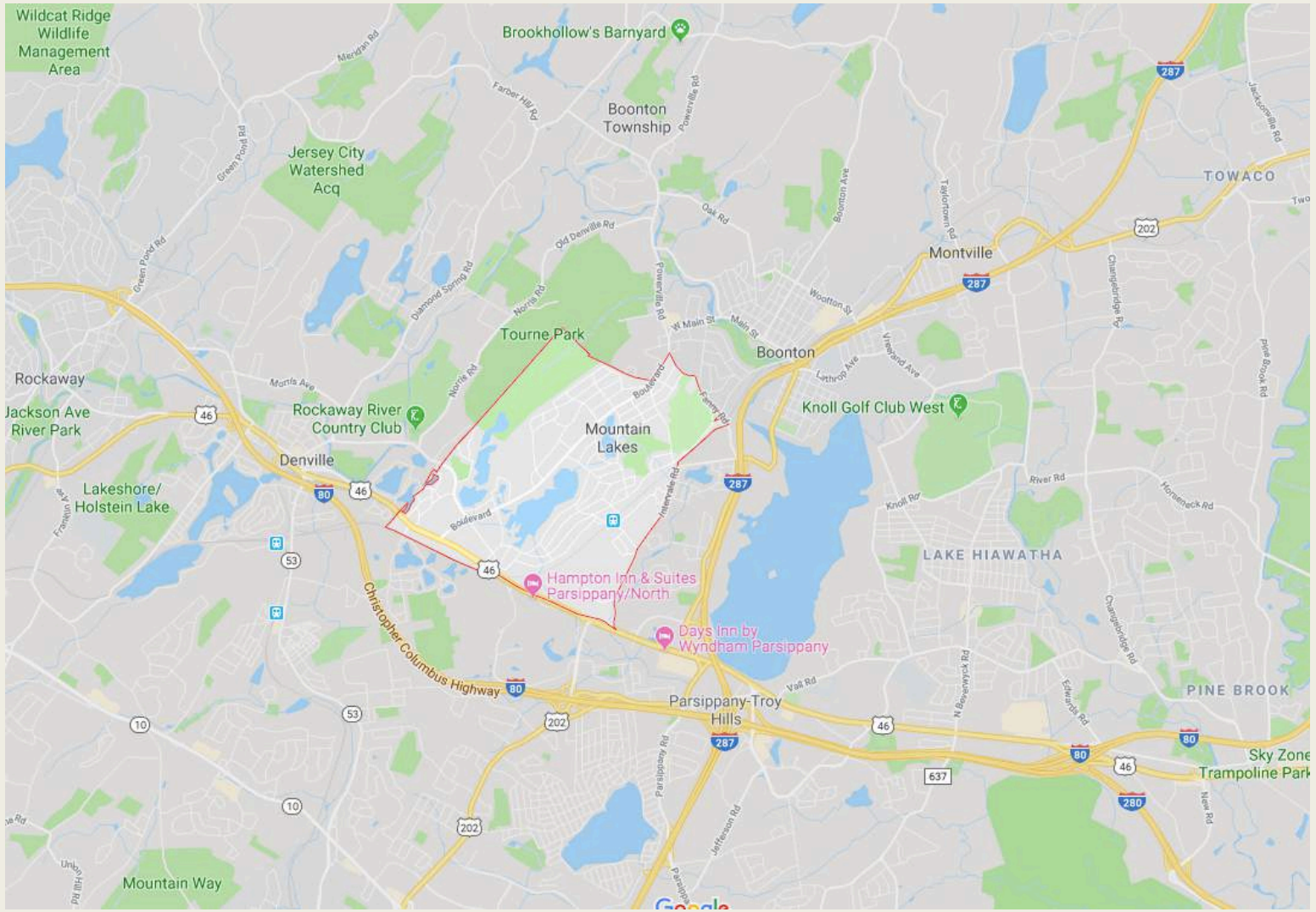
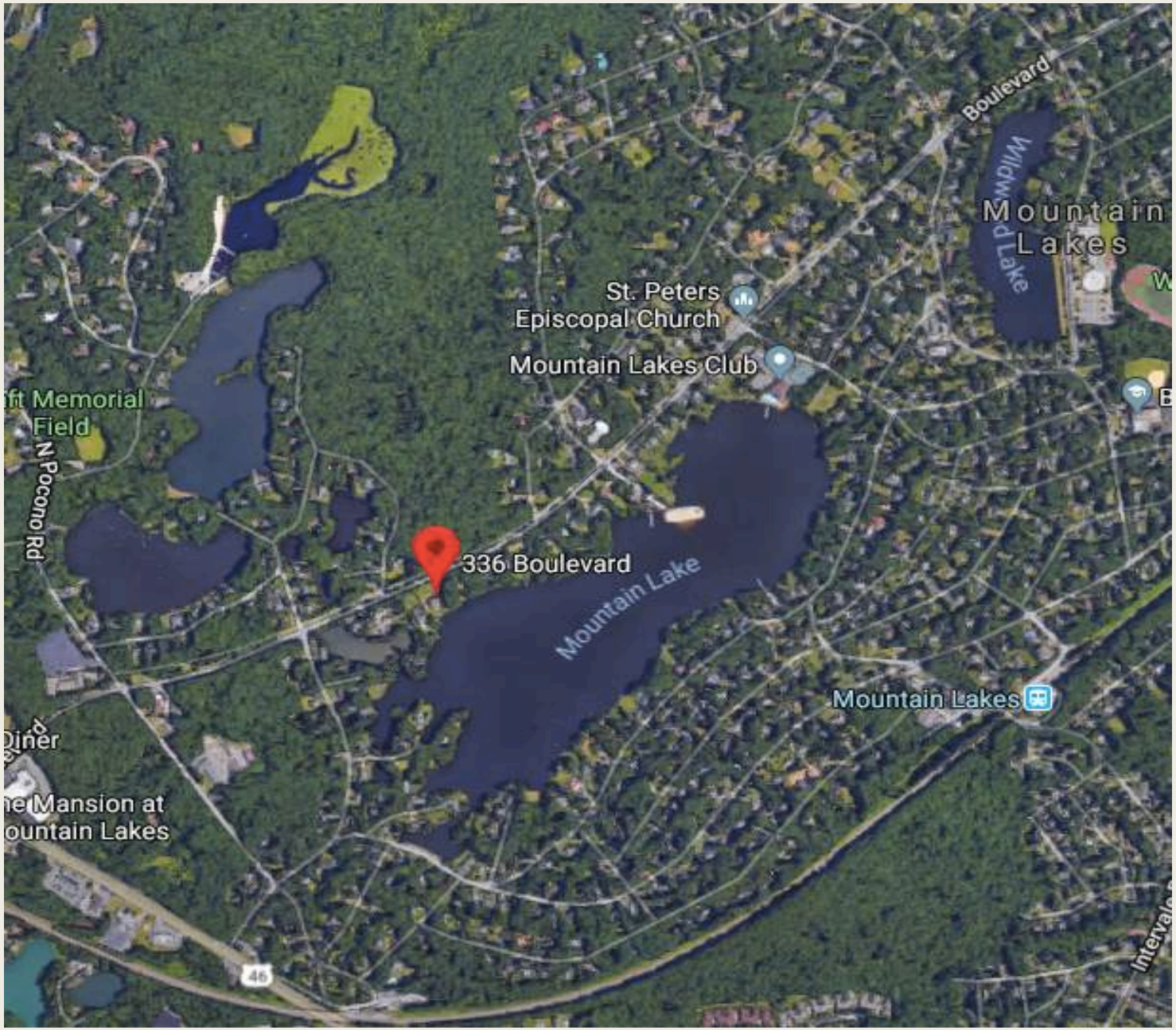
SUSTAINABLE HOUSE

