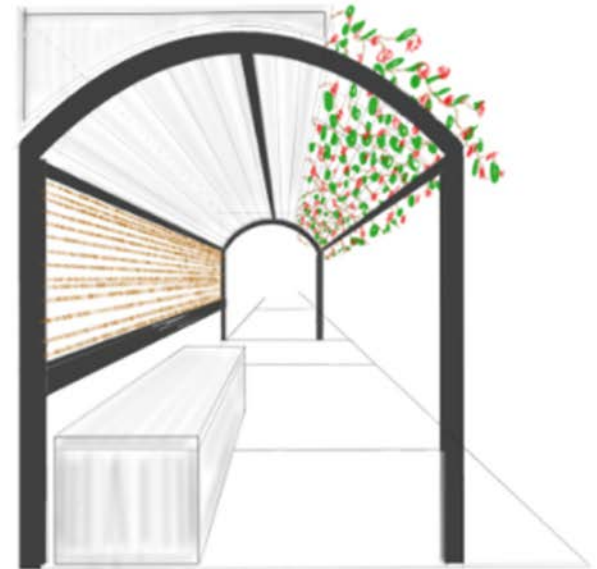
Side



## Concept #2

### GS-The Arch

Cedar & Galvanized Steel





## Concept #3

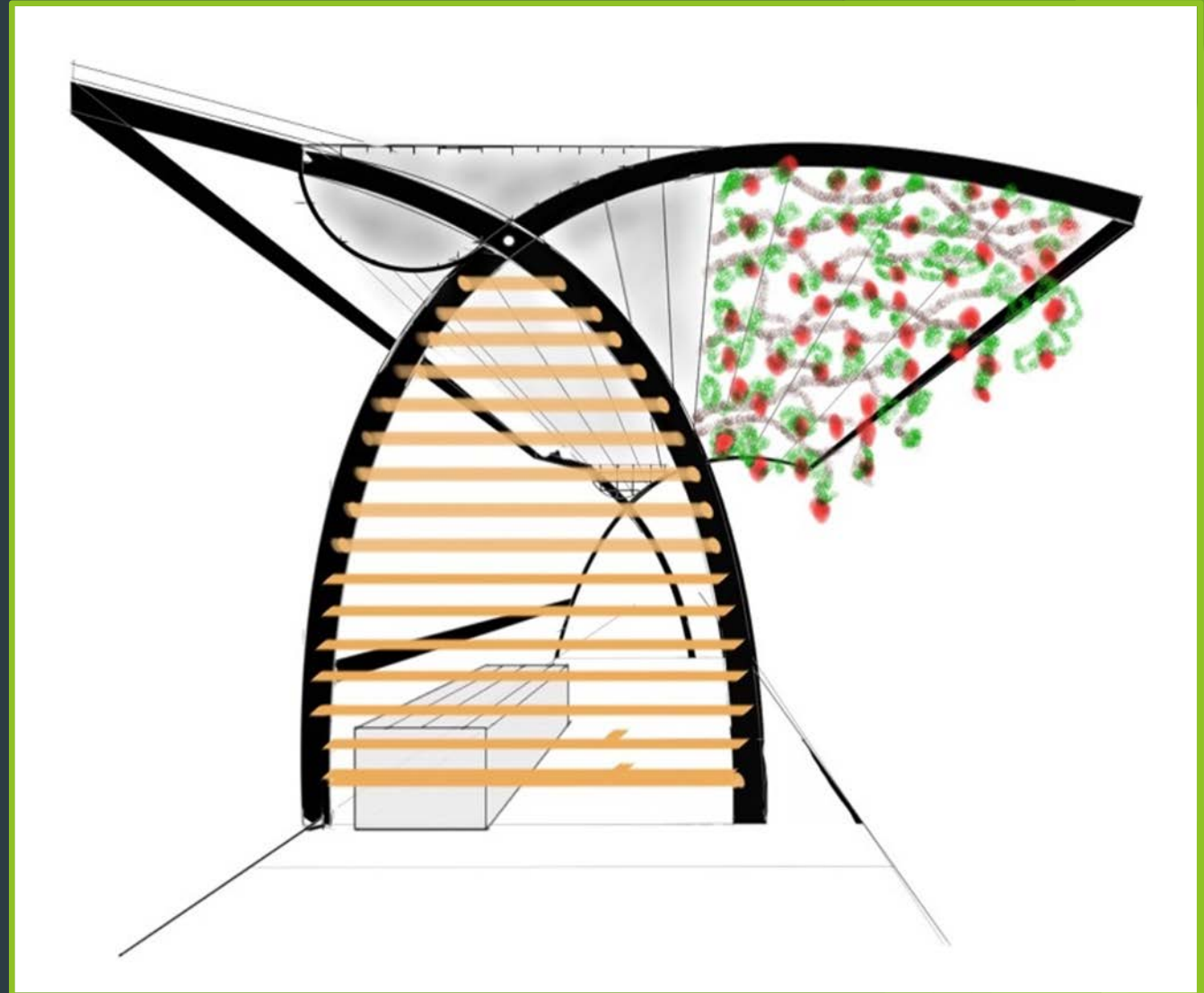
