



***SLRP.***

# Sea Life Revival Project

**ENGI Tank 2021**

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## THE PROBLEM

**94%** of the plastic in the ocean is microplastic

Estimated **\$13 billion** of damage to marine ecosystems

Microplastics harm wildlife and make their way into our bodies

Current solutions act at the sources of these plastics,  
but few clear up what is already out in the water

# THE SOLUTION

**Two-part system** of buoy and filter sits near coastal reef regions or underwater currents

Possibility for use of sensor to detect capacity

**Activated carbon filter** sits 15-20m underwater and removes microplastics from the ocean

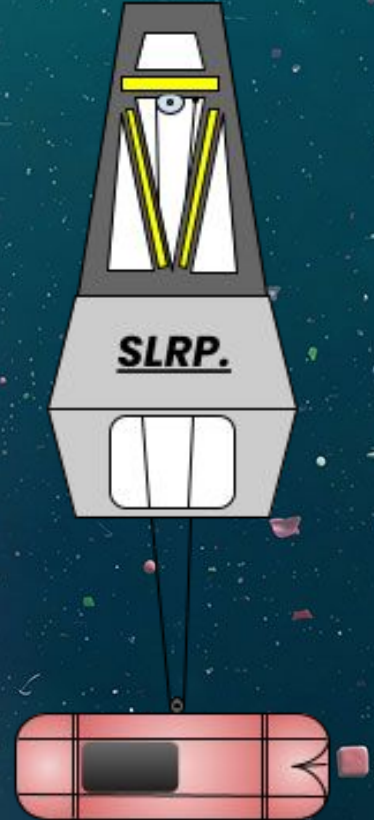


# THE DESIGN

Large buoy acts as a **floatation device** for the filter as well as a way to **track it**

Filter is attached and is designed to **maximize water inflow** and **microplastic capture**

Paired **together**, they create an **efficient** microplastic collection device



# SYSTEM DESIGN OVERVIEW: BUOY

## Electronics Bay

- Houses all technology (excluding solar panels)

## Buoy Framework

- Made of polyethylene and stainless steel
- Floats stably up to 1350 lb, is able to resurface easily in choppy waters