Lucy (Chenxi) Yuan



Area

- Mountain Lakes, New Jersey
- Mountain Lakes is a borough of Morris County in New Jersey



Location

- 336 Boulevard Road

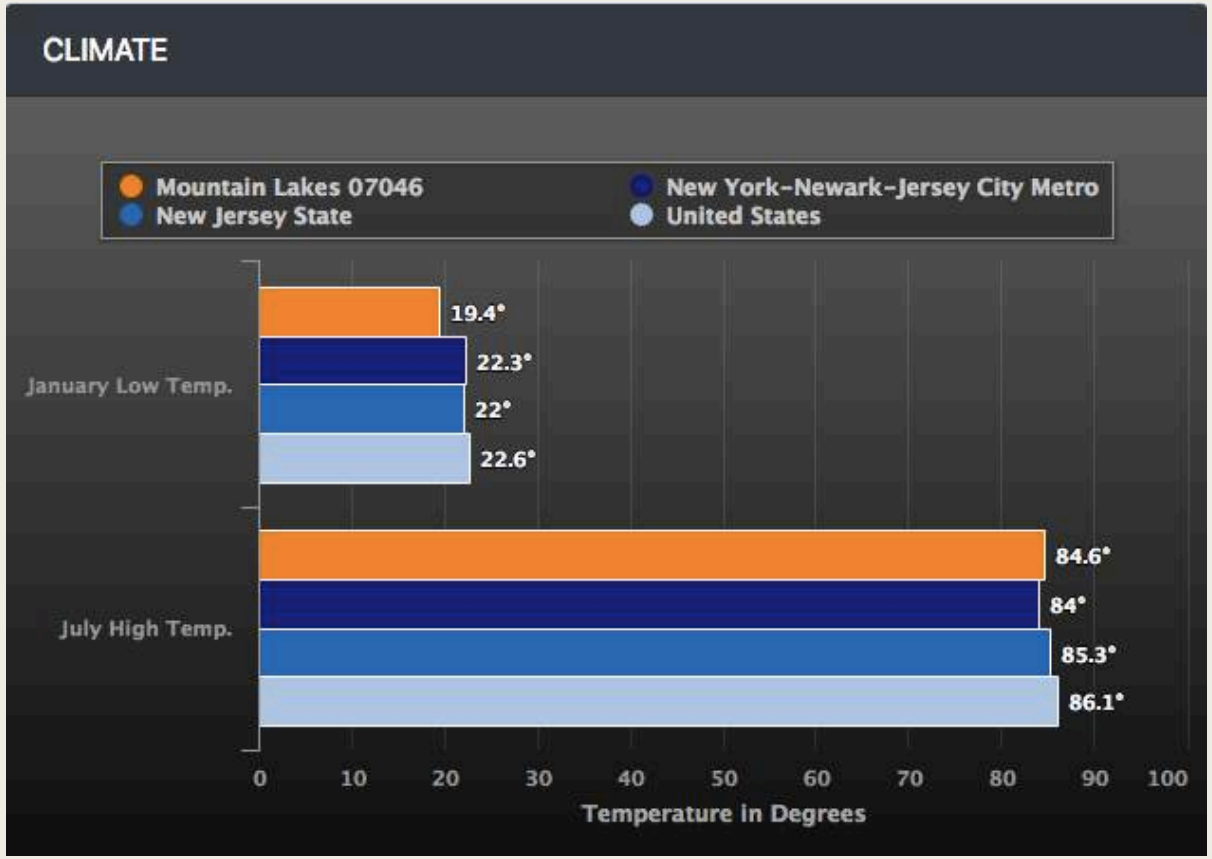
Closer look

- There's an existing house already in place, but I'm just going to ignore that
- The current lot is 100 feet by 370 feet, making it an 0.89 acres lot

Why did I chose this location

- When I lived in New York City as a kid, my family and my childhood friend's family would always go visit our mutual parents' friend's house. Their location is Laurelwood Drive which is just a 20 minute drive from the site I chose.
- There is another lake near their home, but majority of the time that we are there we would go to Mountain Lake
- Because of that, I have always wanted to live near the lake