### GS-Semi-Arch

Cedar & Galvanized Steel



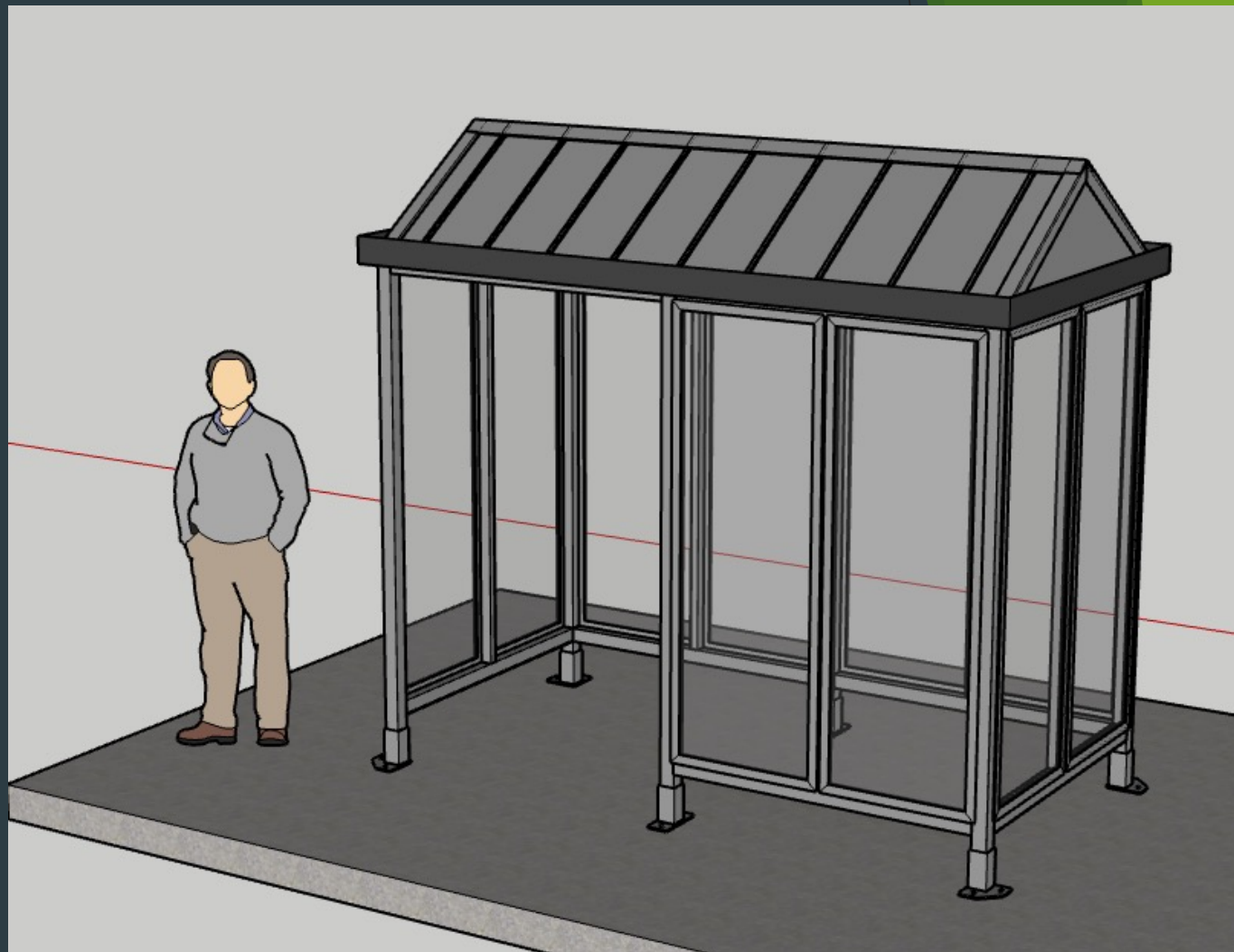
## Concept #4

### GS-The Monarch





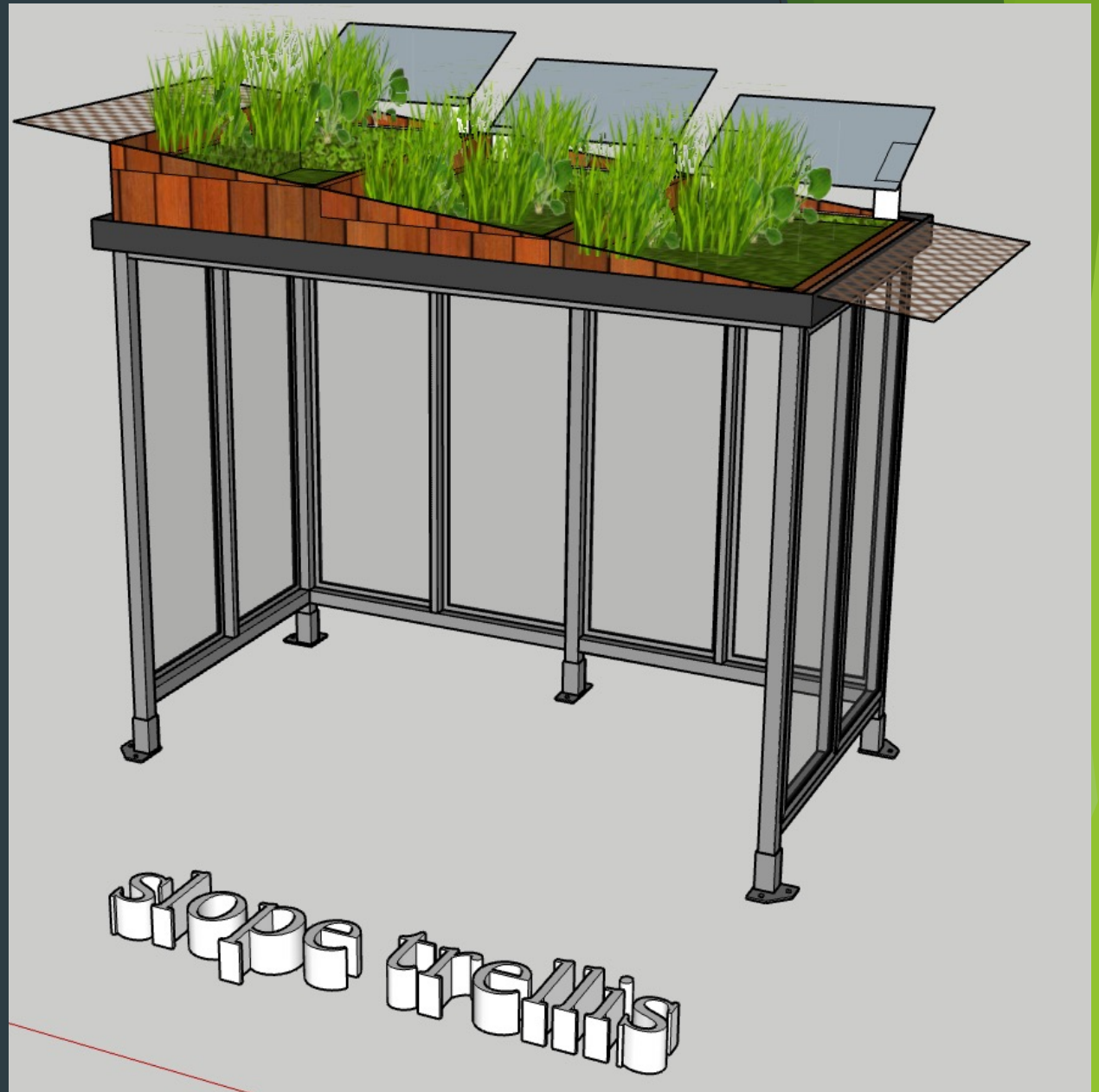
# Conventional



CEO & co-founder [www.livingcanopies.com](http://www.livingcanopies.com)  
[dave@livingcanopies.com](mailto:dave@livingcanopies.com) 301-789-5099