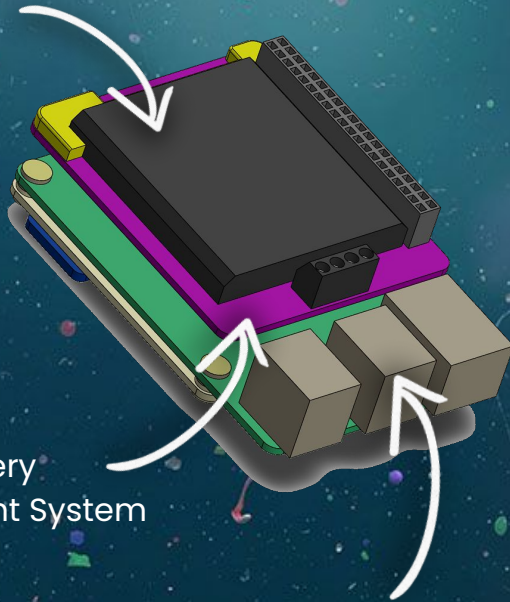
## Winch System

- Cable attached to filter in the water



# ELECTRONIC COMPONENTS

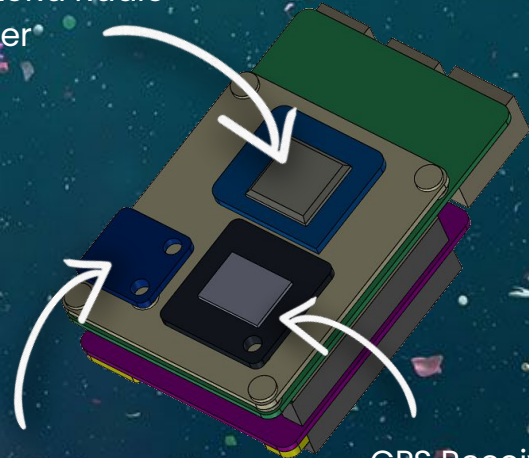
1860 mAh battery



PiJuice Battery Management System

Raspberry Pi 4

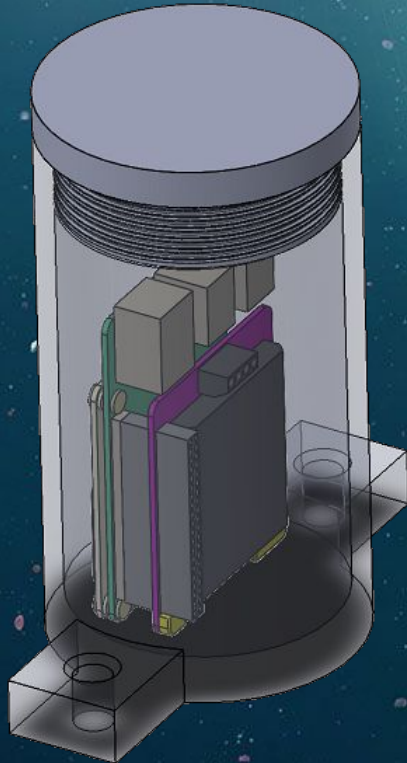
RFM96W LoRa Radio Transceiver



MPL3115A2 - I2C Barometric Sensor

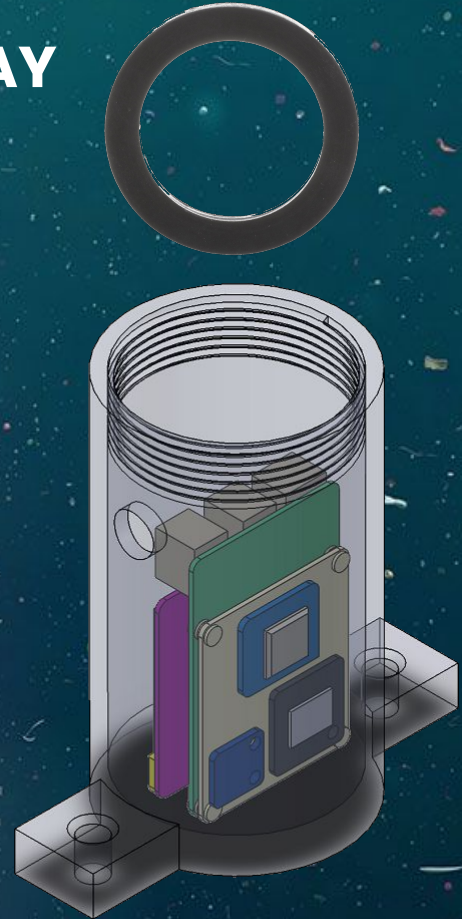
GPS Receiver

# SYSTEM DESIGN OVERVIEW: ELECTRONICS BAY

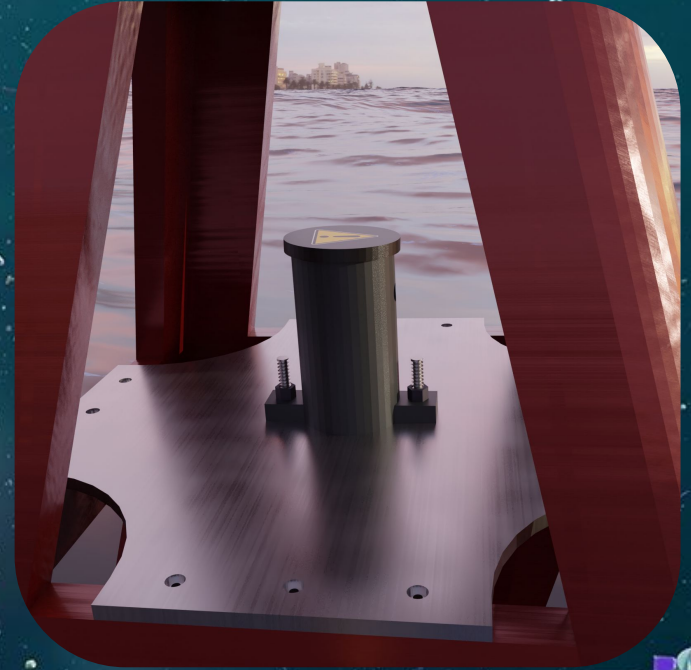
