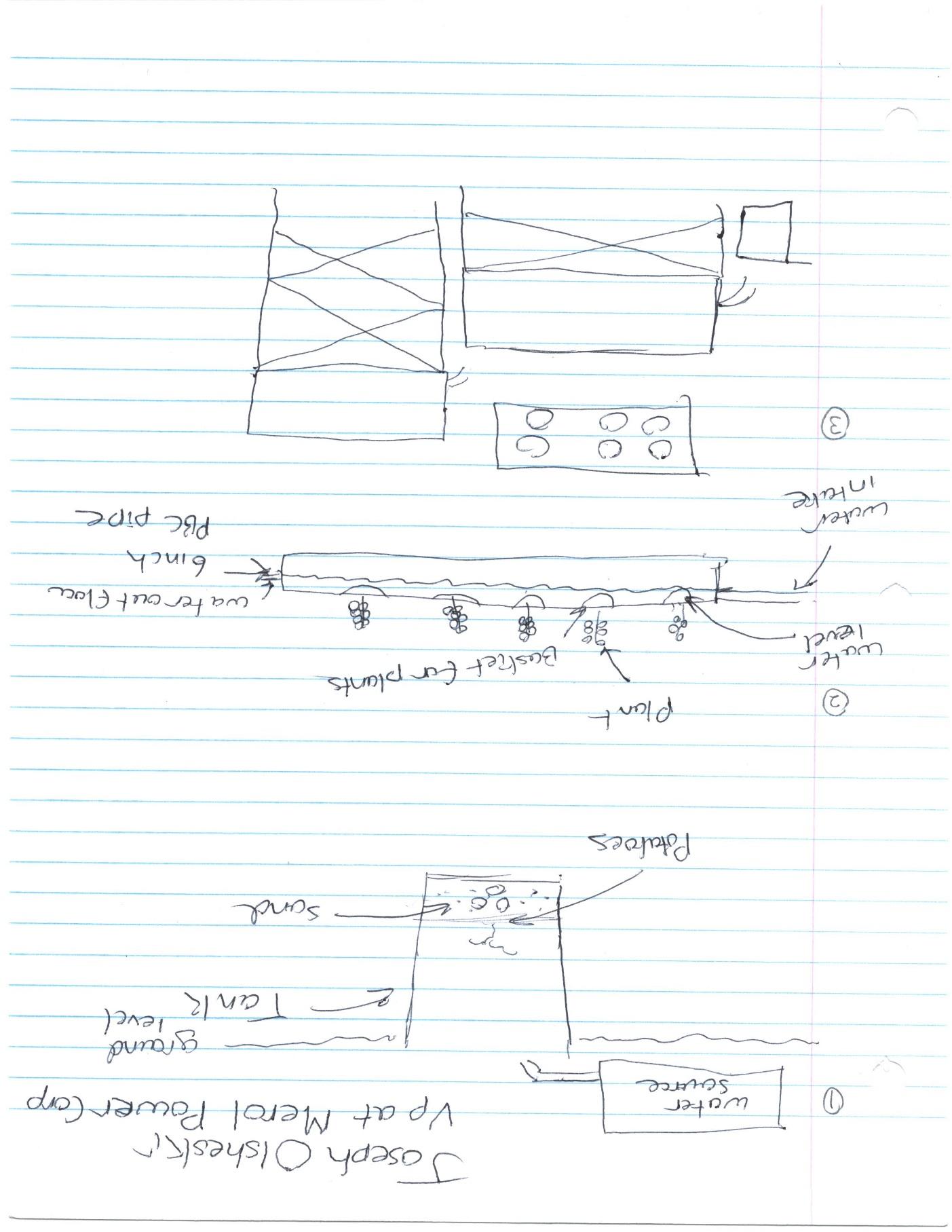
# Introduction

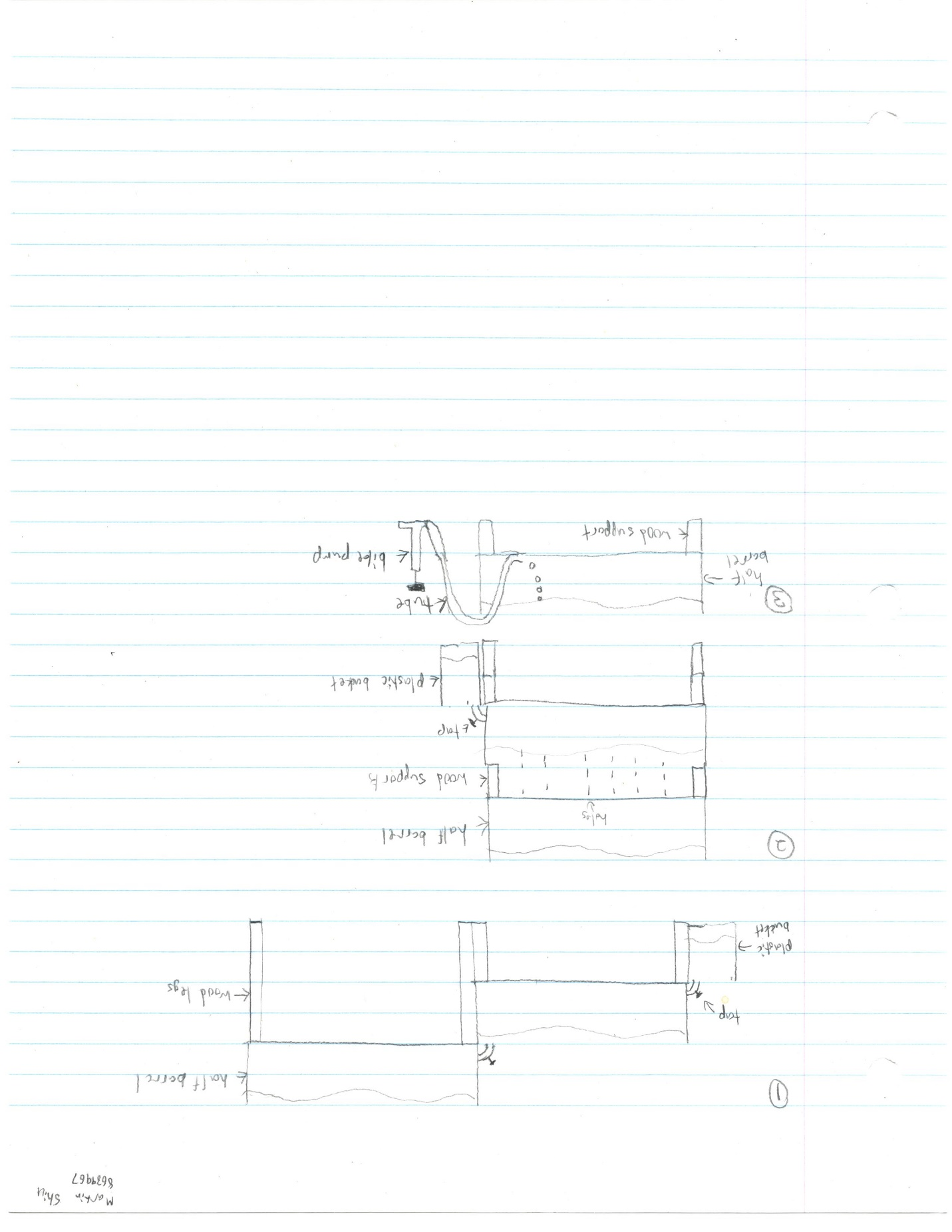
On February 11th, 2017, our team of engineers met to discuss possible solutions to solve the food crisis present in the refugee camps. The goal of this meeting was for every member to come up with three ideas that then would be combined to form one idea from each member. Using each member's final ideas to do an analysis to determine whether or not any of them meet the design criteria outlined at the previous meeting. Using the data gathered the ideas will be refined to create the best possible solution.