Climate in that area



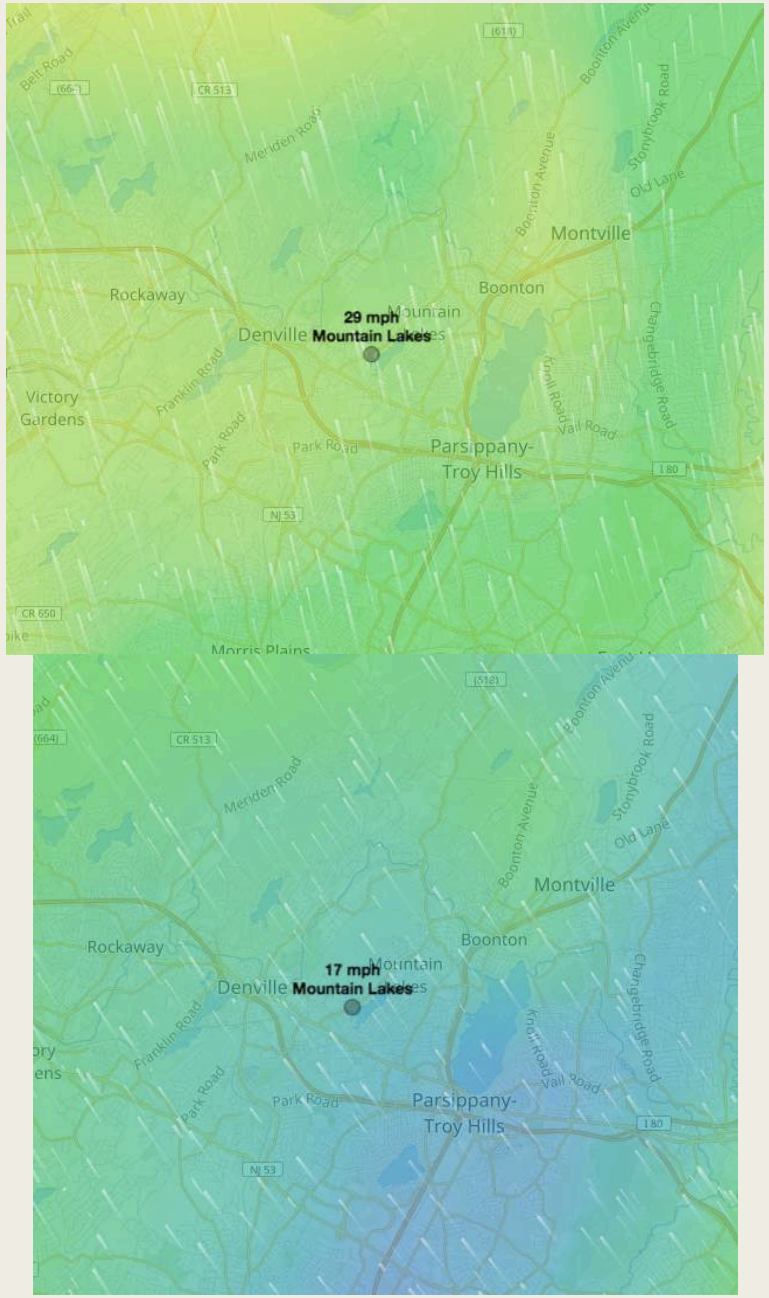
CLIMATE	Mountain Lakes, New Jersey	United States
Rainfall (in.)	50.1	39.2
Snowfall (in.)	26.2	25.8
Precipitation Days	114.0	102.0
Sunny Days	206	205
Avg. July High	84.6	86.1
Avg. Jan. Low	19.4	22.6
Comfort Index (higher=better)	41	54
UV Index	3.8	4.3
Elevation ft.	493	2443

Climate in that area

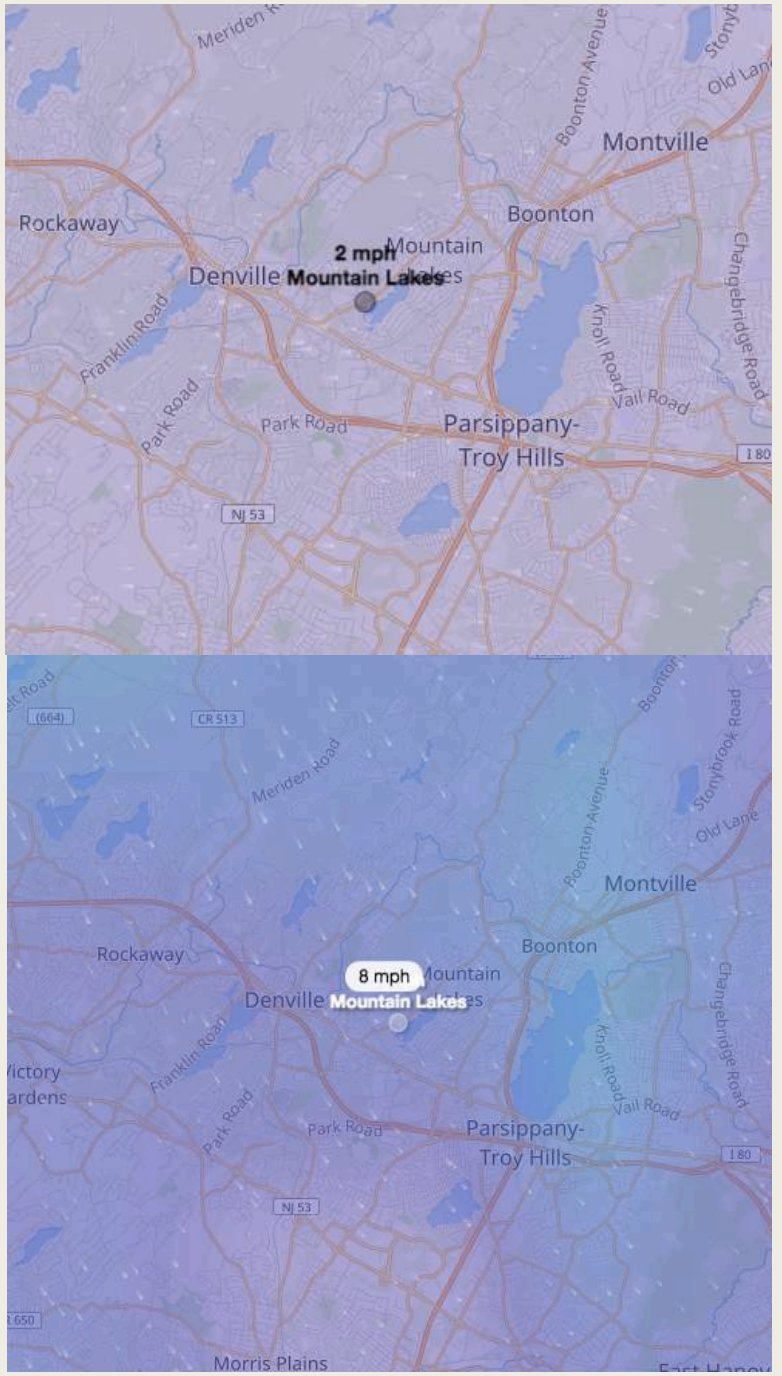
- The lowest temperature in January (which is the coldest month) is around 19°F
- The highest temperature in July (which is the hottest month) is around 85°F
- Mountain Lakes gets on average 26 inches of snow per year, which is a little bit more than the average snow depth in the United States
- On average, the area receives about 50 inches of rain a year, which is considerably higher than the average rainfall in the United States