# Modified Conventional Sloped

## Concept #5





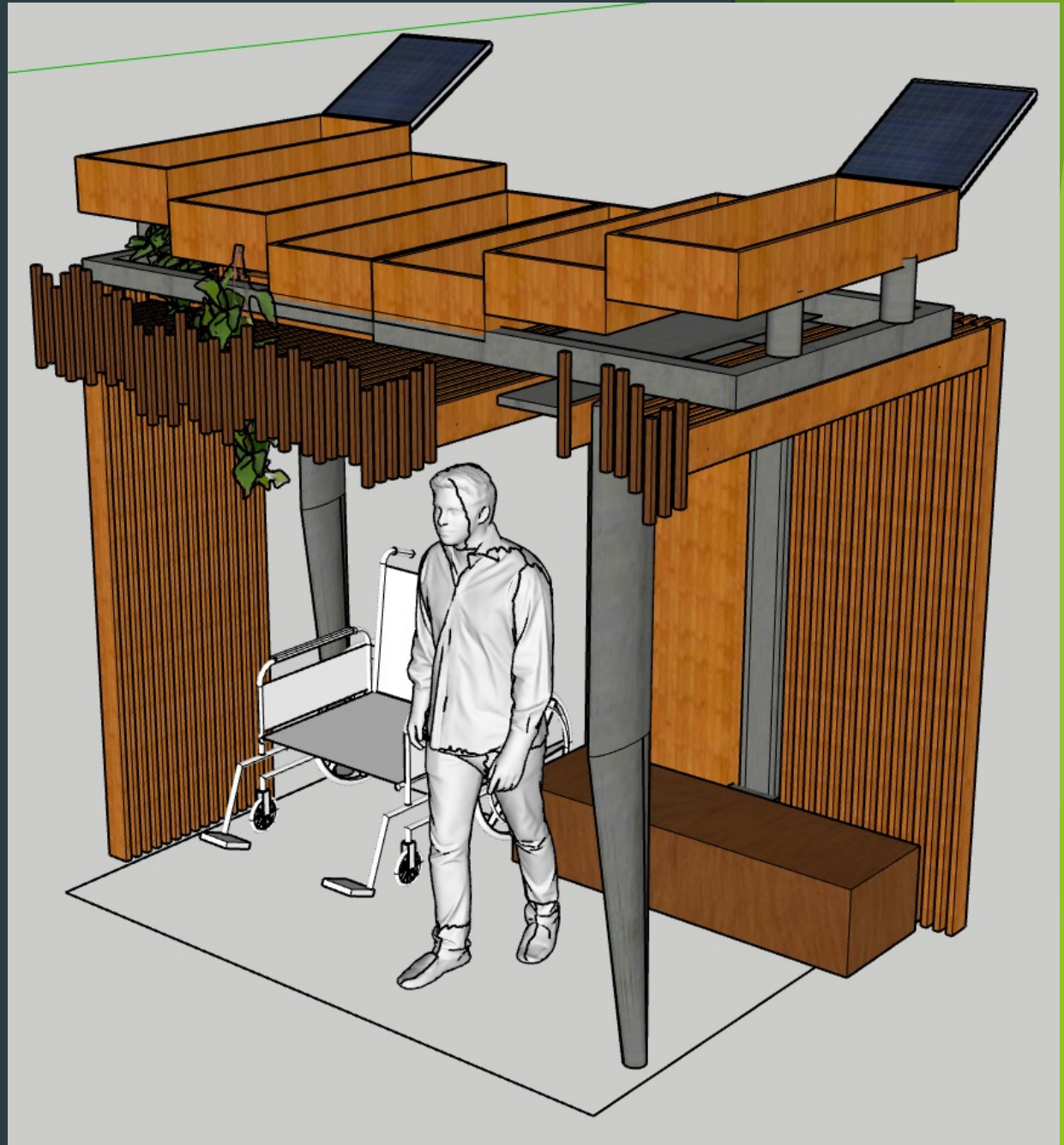
Butterfly  
Concept #6  
Front View



# Butterfly

## Concept #6

### Perspective





# Butterfly

## Concept #6

### Side View



# Butterfly

## Concept #6

### Rear View

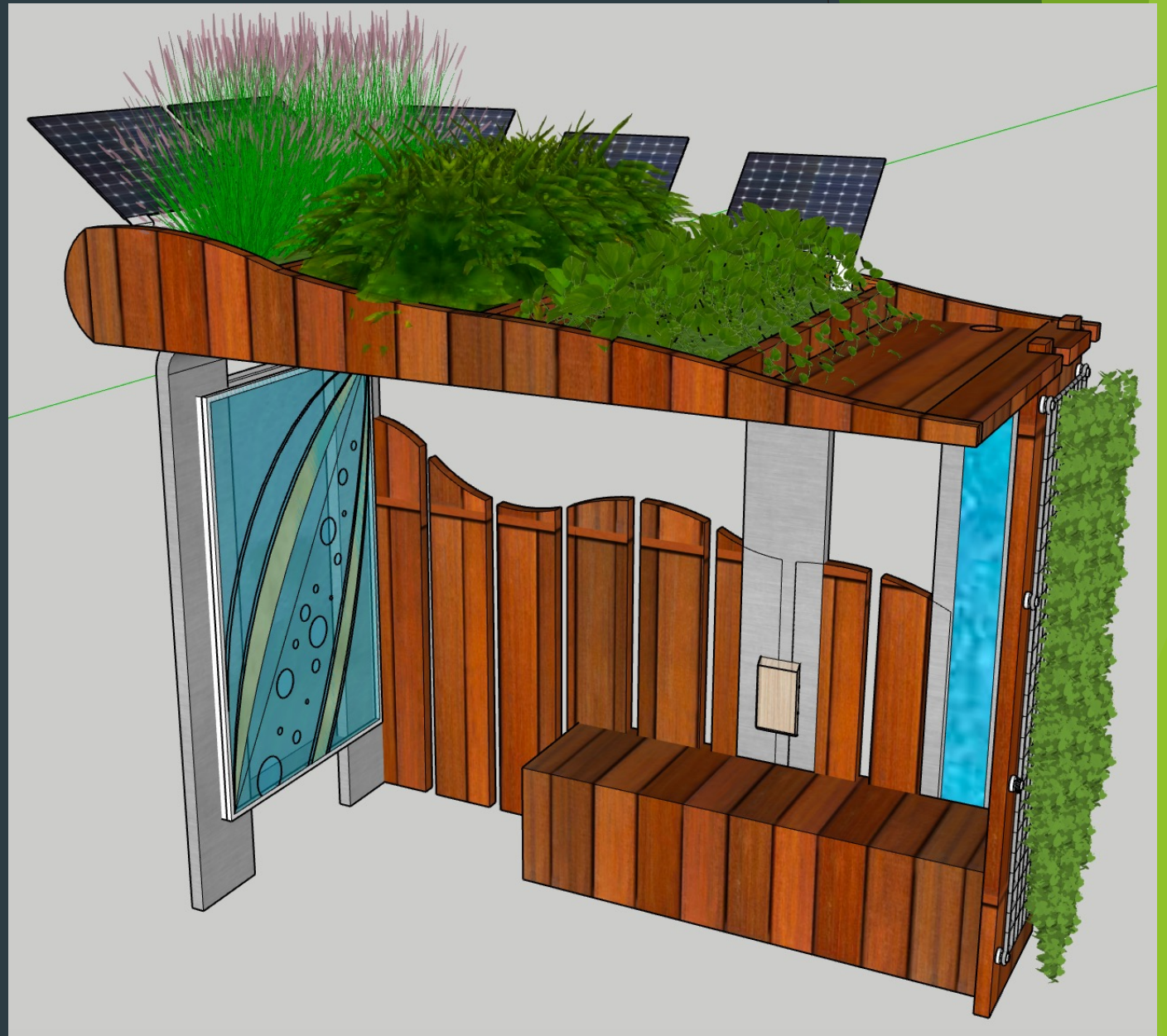




# Stepped-Slope

Concept #7

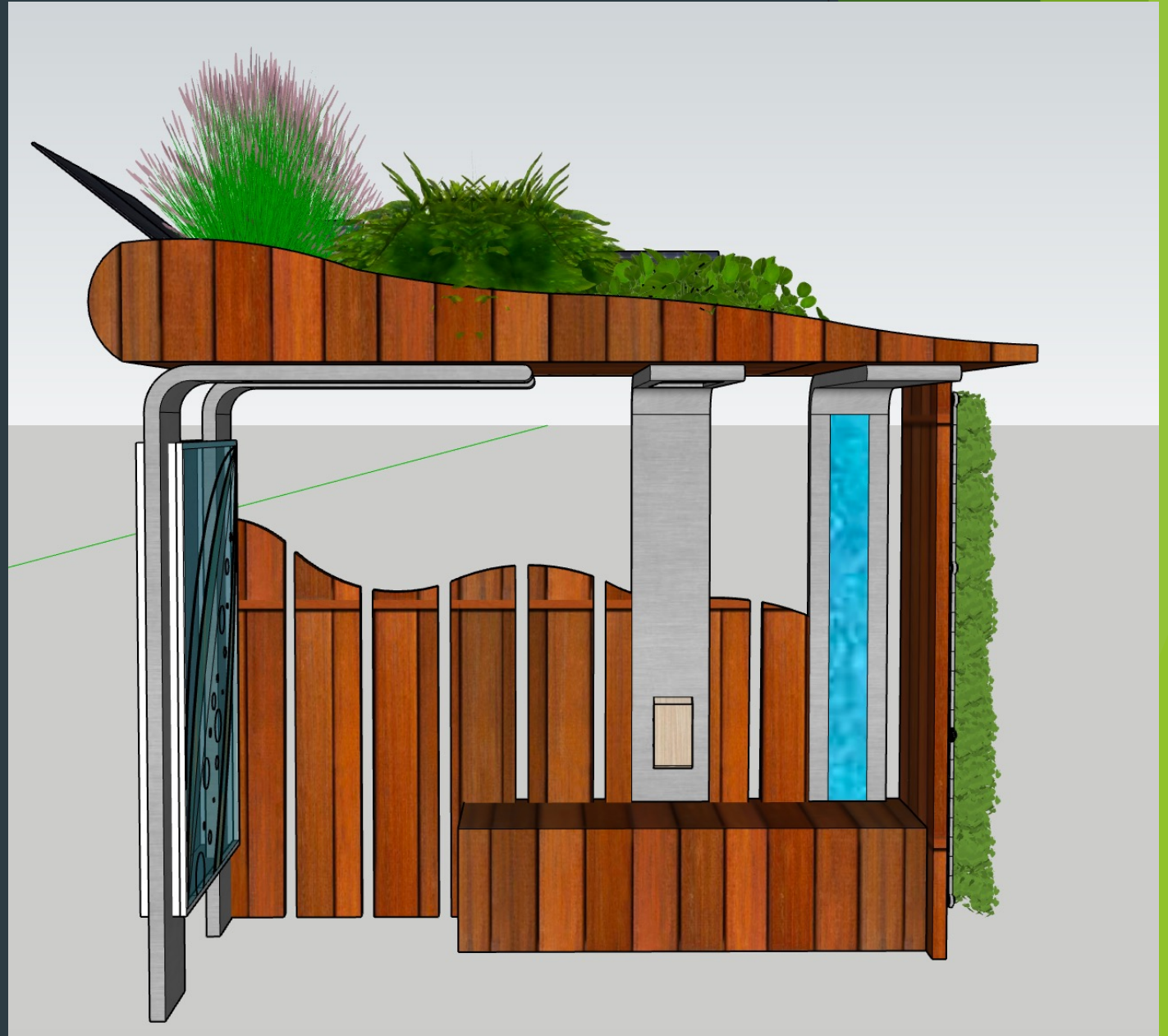
Perspective



# Stepped-Slope

Concept #7

Front View

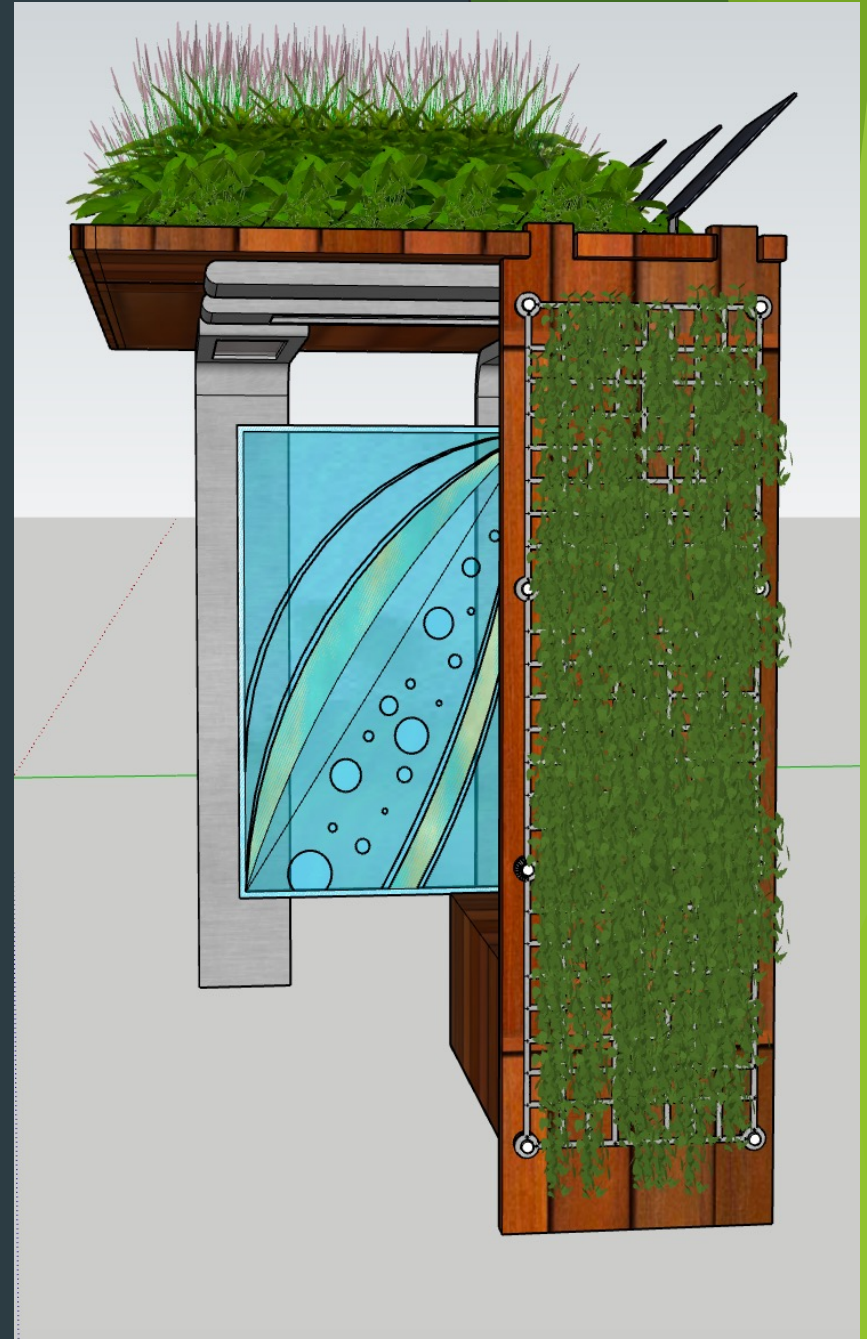




# Stepped-Slope

Concept #7

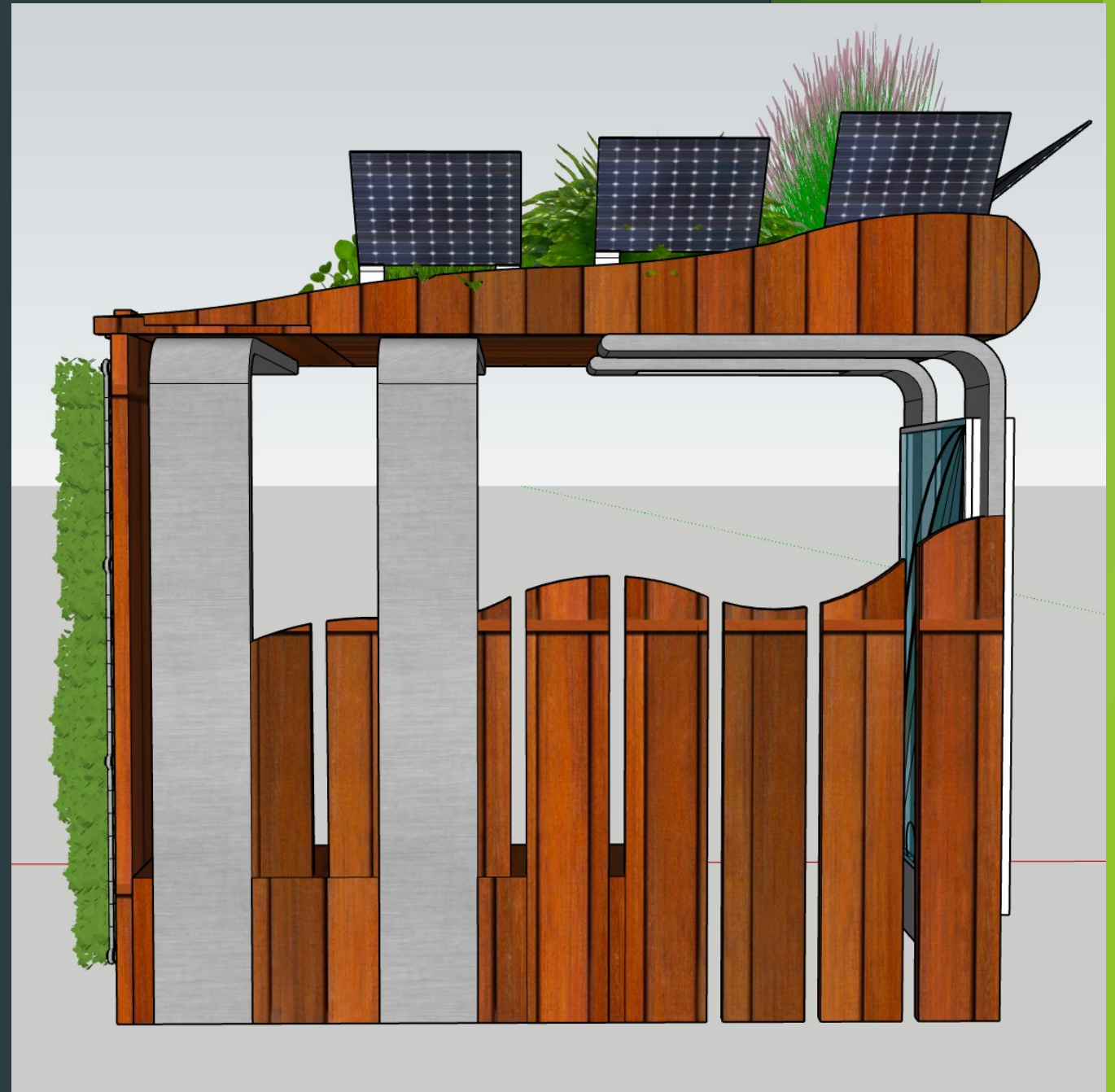
Side View



# Stepped-Slope

Concept #7

Rear View





# Stepped-Slope

Concept #7

Street Rendering