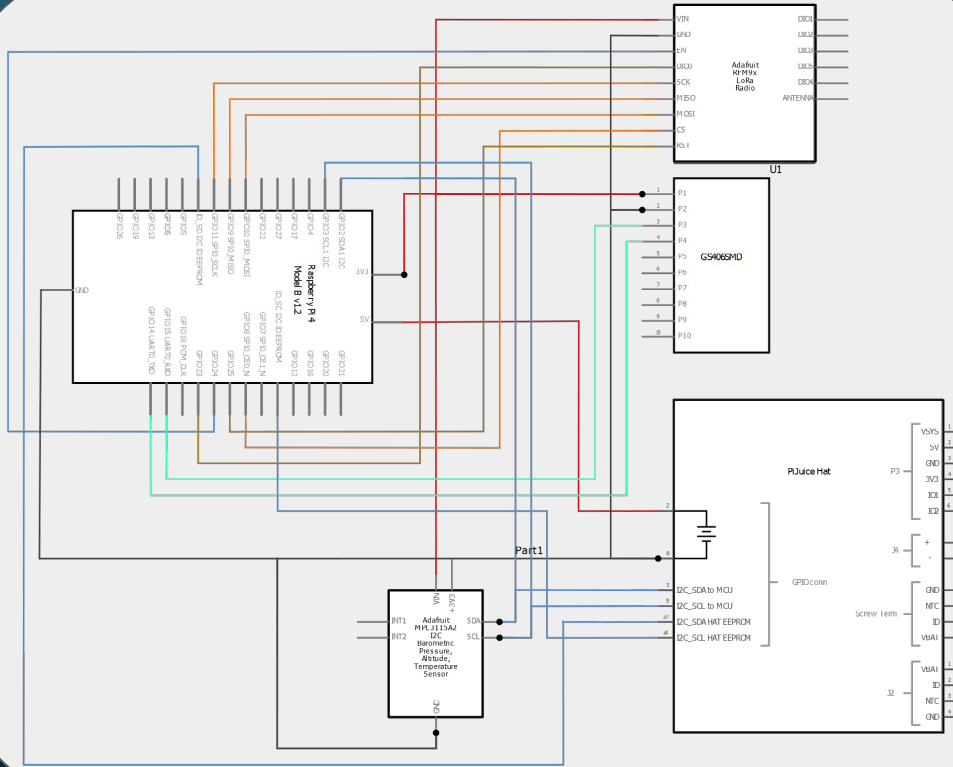


The **Electronics Bay** houses all technology (excluding solar panels)

The lid screws shut, which applies a downward force on the rubber O-Ring in order to keep the electronics safe from the water



# ELECTRONIC COMPONENTS

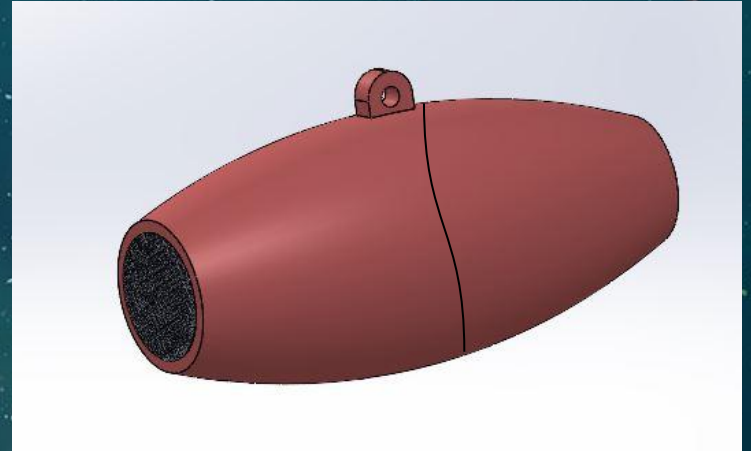




# SYSTEM DESIGN OVERVIEW: FILTER

The cylindrical filter houses multiple **mesh layers**, a **specialized opening**, and a **carbon filter block**

