

E2.10 - City Climate Cartography

Portable Environmental Data Logger
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Motivations and Goals

Concrete in urban areas is able to retain a significant amount of heat. According to the EPA this can be seen as a 1-7°F temperature increase in the immediate area.^[1] Our goal is to create a portable data logger to identify areas in cities that heat islands are present in. This will allow cities to improve infrastructure in these areas to resolve effects resulting from heat islands.

Our Device



Data Visualization

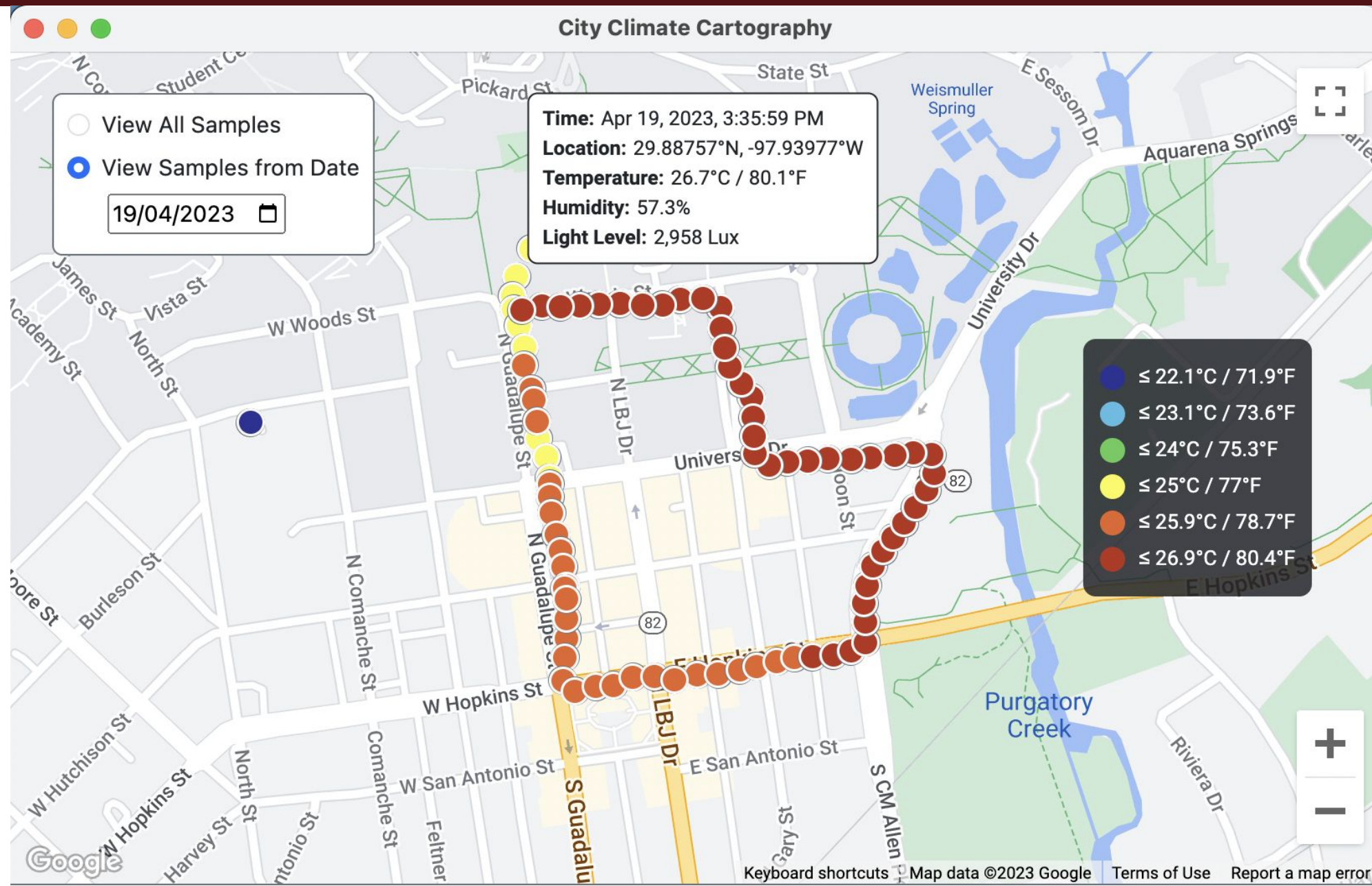
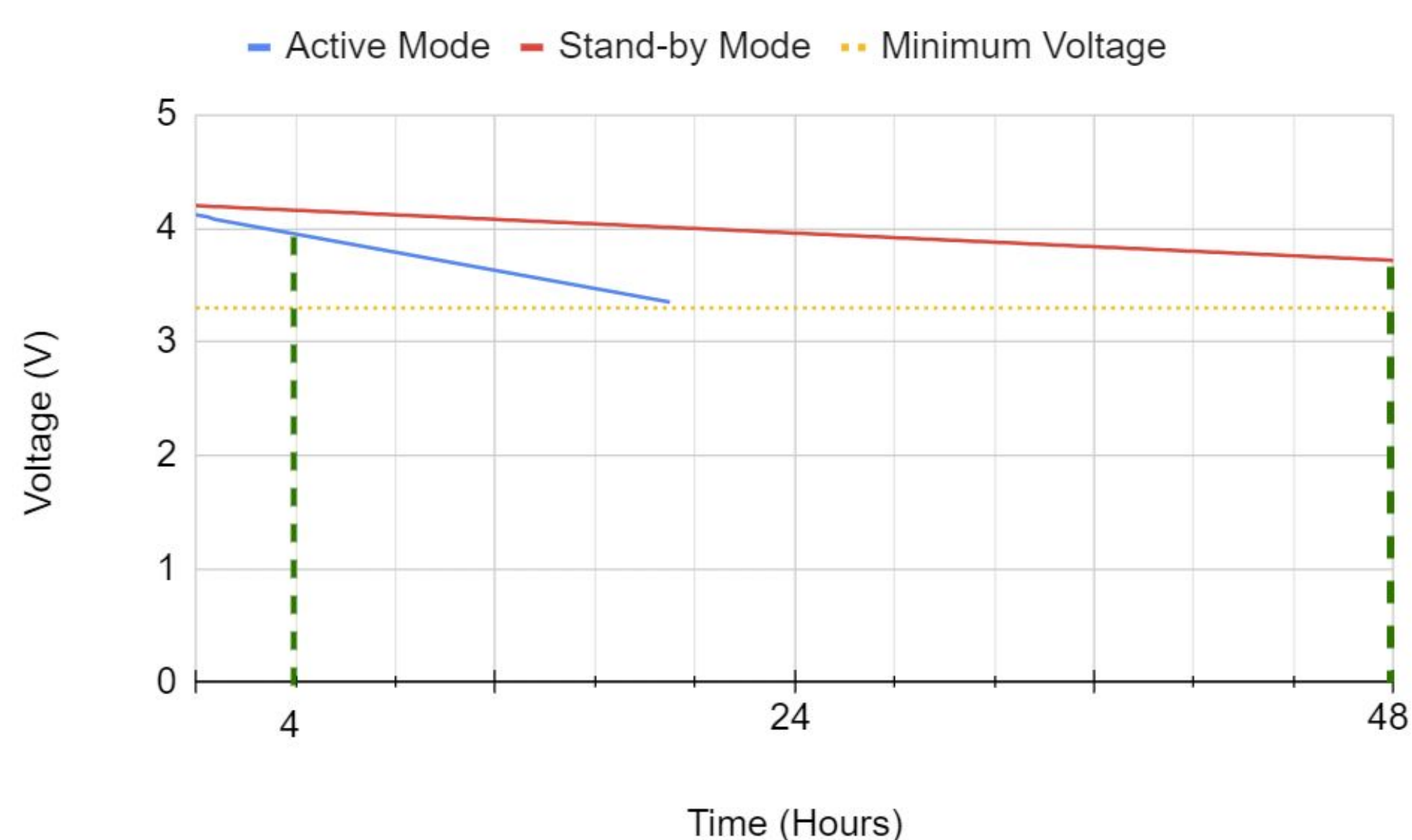