# Stepped-Slope

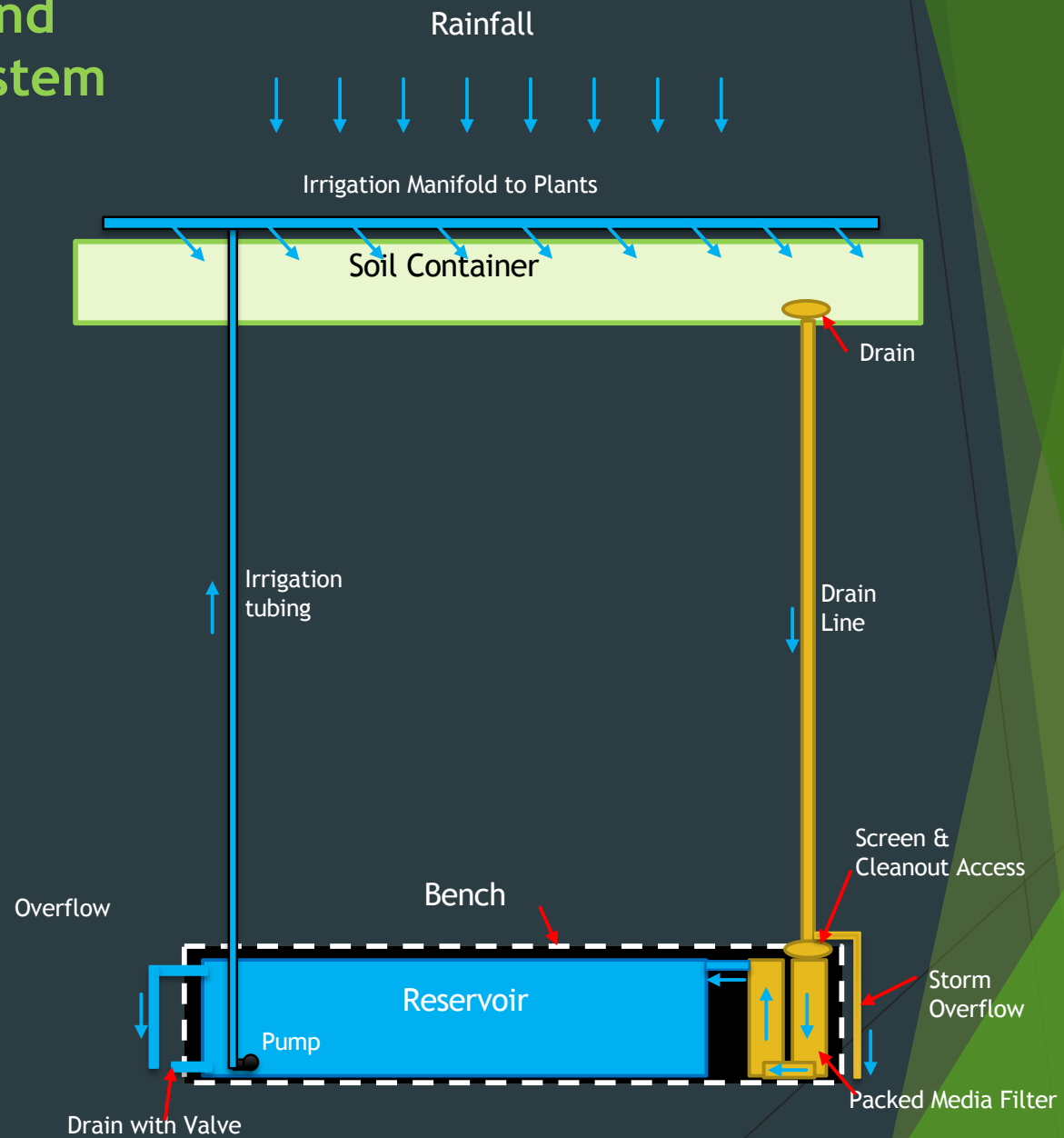
Concept #7

Street Rendering





# Schematic of the Green Shelter's Water Reuse and Recirculation System



# Smart Controller Platform for Cool Green Shelters for Bus Stops Living Canopies Ltd



Solar Power



Charge Controller



LiFePO4 Battery



USB Port/Charging



USB Phone Charging

## Power System



Particulate Matter 2.5



Flooding



Soil + Air Temperature  
Air Humidity

## Environmental Monitoring Sensors



Smart Controller Hardware-Board



Water Pump

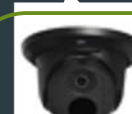


Water Reservoir Level



Soil Moisture Sensor

## Irrigation System



Infrared Rider Detection



Photocell