# Initial concept designs

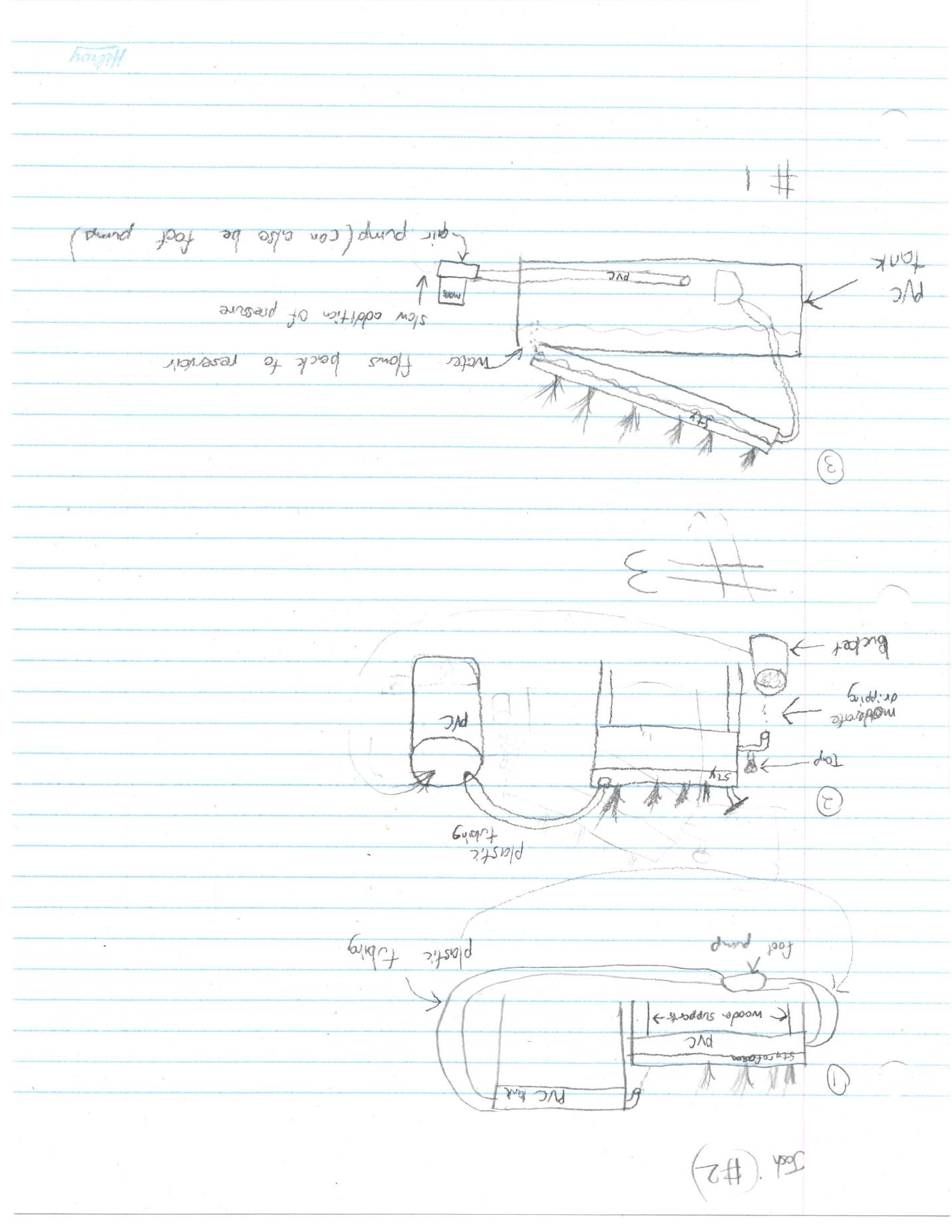
## Joseph



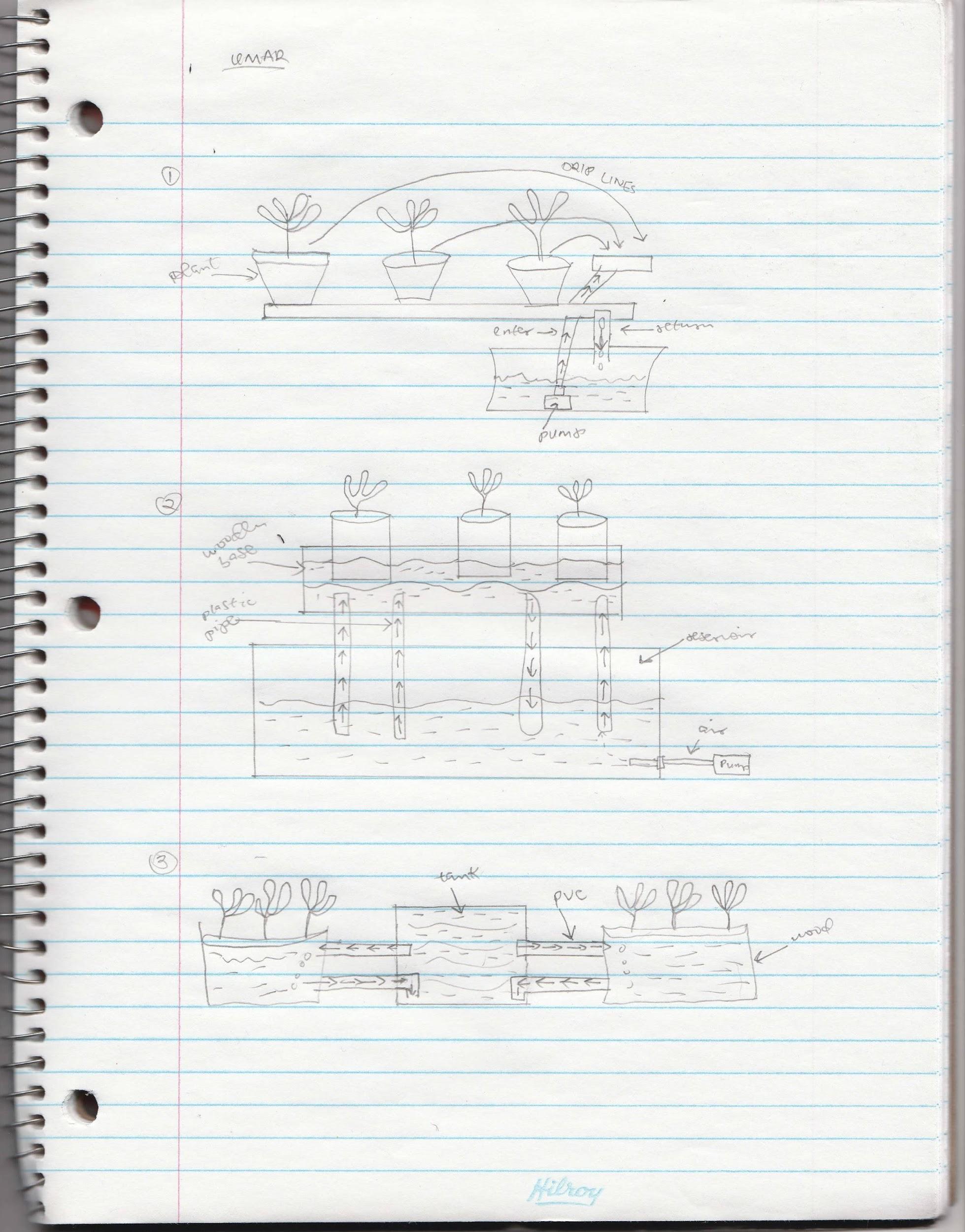
## Martin



## Joshua

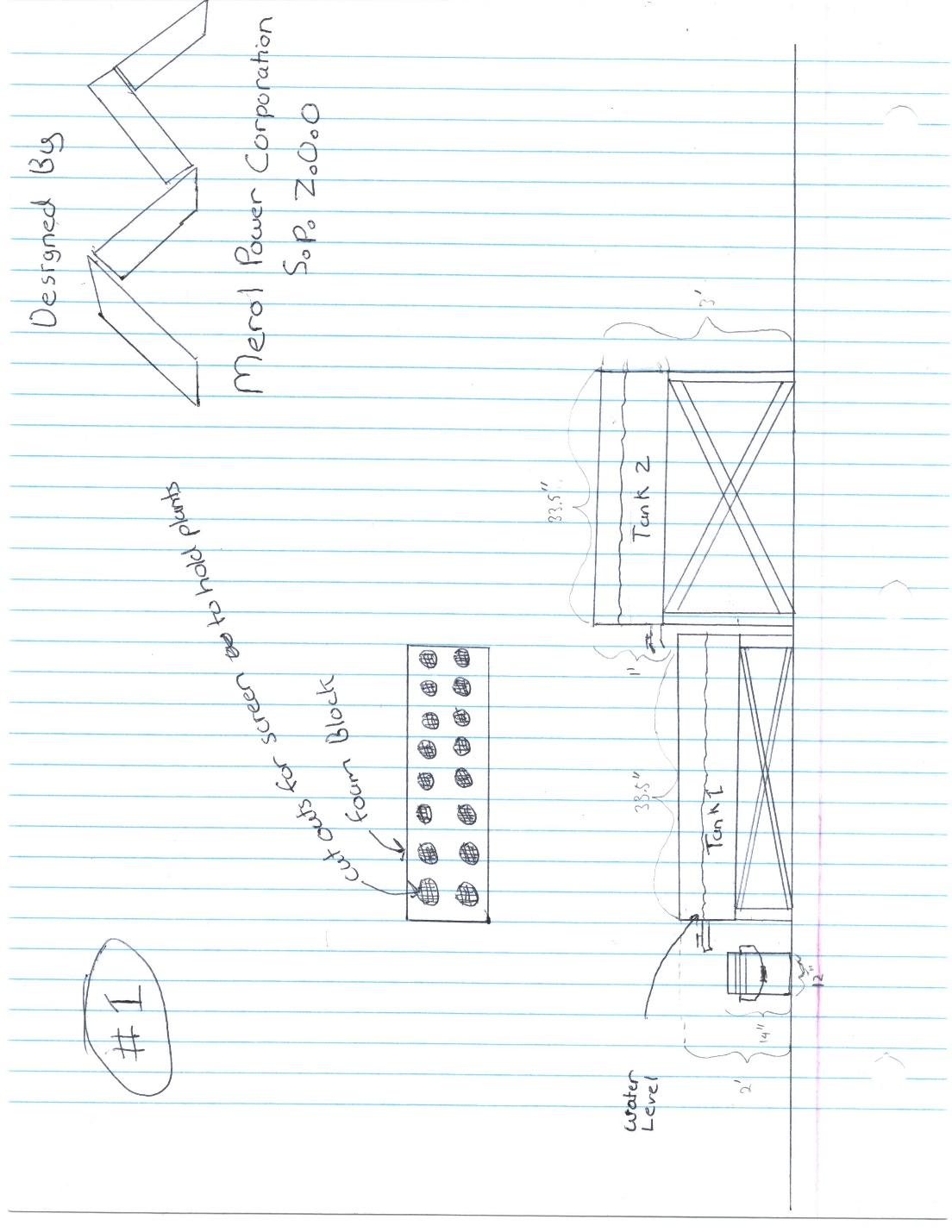


## Umar

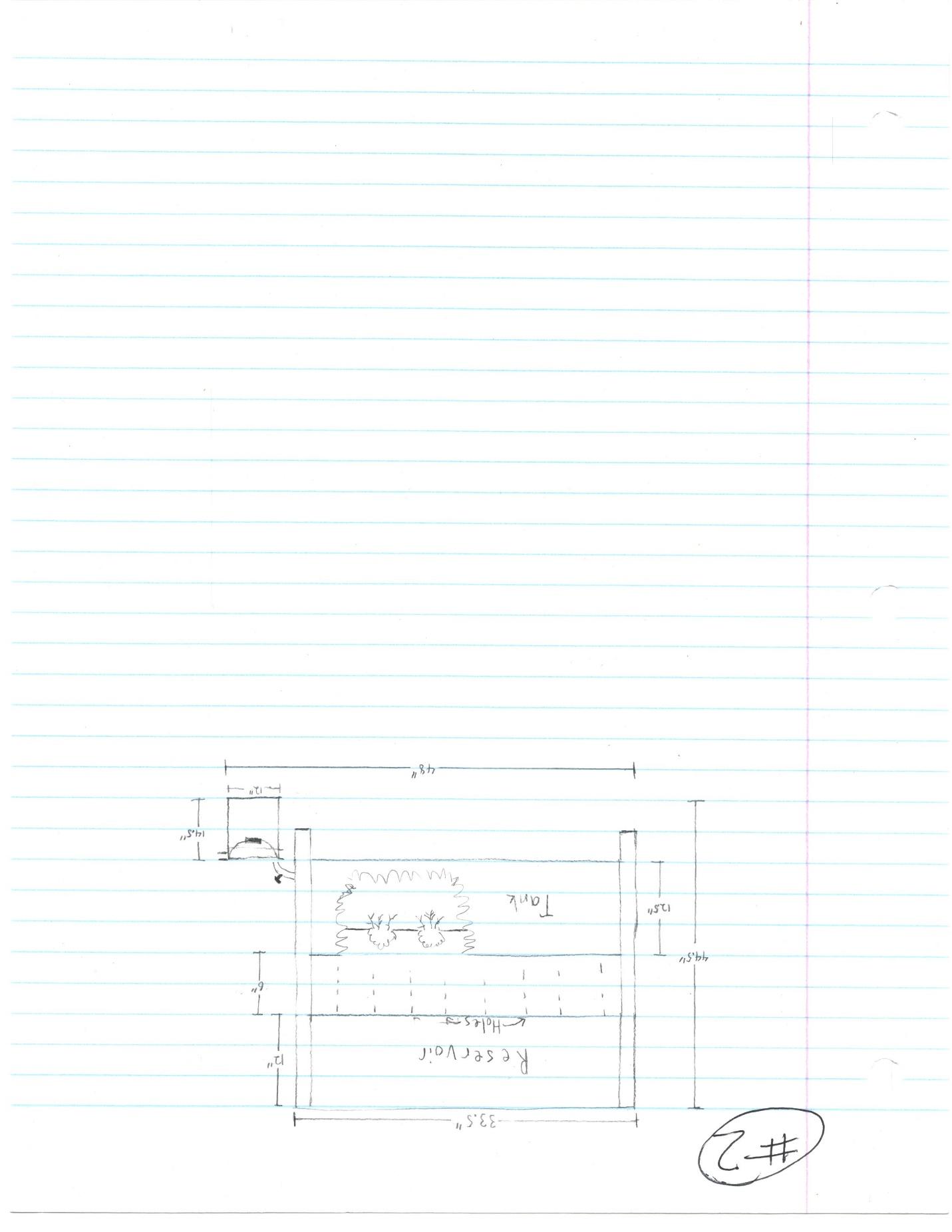


# Refined Functional Designs

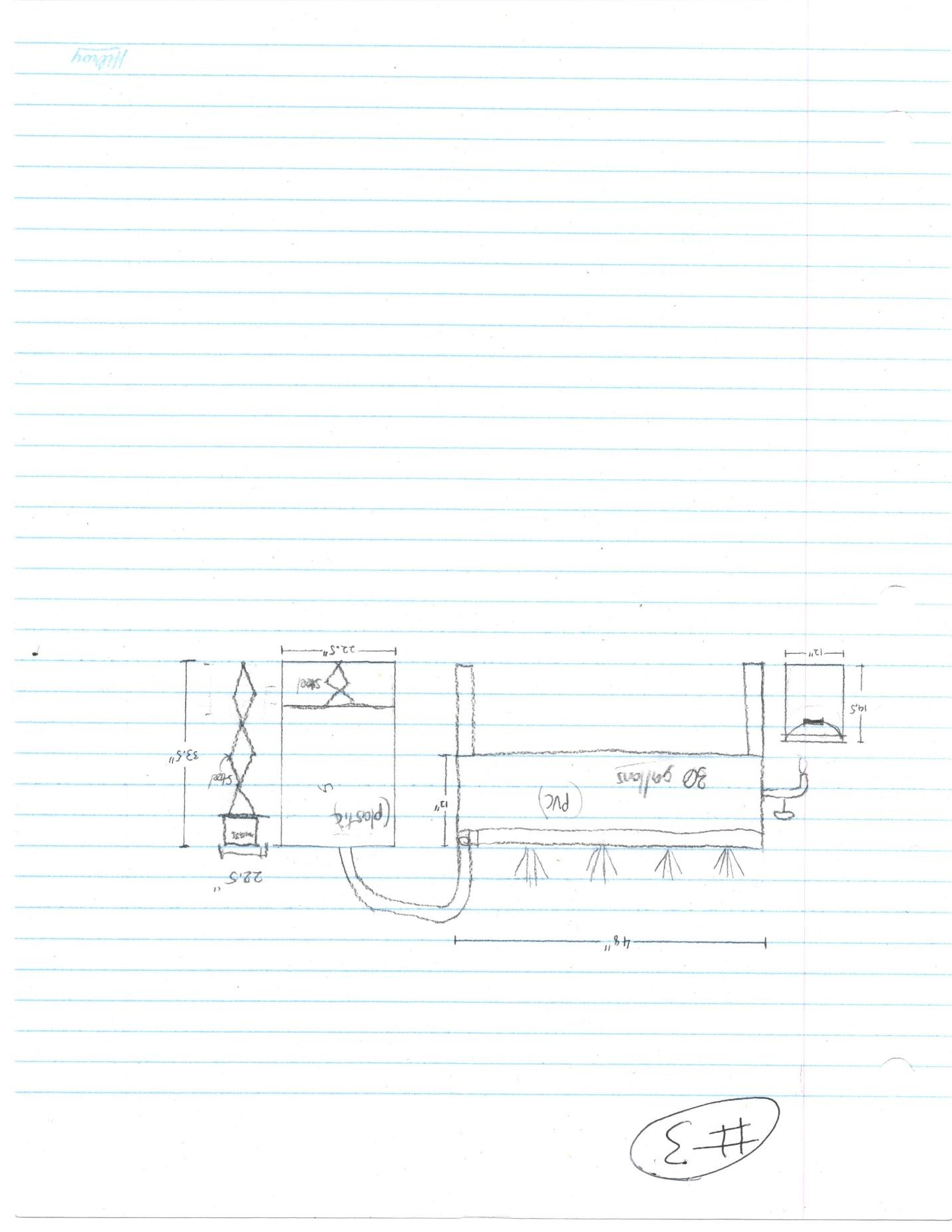
## Design 1



## Design 2



## Design 3



# Selection Matrix

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 2 | 3 |
| Dimensions | Bucket: h=14”, r=6”  Tank 1 + legs: 33.5”  x 22.5” x 24”  Tank 2 + legs: 33.5” x 22.5” x 36” | Bucket: h=14”, r=6”  Tanks + supports: 33.5” x 22.5 X 44.5” | Bucket: h=14”, r=6”  Barrel: h=33.5” r=11.25” |
| Weight | 120lbs | 80lbs | 150lbs |
| Water Volume | 45gal | 45gal | 92 gal |
| Material | Steel | Steel/Wood | PVC/wood/steel |