Wind Direction

Summer



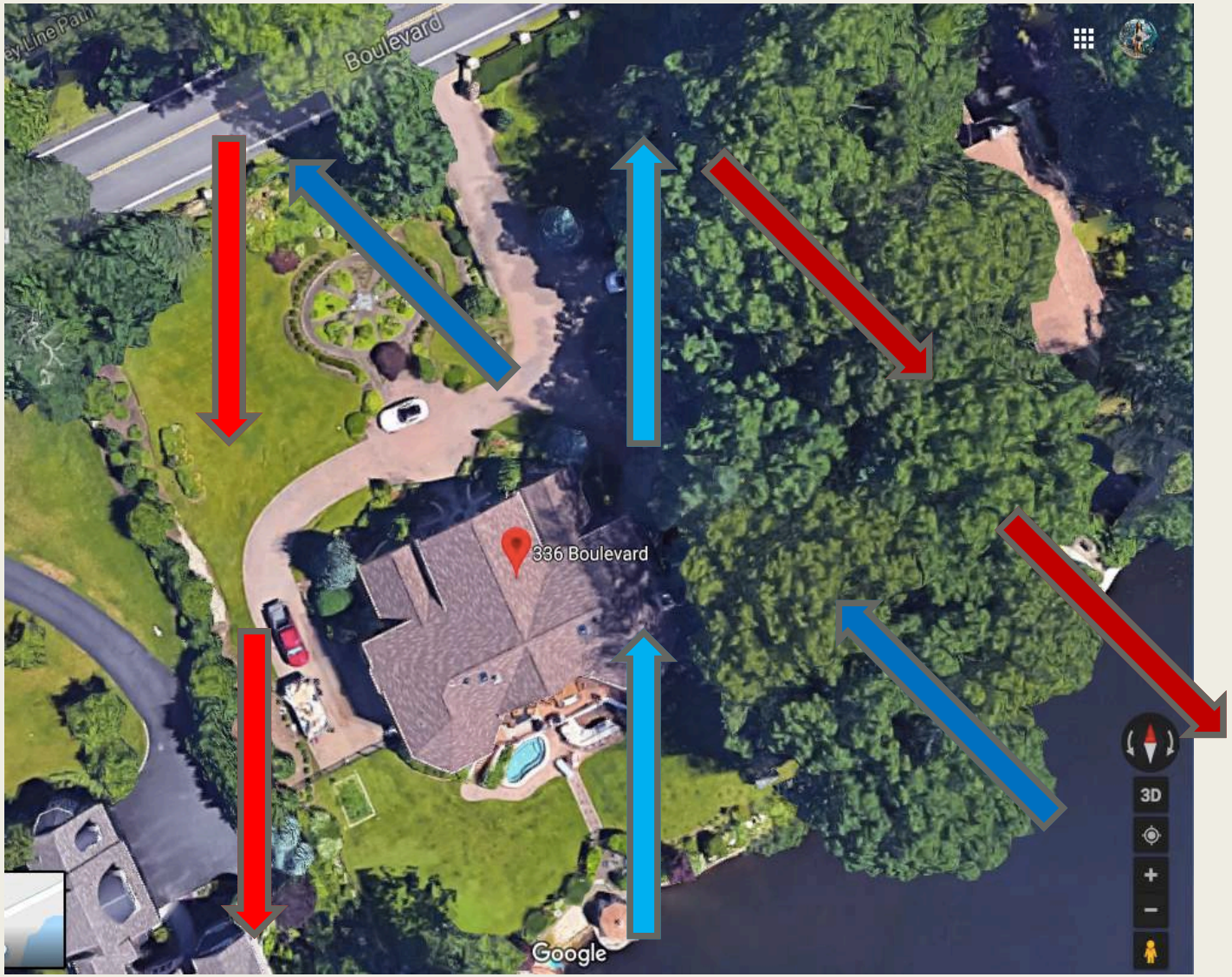
Winter



Wind Direction

- During the summer, the wind would blow from the North to the South in the morning and Northwest to Southeast at night. The wind force during the summer is not as strong
- During the winter, the wind would blow from the South to the North in the morning and Southeast to Northwest at night. The wind force during this time is stronger than it is in the summer
- This would mean there needs to be more insulation during the winter in order to keep the home warm