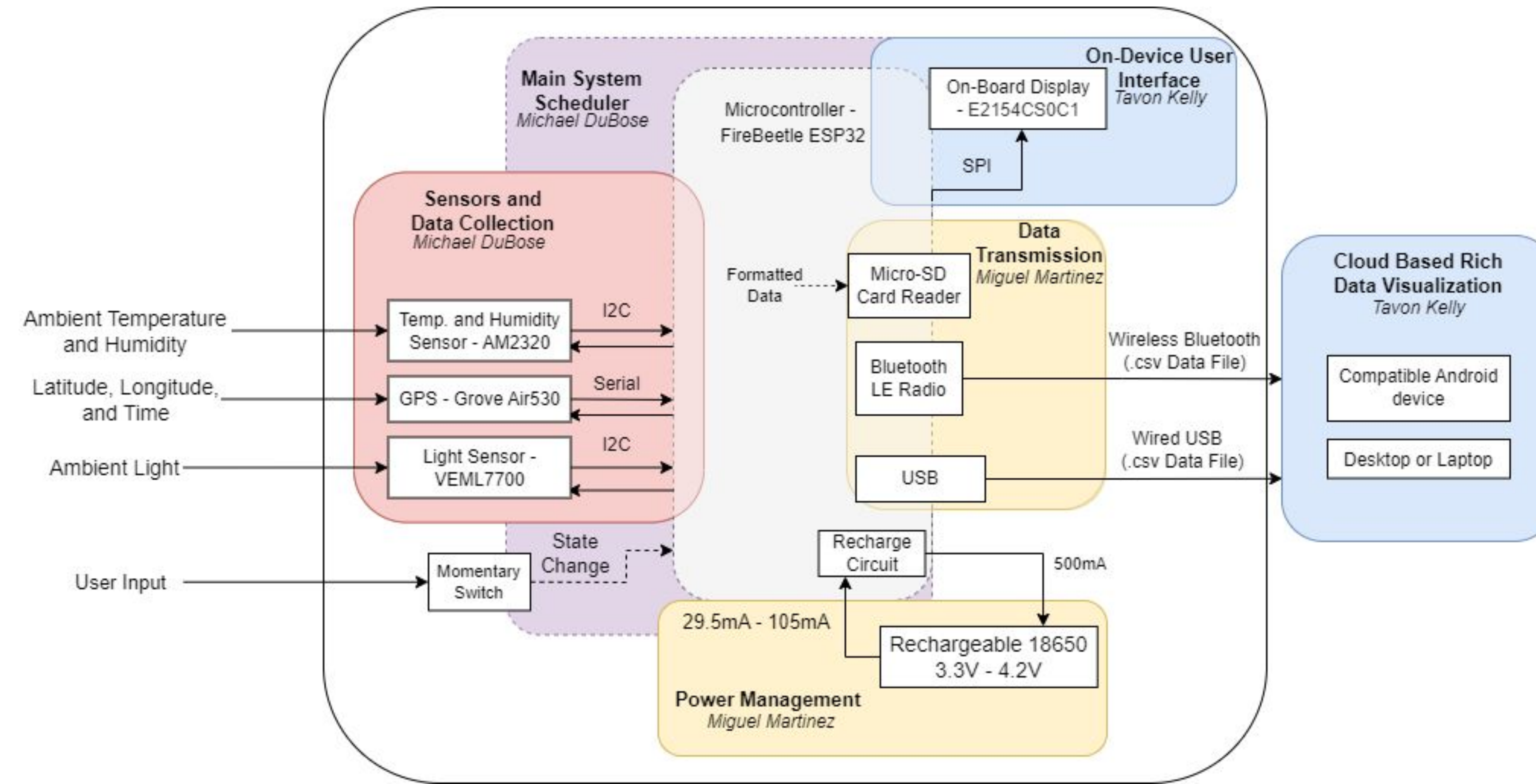
Illustration of Data Collected with the Device