The **activated carbon block** will be at the very end of the filter to trap microplastics

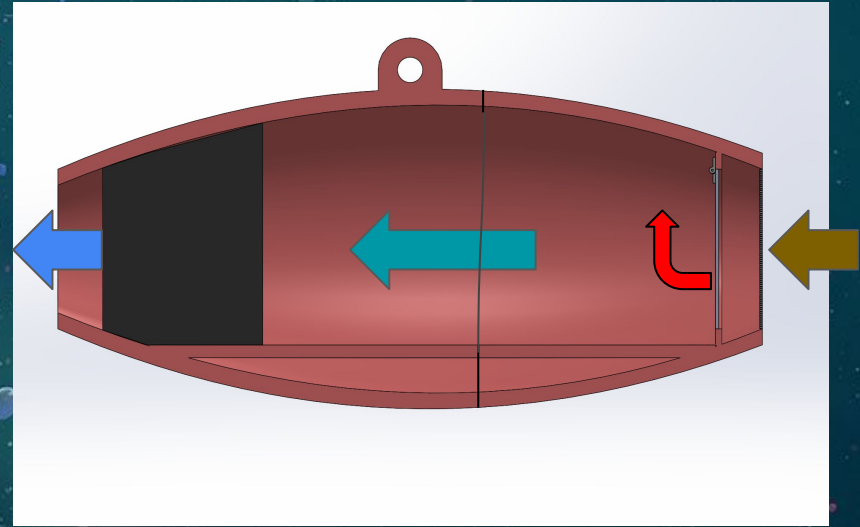


# OPENING

Opening is designed to **maximize** water flow into filter, **minimize** water flow out the opposite way

Allows **correct** orientation

Heavily reduces **backwash** of already collected plastic

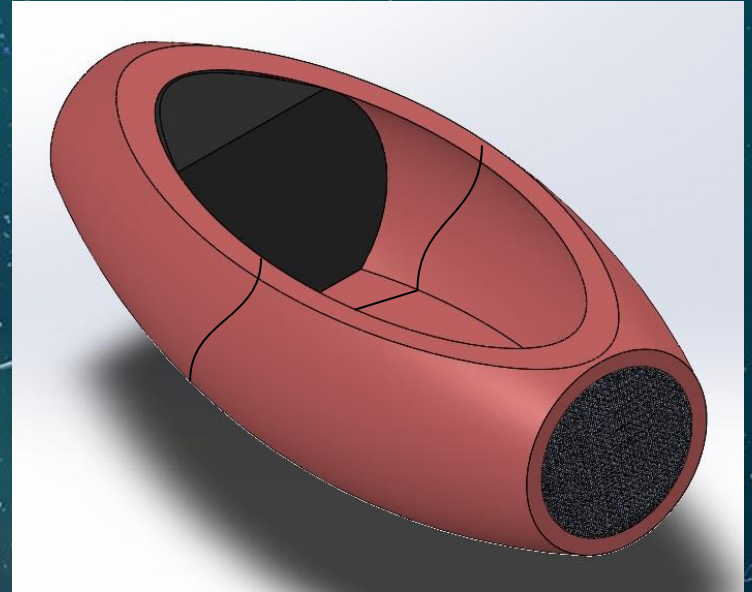


# CARBON PAD REPLACEMENT

**Winch system** on buoy  
allows easy replacement of  
**carbon pads**

Hangs **securely**  
from buoy

Filter is **opened**, and pads are  
replaced with **fresh** versions



# EFFECTIVENESS

Estimated that the filter can process **30-50 L** of ocean water per hour

Around **5 microplastic particles** per cubic meter at 15-20 meter depth

Expected capture of around 2200 pieces of microplastic every year, and with an expected life of at least a decade, expected about 22000 pieces during its lifespan

