Sensors, Microcontrollers & Power Components

Microcontrollers/Boards:

- Cellular + Computation Boards:

- *Option 1*:

- Integrated Cellular: LILYGO T-SIM7600G-H ESP32-WROVER-B - $49.79

- Custom ESP32 Breakout PCB

Option 2:(Chosen*)

- Computation Board: Firebeetle ESP32 IOT Board - $12.9

- Sensor Brekaout Stack: DF Robot Gravity Sensor Expansion Board - $4.9

- Cellular + GPS Module (2 Digital Pins): Crowtail CRT01260S Cellular + GPS Board - $26.63

- Ada Fona Antenna: Right Angle Mini GSM SMA Anetnna - $5.95

Sensors:

- Ph Sensor (Analog): DF Robot Industrial Grade Ph - $64.9

- DO Sensor (Digital): DF Robot Dissolved Oxygen Sensor - $169.0

- EC Sensor (Analog): DF Robot Electrical Conducticity Sensor - $199 or order from Digikey

- Turbidity Sensor (Analog): DF Robot Turbidity Sensor - $9.9

- Temp Sensor (Digital): DF Robot Temp Sensor - $7.50

- ORS Sensor (Analog): DF Robot Oxygen Reduction Potential Sensor - $129

- Water Leak (Digital): DF Robot Water Leak Sensor - $17.9

- Derived Measurements:

1. **TDS** (mg/L) = 0.64 * EC (µS/cm)
2. **Algae Bloom Risk Score** = weighted sum of (high temp + high turbidity + pH↑ + DO fluctuations).
3. **Nutrient Enrichment Indicator** = EC↑ + ORP↓ + DO↓ trends after rainfall/runoff events.
4. **Organic Pollution:** Low DO, low ORP, and high turbidity indicate decomposing organic matter; pH and temperature affect bacterial activity; DO decline over time estimates BOD.
5. **Thermal Pollution:** Rising temperature with falling DO signals heated discharges or runoff.

6. **Chemical/Industrial Pollution:** Extreme pH, high EC, abnormal ORP, and suppressed DO reveal ionic or chemical effluent, though specific compounds remain unknown.

7. **Eutrophication/Algal Blooms:** Elevated daytime DO, nighttime DO drops, higher pH, and turbidity growth show algal photosynthesis and bloom intensity.

Power Components:

- Solar Panels (Options):

1. (x2): 280x280mm 10W 12V - $24.19
2. (x2): 250x120mm 10W 12V Solar Panel - $3.64

- Lipo Battery: Li-ion 3.7 V nominal, ≥6000 mAh - $24.99

- Solar charger: Adafruit DC Solar Li-ion Charger -$14.95

- ESP32 Voltage Reg: Pololu D24V10F3 - $12.95

- Ada FONA Voltage Reg: AITRIP DC Adjustable Buck- $14.99

- Ada FONA Input Capacitor: Radial Leaded 25VDC 470uF Capacitor - $0.78