LED Lighting

## Lighting System



Internet Dashboard  
Remote Monitoring & Alerting  
Remote Commands



# Power Requirements

## A) Charging Personal Devices via a 5W USB Port

### Assumptions:

1. 2 USB Ports
2. Smart phone charging consumes power at 3000 mA. Based on fact you can charge 50% of an iPhone with 3000 mAh battery in ½ hour.
3. Assume highest use rate: 2 ports for 12 h

$$\text{USB Port Consumption} = 2 \times 12 \times 3000 \text{ mA} = 72,000 \text{ mAh} = \mathbf{72 \text{ Ah}}$$

## B) LED Lighting

1. 20 lux (lumens/m<sup>2</sup>) is std for bus stops
2. At 27 m<sup>2</sup> this gives ~600 lumens
3. Need 8-12 W of LED lights to produce 600 lumens
4. Lights on for 16 h per day in winter
5. 12 W @ 12V gives 1A
6. LED Consumption = 1 A x 16 h → **16 Ah**

## Power Requirements (cont'd)

### C) Water Pumping

1. Pump rated at 60W or 5A
2. Pump on 30 min per day or 0.5 h
3. Pump Consumption =  $5A \times 0.5h = 2.5 \text{ Ah}$  (round to 3 Ah)

### D) Circuit Board and other sensors

1. Assume sleep mode of 10 mA
2. Sleep Mode consumption =  $24 \text{ h} \times 10 \text{ mA} = 240 \text{ mAh}$
3. Active mode of 100 mA and 1 h/d
4. Active Mode Consumption =  $1 \text{ h} \times 100 \text{ mA} = 100 \text{ mAh}$
5. Total Board consumption =  $340 \text{ mAh}$  or  $0.34 \text{ Ah}$  (round to 1 Ah)

### E) Total Power Consumption

- |                     |       |              |
|---------------------|-------|--------------|
| 1. Personal Devices | 72 Ah |              |
| 2. LED Lighting     |       | 16 Ah        |
| 3. Water Pump       |       | 3 Ah         |
| 4. Circuit Board    |       | 1 Ah         |
| 5. <b>TOTAL</b>     |       | <b>92 Ah</b> |

# Power Requirements

## A) Battery Sizing

1. Use at 100 Ah LiFePO<sub>4</sub> to provide peak load of 92 Ah

## B) Solar Panels

1. 100 W panel @ 18 V provides 5.5 A
2. Winter daylight is 9 h in December
3. 9 h x 5.5 A → 50 Ah but mfg recommends 35 Ah per day
4. To produce 100 Ah with 35Ah per 100W requires 3 x 100 W or 300 W of panels