Power Consumption

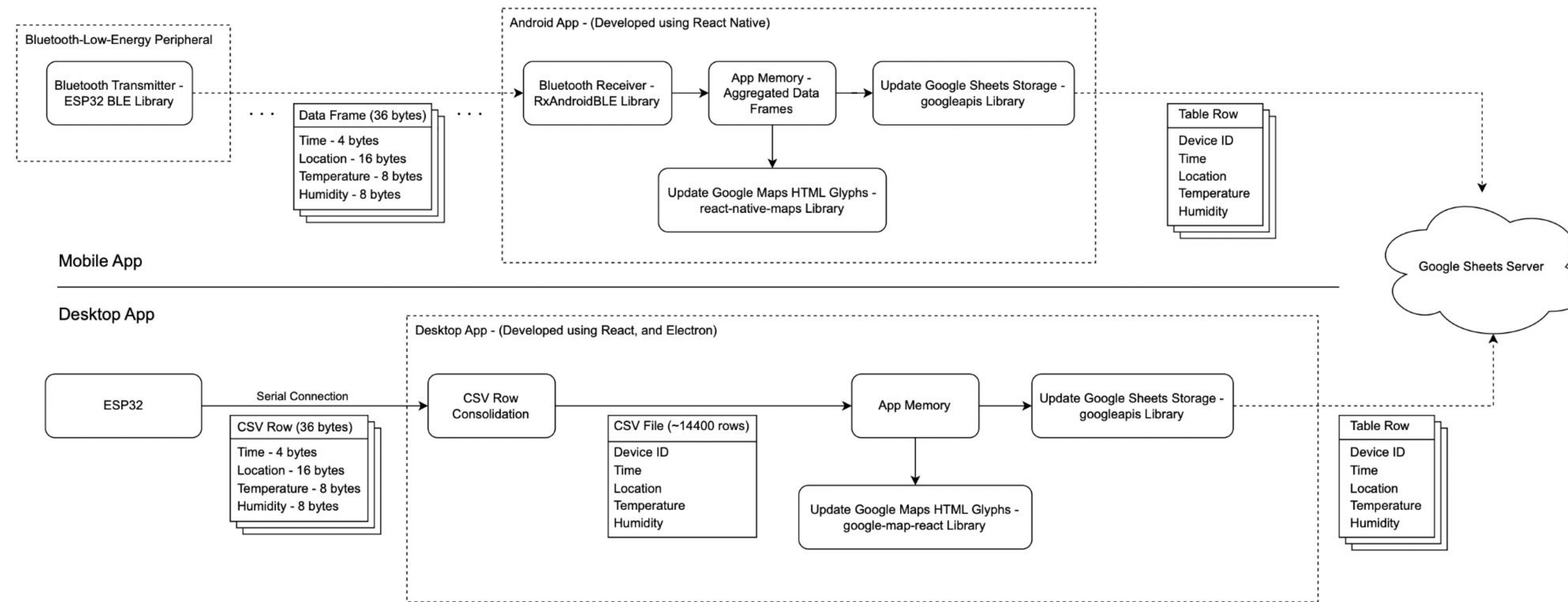


Active and Stand-By Vs Our Minimum Life Requirements

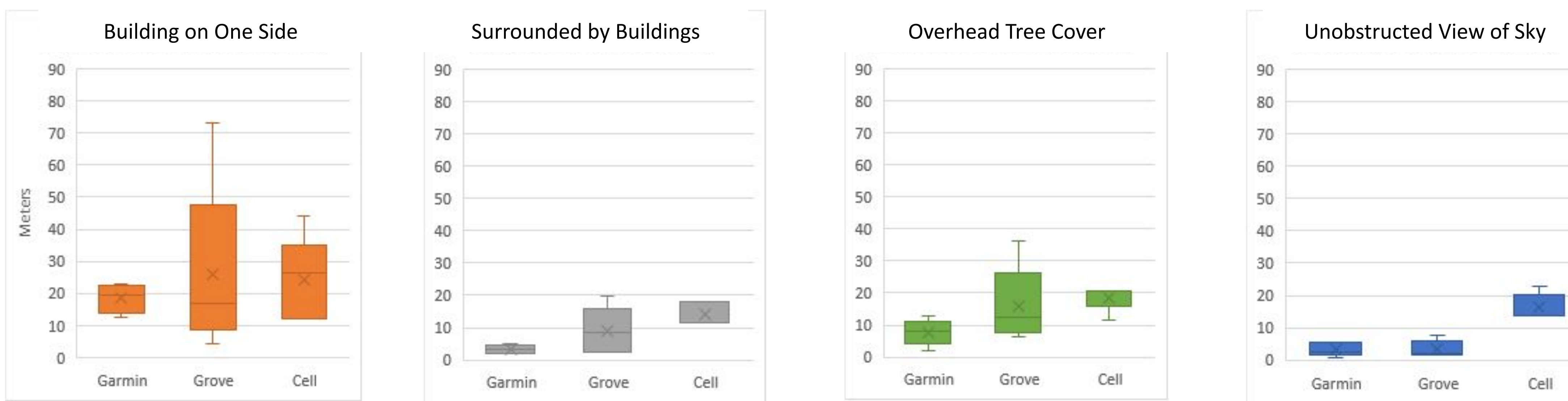
Overall Block Diagram



Mobile and Desktop Data Visualization Pipeline



Our Device Vs \$239 Garmin GPS



Final Results

Test	Expected	Actual
GPS Accuracy	Obstructed: <2m Unobstructed: <1m	Obstructed: 15.7 meters Unobstructed: ~5 meters
Lux Sensor Data	Covered: 0 Lux Cloudy Day: 7.5k Lux	Covered: 0 Lux Cloudy Day: 7.2k Lux
Temperature Sensor Data Accuracy	±1°C	±0.63°C (Average)
GPS Satellites in View	> 4 in view	~11
Time Based Sampling	Sample at 30 sec	30.72 sec
Distance Based Sampling	Sample at 20 meters	<20 meters: Doesn't Sample ≥ 20 meters: % Samples
Display Readability	100% Accuracy	90% Accuracy
Upload Accuracy	100% Accuracy	100% Accuracy
Transmission Speed	<5 minutes	Wired: 39.2 seconds
Device Size and weight	40x40x100 mm 150 grams	40x40x100 mm 150.0 grams
Device run time	Active: 4 hours Stand-by: 48 hours	Active: ~19 hours Stand-by: ~70 hours
Device Survivability	Water resistant Survives 3 ft drops	TBD
BOM Cost	\$30.00	\$31.65
Data Storage	1 month of data (max 64,000 kilobytes)	1 month of data (450 kilobytes)

Acknowledgements

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Citations:

¹ "Learn About Heat Islands," Heat Islands, United States Environmental Protection Agency, accessed September 28, 2022, <https://www.epa.gov/heatislands/learn-about-heat-islands>.

² "Heat Island Impacts," United States Environmental Protection Agency, accessed April 5, 2023, <https://www.epa.gov/heatislands/heat-island-impacts>