Filter Replacement is due every 6 months

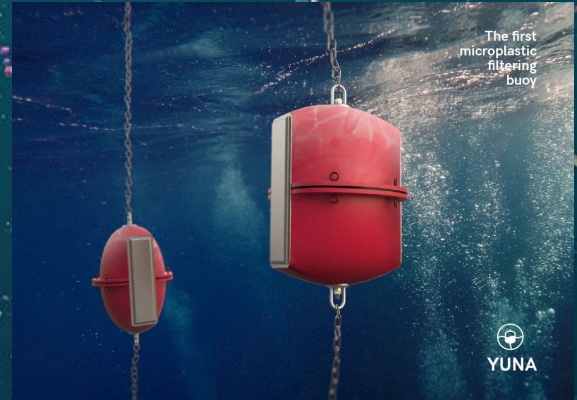
# OUR DESIGN ADVANTAGES

Ease of use is our goal to separate ourselves from other microplastic filters

The winch design allows easy filtration replacement

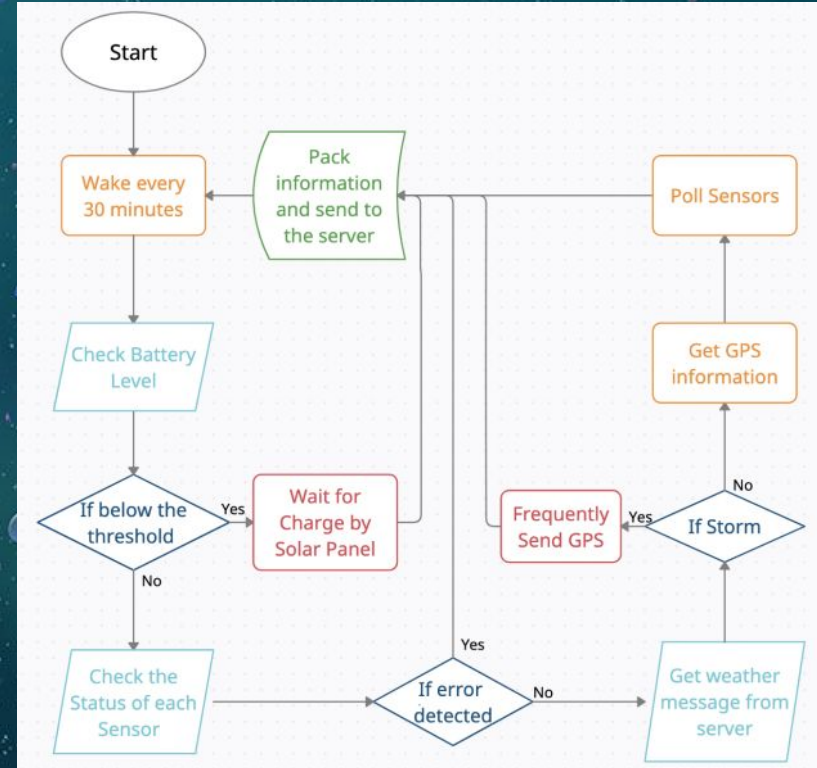
No water equipment required

Easy filter replacement and maintenance from above water

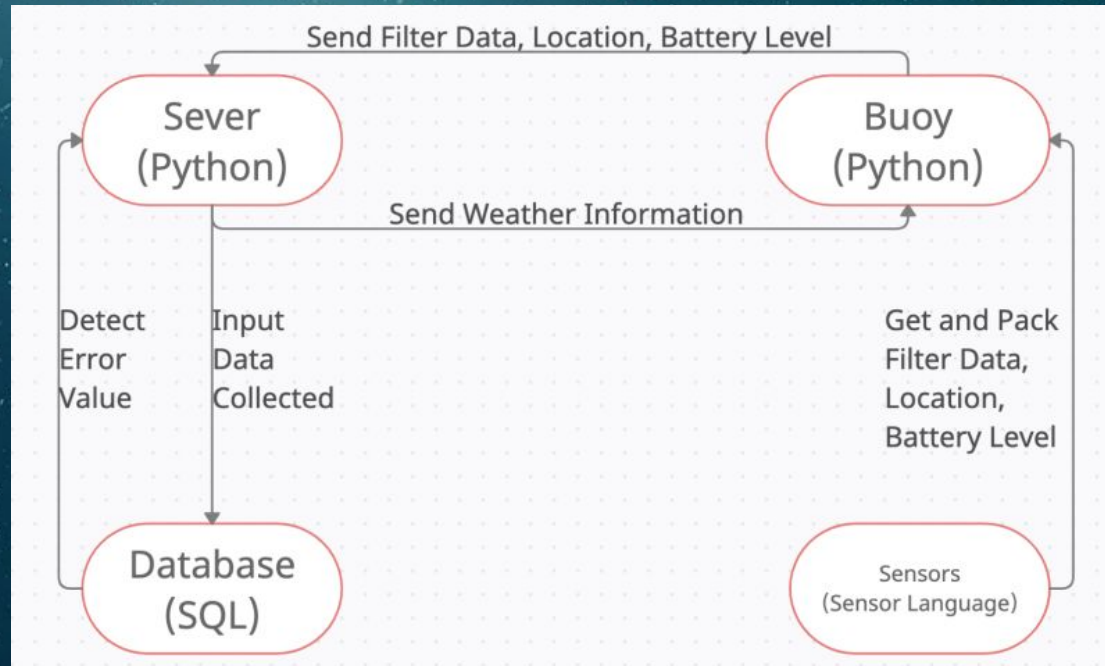


# FLOWCHART

1. Wake every 30 minutes
2. Check battery level of on board battery
  - a. If below threshold, wait for a charge
3. Check the status of all of the sensors
  - a. If any errors are found, send error message to server
4. Get weather from server
  - a. If storm is forecasted, ping location
5. Pull information from all of the sensors and send it to Server



# CODE STRUCTURE



# BILL OF MATERIALS

Buoy	Cost	Quantity	Total Cost
Polyethylene	\$0.55/lb	235.65	\$129.61
316 Stainless Steel (in general)	\$0.78/lb	406	\$316.68
Reflective Tape	\$1.00/ft	8	\$8.00
Waterproof Crank Winch	\$28.90	1	\$28.90
Polypropylene	\$2.19/ft	50	\$109.50
<b>Buoy Total:</b>			<b>\$592.69</b>
Filter	Cost	Quantity	Total Cost
Polypropylene	\$0.28/cub.in.	300	\$84
Activated charcoal sheets	\$0.04/sq.in.	120	\$4.52
Fiberglass mesh	\$0.0025/sq.in.	19	\$0.05
