

## INTRODUCTION

- Chesapeake Bay far exceeds current nitrogen TMDL
- Smart monitors can be used to measure nutrient loads being discharged from green infrastructures
- In current bioreactor gardens, only water levels are measured, so nitrogen sensing is needed
- Green Mechanics has been implementing data transmission through satellite to determine water readiness to discharge

## DESIGN OBJECTIVES

- To increase applicability to present systems, a small-scale bioreactor garden was constructed to run synthetic wastewater
- Through influent and effluent testing, we sought to establish a correlation between nitrogen and dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), and electric conductivity (EC)
- The microcomputer processes and displays data from effluent to determine whether the garden should extend retention or discharge

## SAP & SOP

### SOP:

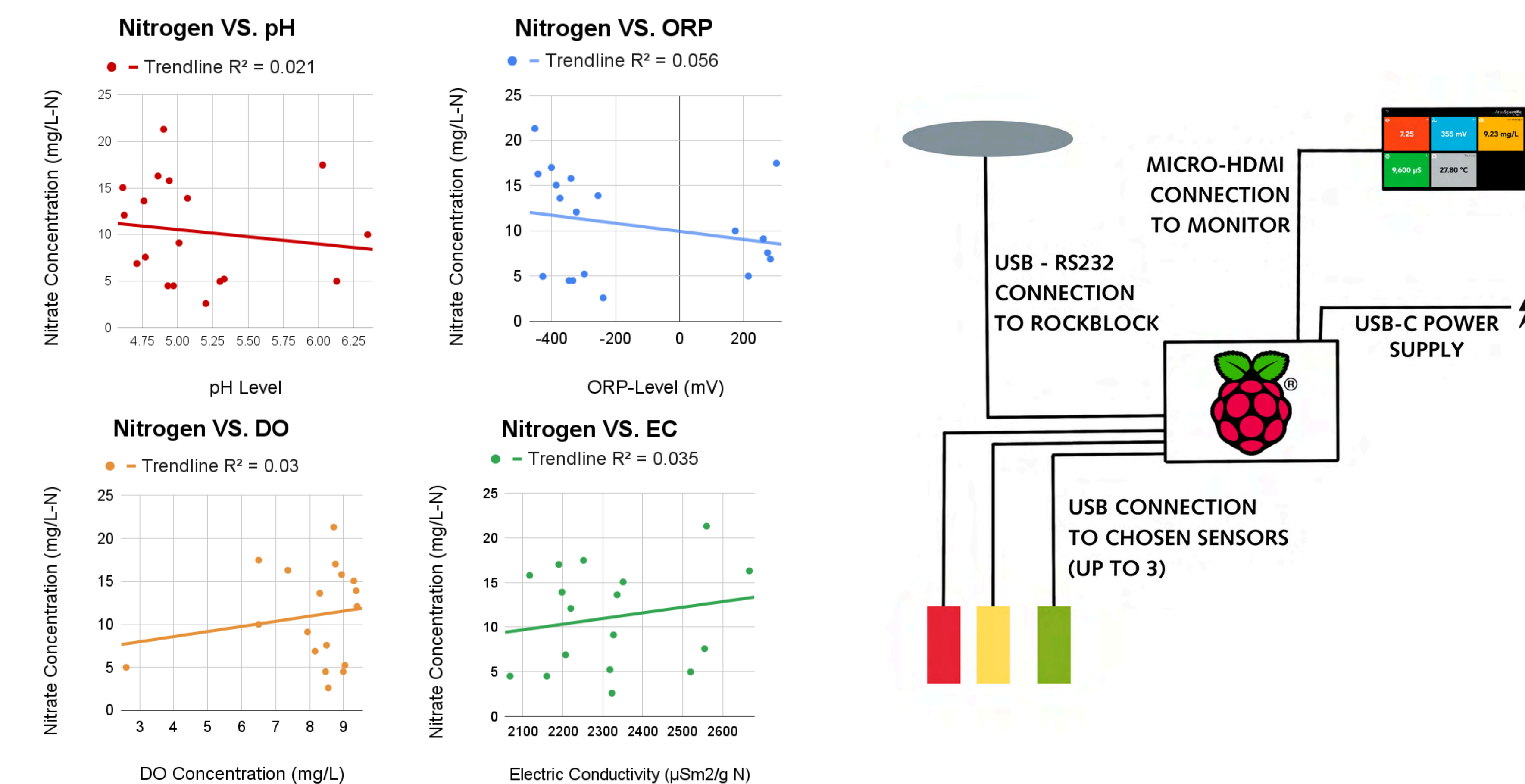
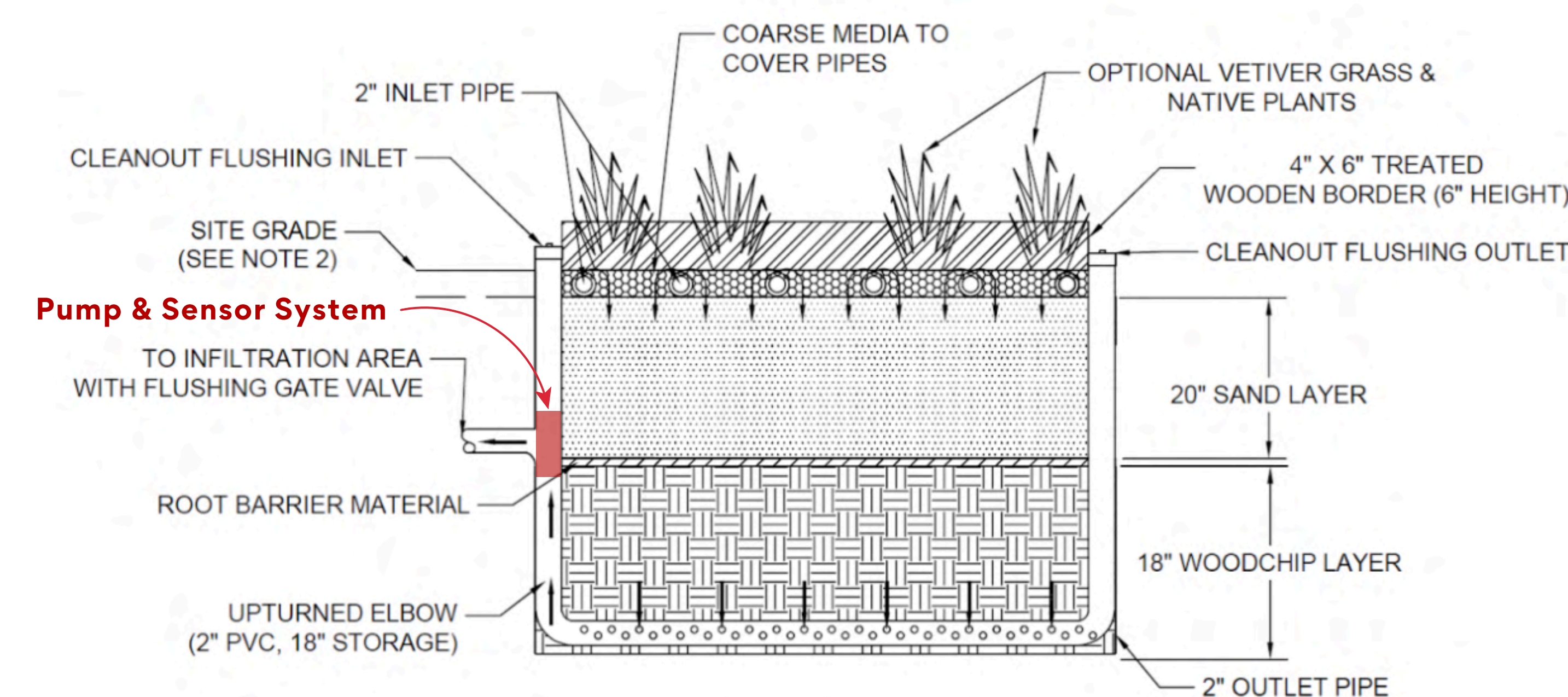
- 1) Soak Dog Food in DI water for 24 hours
  - a) 6 cups of Dog food for 1 gallon of DI
- 2) Filter water to remove large solids
- 3) Run filtered water through garden using a pump
- 4) Leave water to sit for 24 hours retention time
- 5) Take measurements for Nitrate, DO, pH, ORP, and EC on effluent

### SAP:

- 1) Remove outliers from analysis through Z value
- 2) Plot all points and find a trendline with  $R^2$  value
- 3) Use correlations where  $R^2 > 0.5$