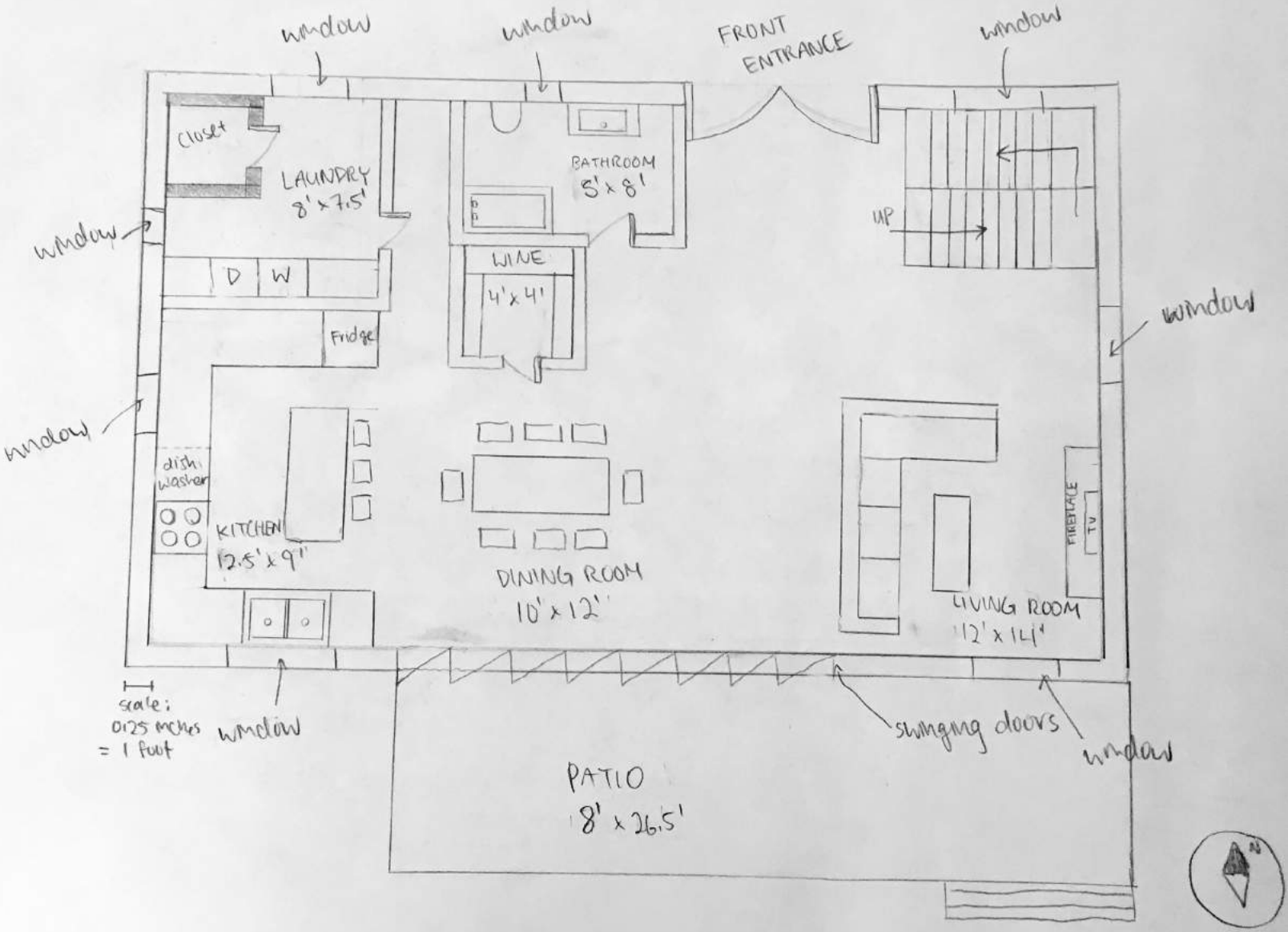
Wind Direction



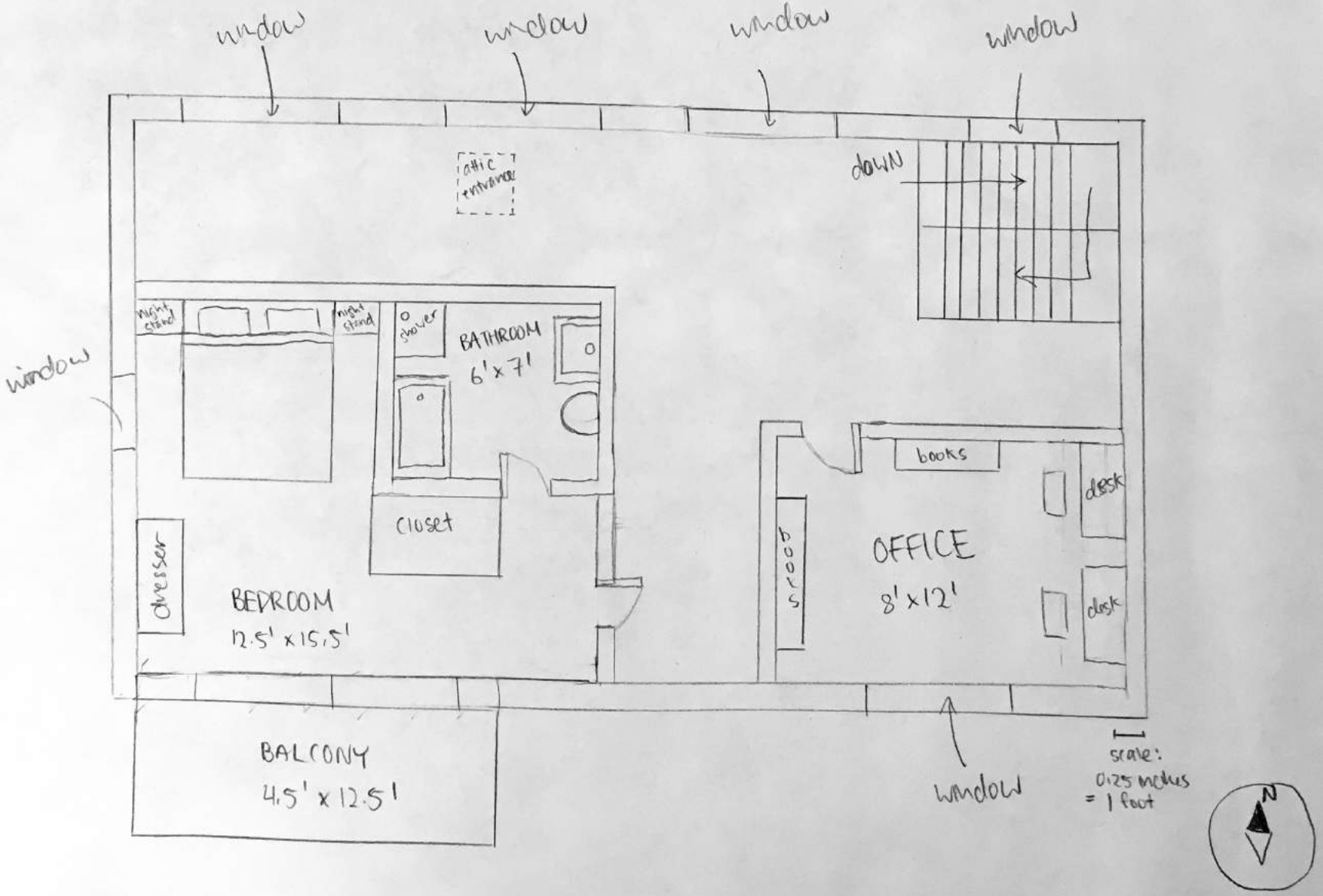
Key:

