Pinoleville Pomo Nation

Renewable Energy Feasibility Study
Status Report

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PPN Mission and Vision

Mission Statement…

The Pinoleville Pomo Nation secures tribal government, affirms and protects tribal sovereignty, and maintains government-to-government relationships. The Nation is dedicated to developing and maintaining co-operative alliances that benefit the Nation and local community. The Nation is committed to the preservation of its history, culture, and traditions. The Nation provides for the health, safety, and general welfare of its citizens, while promoting economic self-sufficiency and personal independence.

Our Vision…

We see our community being healthy spiritually, physically, emotionally and mentally. We will become independent and self-sufficient through economic development. Self-governance will be carried out through leadership focused on cultural and traditional values, taking actions needed to bring our people into balance. We see ourselves passing on the knowledge and wisdom of our ancestors to future generations, and encouraging understanding with communities outside of our own.

Pinoleville Today and Tomorrow

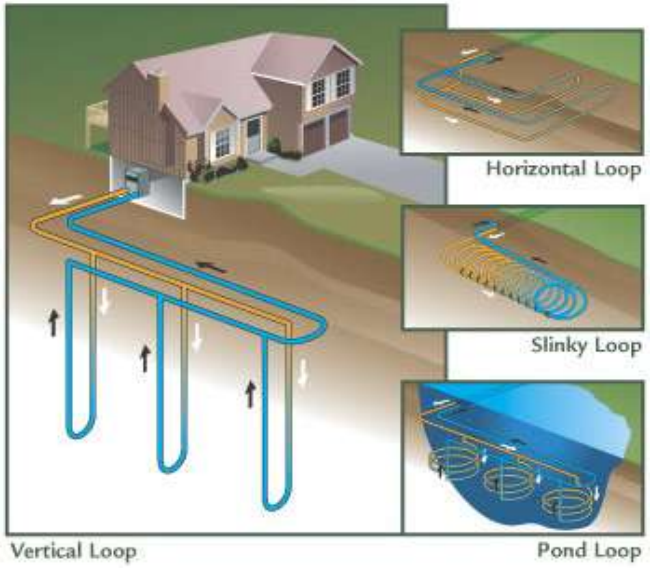
With cultural food and dancing, Pinoleville continues to host Big Times, carrying on a tradition from the 1800's. Held every July. All are welcome.

Volunteers working in the Pinoleville Native Plants Preserve, a place set aside to preserve plants traditionally used by Pomo people, pass on cultural knowledge, and provide materials for cultural practices.