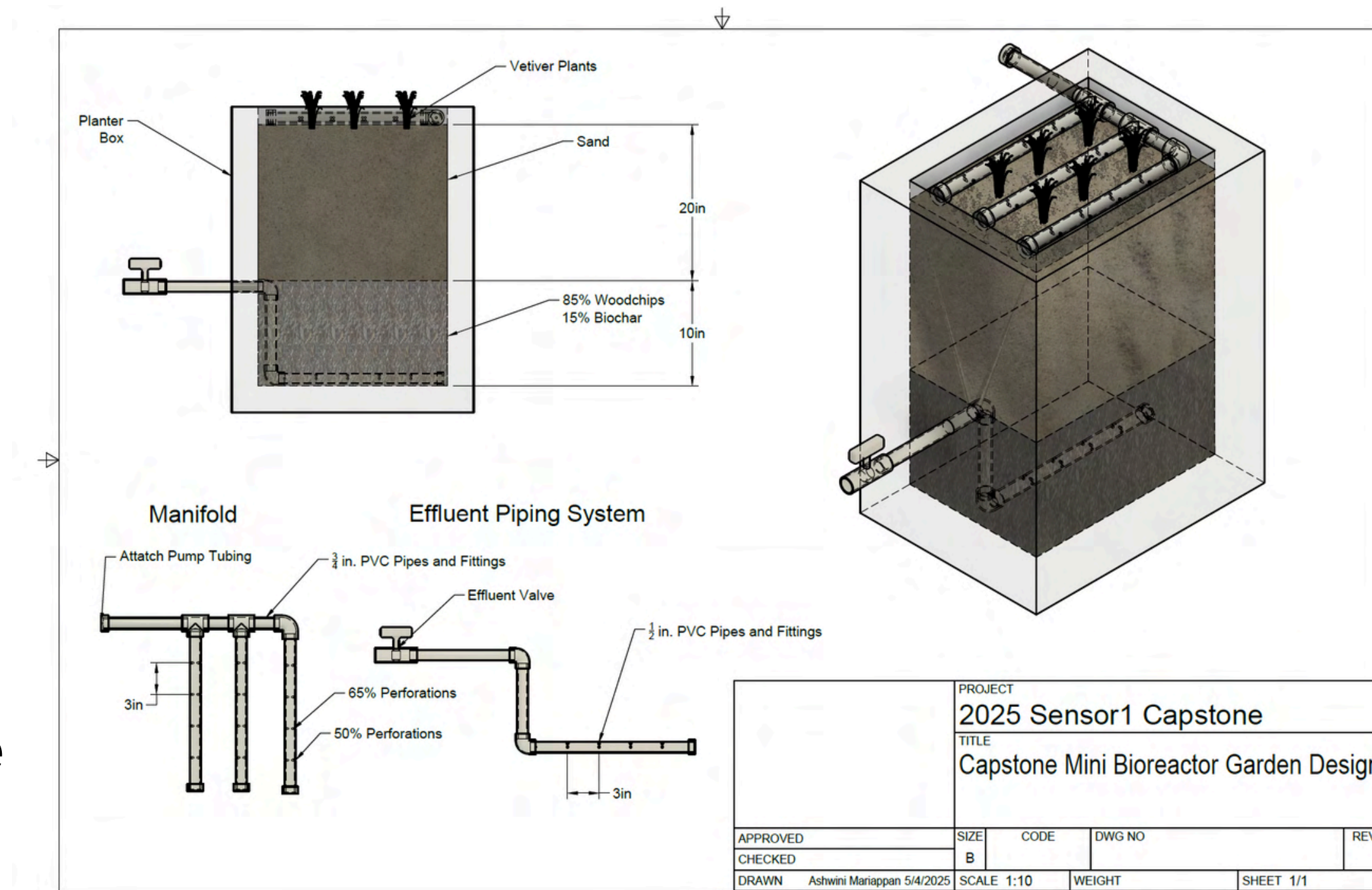
## DESIGN SKETCH

The sensor will be installed above the outlet pipe and connected by cable to the existing RockBLOCK, which detects water height and connects to the satellite transmitter. A pump will pull a sample for testing. The data and discharge command will be sent and the discharge valve will open or remain closed.



## CORRELATION RESULTS

Due to several complications, a strong correlation was not found. DO and pH are likely to be the strongest indicators of sufficient nitrogen removal. Future replications of the experiment can reduce uncertainties and enable researchers to determine threshold values with the strongest correlations.



## COST ESTIMATE

DO SENSOR KIT	\$390	RASPBERRY PI	\$110	MONITOR CONNECTION CABLE (MICRO HDMI-HDMI, OPTIONAL)	\$20	Total cost: <b>\$1424</b>
PH SENSOR KIT	\$270	SD CARD (32 GB)	\$10			
ORP SENSOR KIT	\$270	MICROSD READER	\$17	POWER SUPPLY CABLE (USB C-)	\$?	
EC SENSOR KIT	\$315	ROCKBLOCK CABLE CONNECTION	\$23			