- Red – summer morning
- Dark red – summer night
- Light blue – winter morning
- Blue – winter night

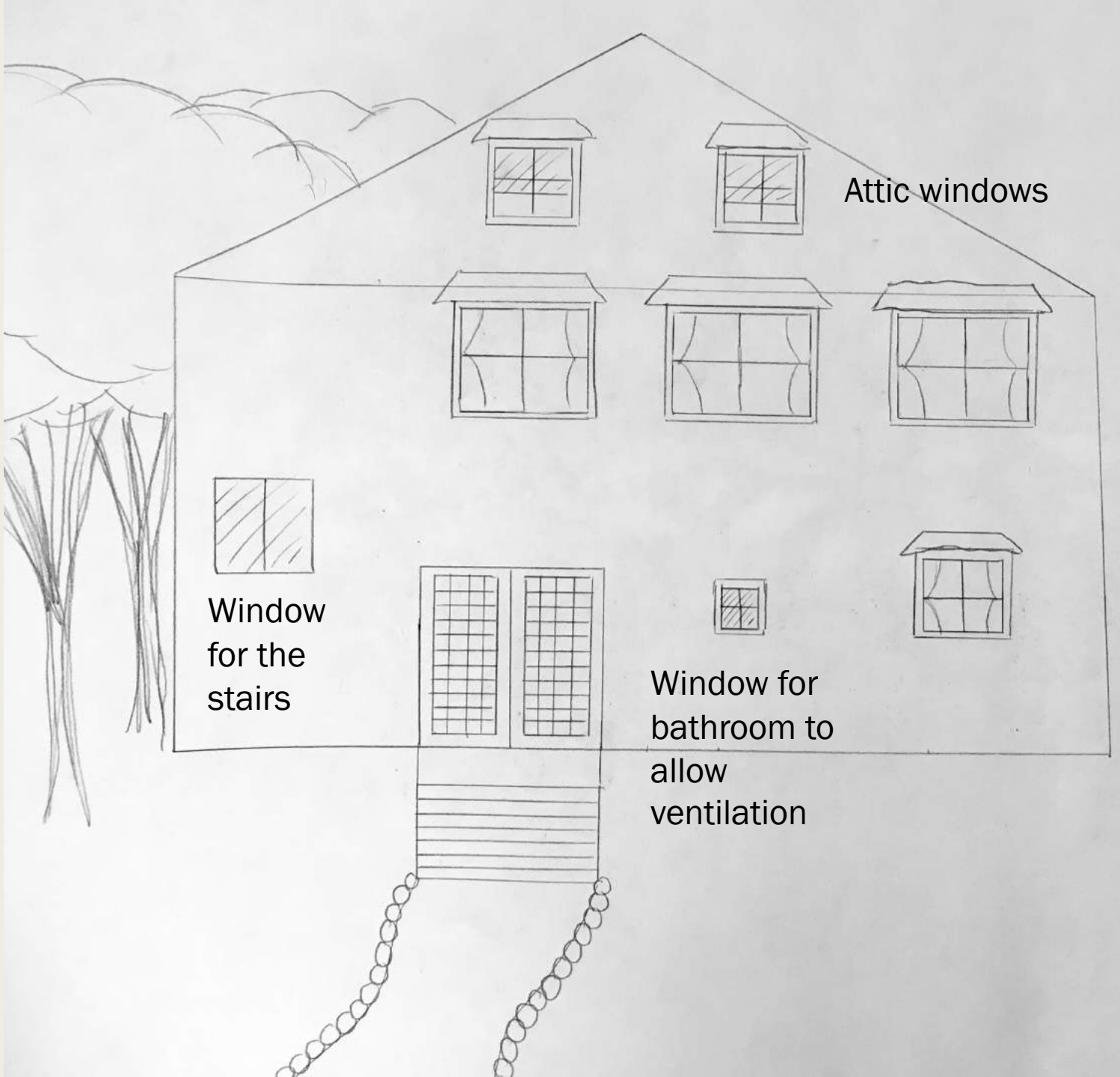
Floor Plan: 1st floor



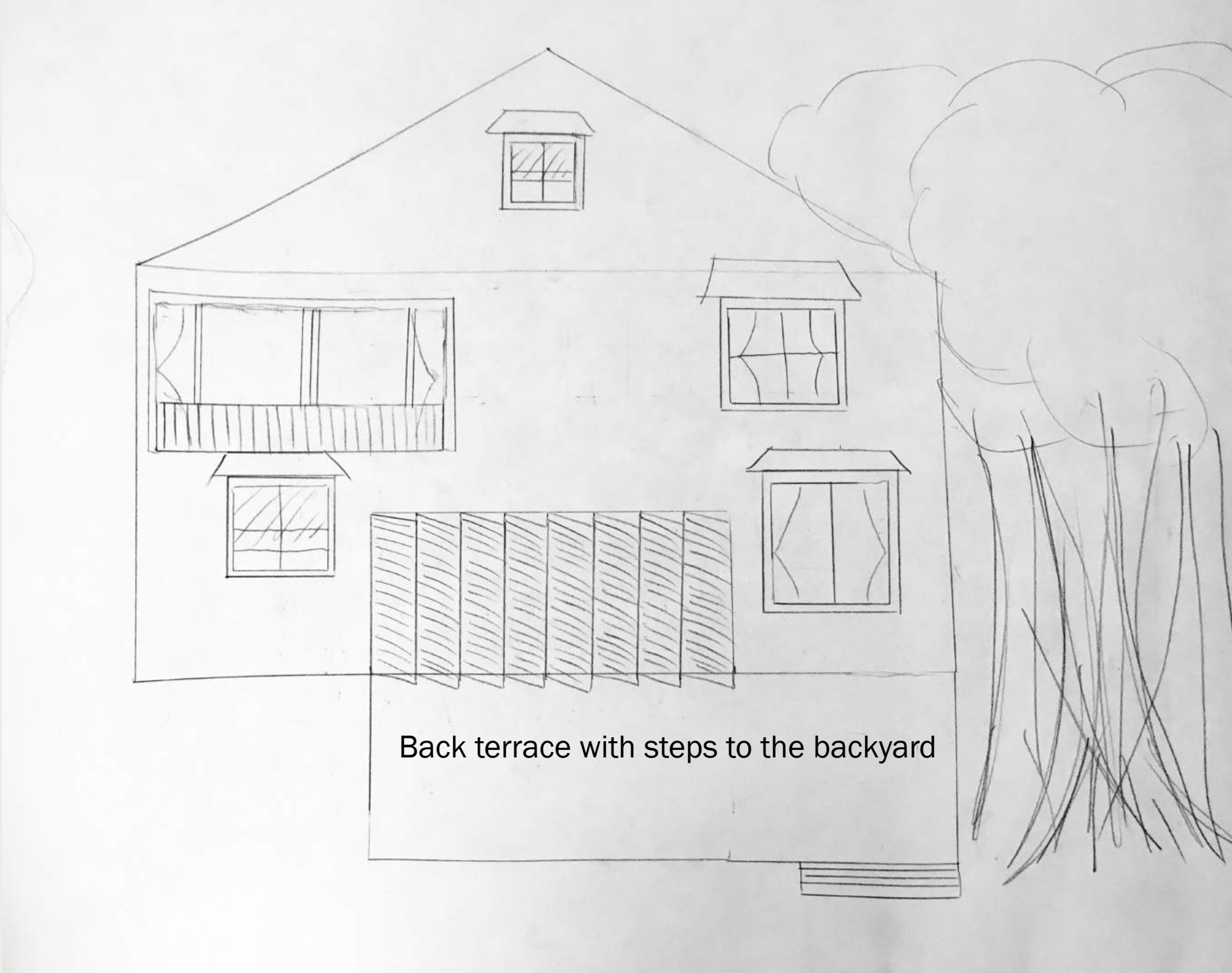
Floor Plan: 2nd floor



Front elevation



Back elevation



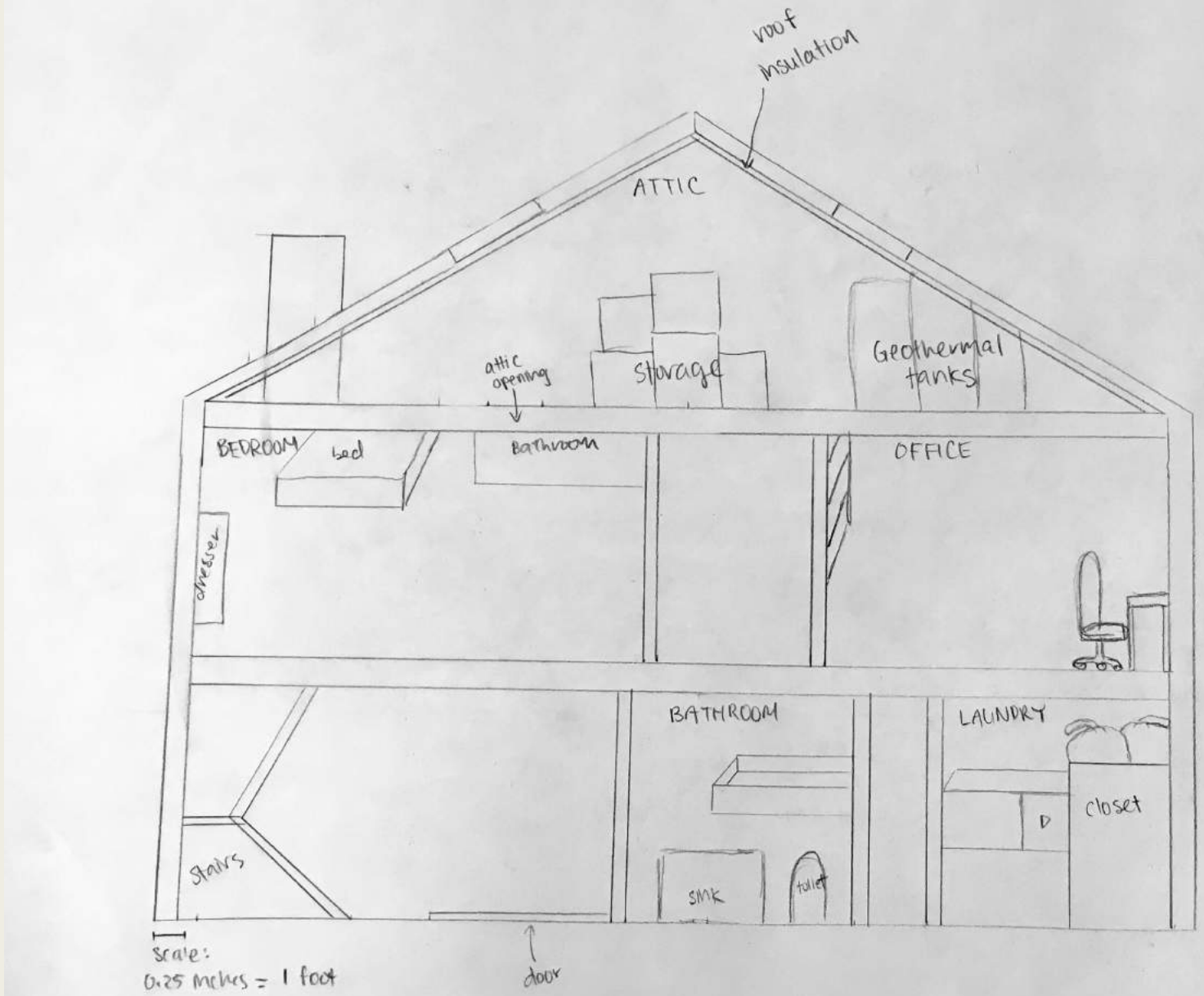
House features

- There is a tree on the northeast side of the house (if you look at the site from the back of the house: true north). I decided to place the stairs and the living room on the right side of the house because there is not much sunlight that is needed on that side (no need for a lot of windows)
- The bedroom on the 2nd floor would have a balcony in order to allow shade to the bottom floor (kitchen)
- I would like for there to be a vegetable, fruits, and herb garden on the kitchen's side as travelling to the nearest grocery store takes a long time. During the winter, however, the garden would not be there as there is no chance for it to flourish due to the climate.
- I wanted the dining room to be connected to the kitchen so I designed the kitchen to be more open. This way there is an easier access to put the food onto the table.
- The bed is oriented towards the balcony to allow maximum sunshine and fresh air.