Renewable Energy Feasibility Study: Overview

- Project Duration: May 2010- September 2011

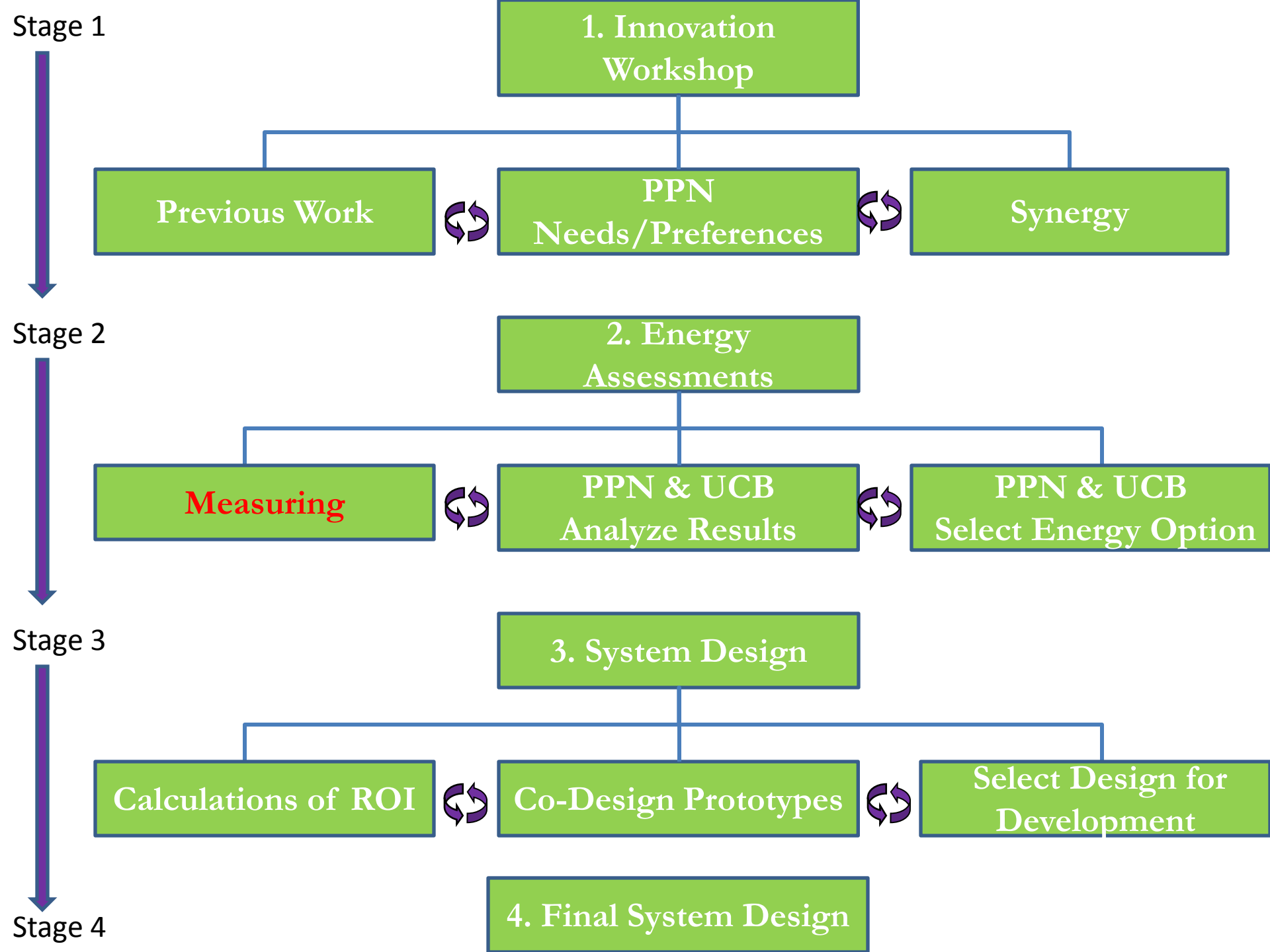
- Focus areas:
  - micro-hydroelectric,
  - geothermal heat pumps,
  - wind,
  - solar electric,
  - solar thermal



- Primary Objective:
  - Deployment and development plan that has the renewable energy options and designs that meets the PPN's cultural, environmental, and economic requirements

Renewable Energy Feasibility Study: Additional Objectives

- Secondary Objectives:
  - Design cost effective renewable energy systems that can meet the power needs of the PPN and provide a **source of revenue** to the PPN
  - **Reduce greenhouse gas** emissions and other air pollutants associated with commercial, residential, and industrial applications at the PPN
  - **Train** members of PPN to assess renewable energy potential by installing, monitoring, and evaluating data with guidance from CARES


Stage 1
1. Innovation Workshop
Previous Work
PPN Needs/Preferences
Synergy
Stage 2
2. Energy Assessments
Measuring
PPN & UCB Analyze Results
PPN & UCB Select Energy Option
Stage 3
3. System Design
Calculations of ROI
Co-Design Prototypes
Select Design for Development
Stage 4
4. Final System Design

Renewable Energy Feasibility Study: Current Status

- Kick-off Workshop, key points:
  - Energy strategy focused on **self-sufficiency** (off grid, resilient, multi-sourced, locally-sourced)
  - Technology preferences are green: **geothermal, solar, micro-hydro, wind**
  - **Integration** with water and green building projects is important
  - **Potential barriers** to renewable energy implementation include land tenure and shortage, start up costs and financing barriers, environmental impacts (birds and fish)