| Water Consumption (assuming no evaporation) | 0 | 0 | 0 |
| Medium | Water | Water | water |
| Electricity | Not Req. | Not Req. | Not req. |
| Material Cost | $100 | $75 | $150 |

# Design Descriptions

Design 1 incorporates 2 levels of tanks made of half a 55 gallon drums each. From the diagram, the water in tank two would be the reservoir water flowing into tank one.The water in the reservoir (tank 2) would need to have nutrients added into it every so often to ensure an adequate supply for the plants. The water dripping through the valve into tank 1 would aerate the water and also replenish the nutrients in that tank. As the water flows through tank 1, it would slowly exit through another valve into a 5 gallon bucket which would be manually transported back into tank 2, completing the cycle.

Design 2 would be the most compact and material efficient design. It consists of 2 tanks stacked above one another, tank 1 acts as a reservoir containing the nutrient enriched water and tank 2 is for plants to grow in. Tank 1 has strategically placed holes in it to let water drip into tank 1. The holes would allow for water to be aerated as it hits the water in tank 2. Tank 2 is the container for the plants which are held in place by a floating membrane with holes allowing for the water droplets from tank 1 to physically hit the water. The water then travels through a valve into a 5 gallon bucket which would be manually transported back into the reservoir.

Design 3 has a pressure plate with a mass on top of it. This mass pushes the plate downwards which would in turn, pushes the plate on the bottom of the tank up. This would make the water from the barrel flow through the tube into the reservoir. The recycled water would then go into the bucket and back into the barrel.

For design 1, Joseph took his three-layered dual tank system and incorporated taps into it. For design 2, Martin took his second conceptual design, and added a water permeable plant holding platform from Joe’s design.

For design 3, Josh took his gradual addition of pressure concept from his first design and incorporated it into his final design.

In the end, design 1 was selected as the base for the global concept. The group agreed that some parts in the the original design could be substituted for wood from design 2 instead of steel. This combination would decrease cost and weight but would also decrease the durability of the product. The two materials could easily be interchanged if the user preferred one over the other.

# Conclusion

Looking at the three final designs that were created by the engineering team, it is possible to see that they share many similarities to each other. The main and most important similarity is that none of the final solutions require electricity to function. The main downfall of all of the final ideas is that they all require a large amount of water to function properly. Looking at the list of specifications it is clear to see that they are many areas in which the designs can be refined to make them more effective.