Section

Note:

- the house is actually not tilted; I just didn't draw it straight enough.
- The drawing shows a hip roof, but a correction would to have a gable roof in order to provide shelter from the sun as well as to allow rain to fall easily

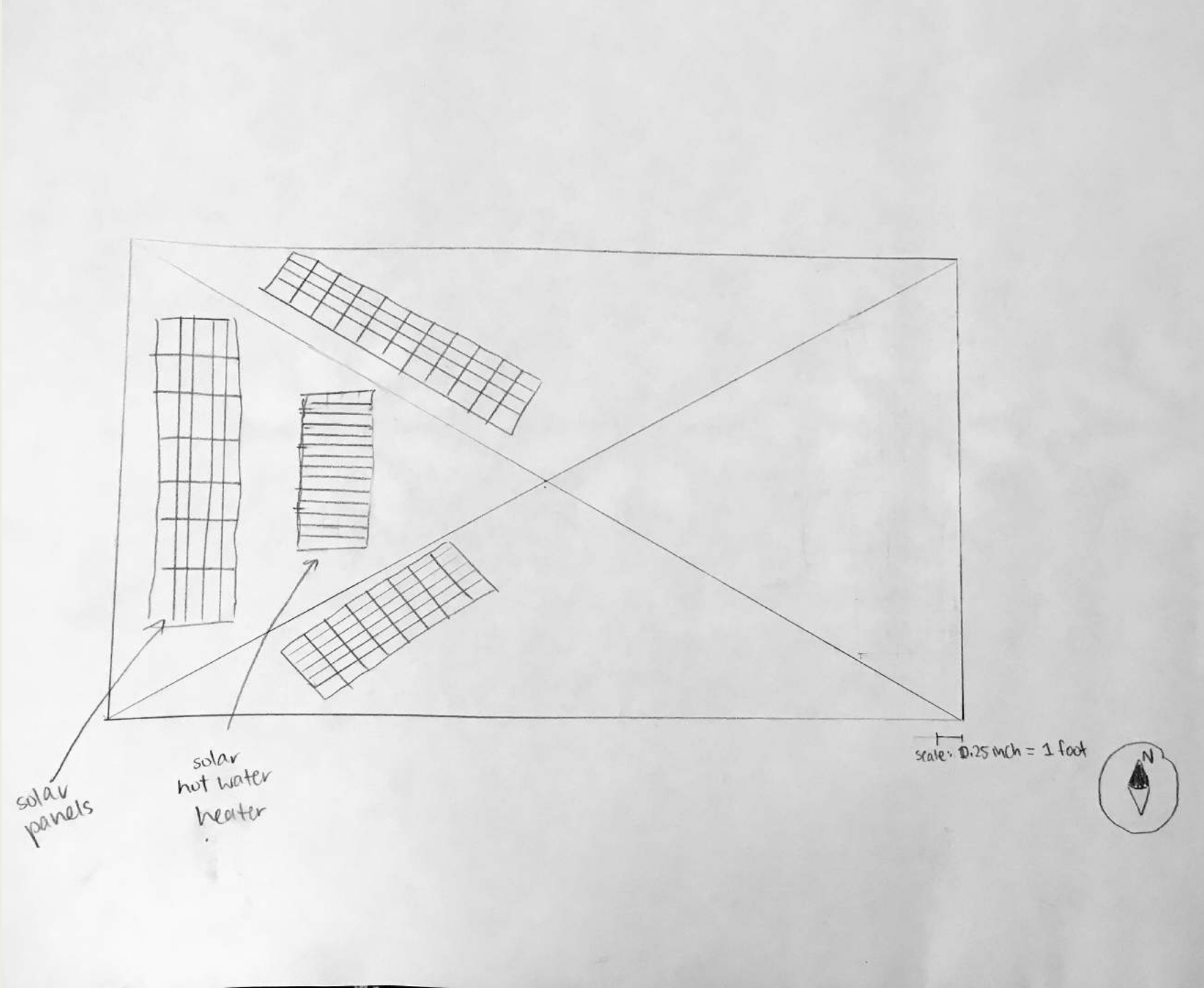


Sustainable features

- Solar panels on the roof to be converted into solar energy to power the electricity (lights, stove, refrigerator, etc). I want to also place a solar hot water heater to allow the house to get hot water for washing, showers, etc.
- Since solar energy would not be enough to power the entire house, there needs to be another source of energy. I decided on geothermal tanks that follow either a open or vertical closed loop, which is common in suburbs. **Correction:** The geothermal tanks are currently located in the attic because I wanted to be able to use up more of the space. It is possible for there to be geothermal tanks up there, but it is not the most ideal as it is better to have it in the basement for less interruption.
- There would not be any air conditioning system throughout the house because the house is located right by the lake, which would allow air to travel through into the house and out. There are insulated bifold doors made up of glass placed before the terrace to allow sunlight to go into the house. Since these doors can swing open in different directions (separately), you can control how much wind you want to enter into the house.
- The bedroom's balcony door has a sliding feature and is made up of glass. This way the door can act as both a window (to allow sunlight and air) and a door (to gain access to the balcony).
- The windows in the house will also be sash windows in order to prevent cold air to get into the house in the winter.
- Having a lot of greenery and open outdoor spaces helps clear the mind of toxins and allows fresh air.

Roof view

- The roof would also have insulation (loose-fill insulation) to allow maximum prevention from cold air rushing in during the winter



Roof view reflections

- Currently the house has a hip roof, which is not the most ideal. A gable roof would be more suited for the environment and area.
- The solar panels are placed on the west side of the house as the east side would not have ample amount of sunlight due to the trees shadowing down. That would not be the most ideal place to put them because there would not be as much sunlight as if it was located on the south.

← What it may look like if it is changed to a gable roof with Southwest facing solar panels

N ←

Sunlight

- Since the summer sun is higher than everything else, having the gable roof edges go down to there should be enough to prevent the house from overheating during the summer