Buna-N Rubber strip	\$2.05/sq.in.	10	\$20.50
Sand	\$0.11/lb	1	\$0.11
<b>Filter Total:</b>			<b>\$109.17</b>
Electrical Systems	Cost	Quantity	Total Cost
Microcontroller	\$35	1	\$35
GPS module	\$11	1	\$11
Low voltage Solar Battery Charger+Battery	\$120	1	\$120
Network Access Point	\$25	1	\$25
Additional Weather Sensor Budget	\$10	1	\$10
Additional Miscellaneous Parts	\$10	1	\$10
<b>Electrical Systems Total:</b>			<b>\$211.00</b>
<b>TOTAL ESTIMATED COST</b>			<b>\$912.86</b>

## Pricing

Materials +  
Manufacturing = \$1100

Selling Price = \$1200



# BENEFITS

- Mitigate the amount of microplastics stagnant in the ocean
- Reduce health risks posed to both humans and seawater organisms
- Create cleaner coastal areas

# FUTURE RESEARCH

- Test filtration system prototype along California coastline
- Modify prototype based on results
  - Modify chassis for more efficient water filtration
  - Reduce costs of materials and manufacturing
    - Aim to reduce size and weight
- Identify most impacted coastal regions
  - Rivers, estuaries, open ocean, coastlines, etc.
- Contains **optical sensor** that will alert customer when filter is full
  - Reduce further need of checking to maximize rate

# Thank You

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