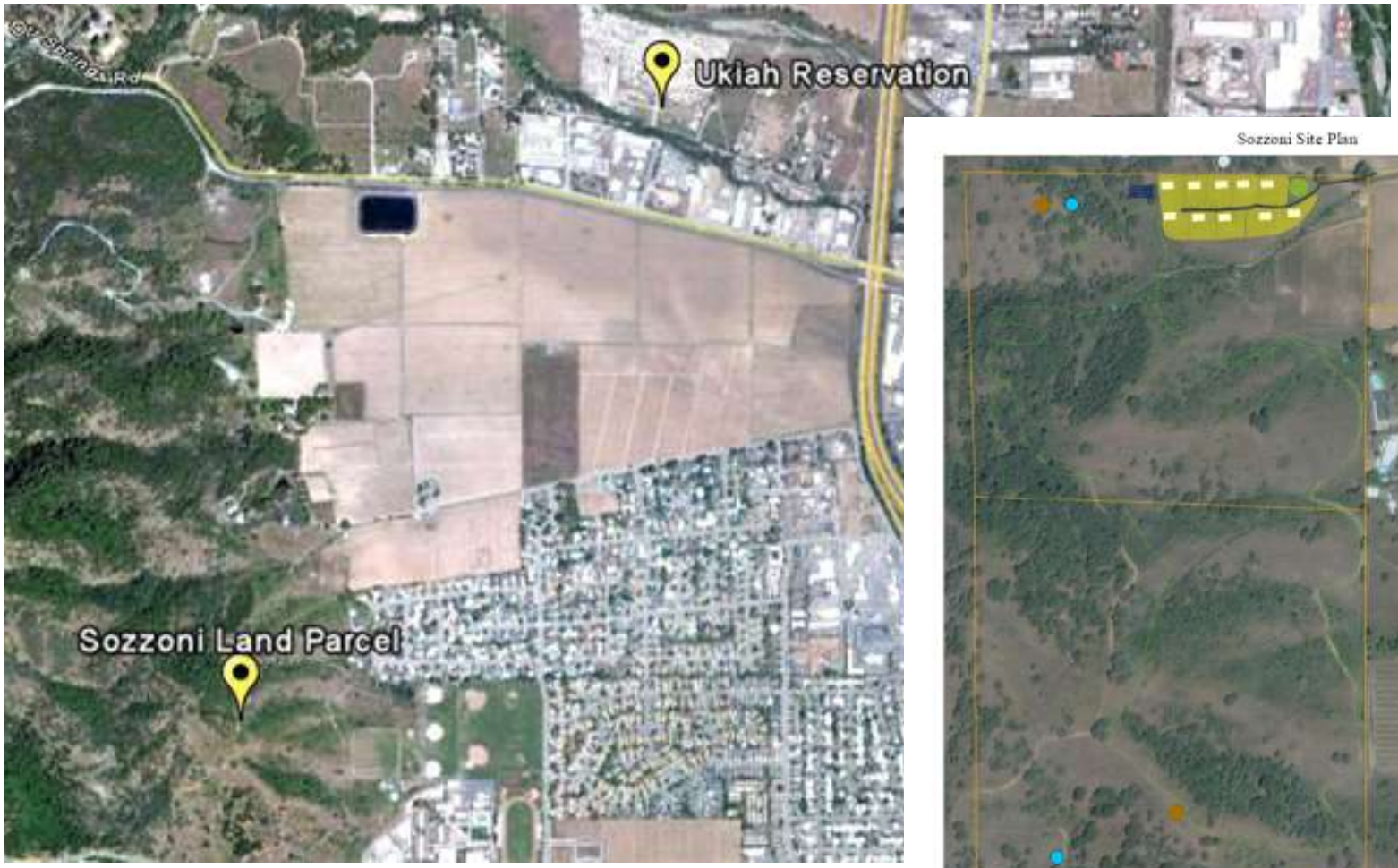
Talking Renewable Energy

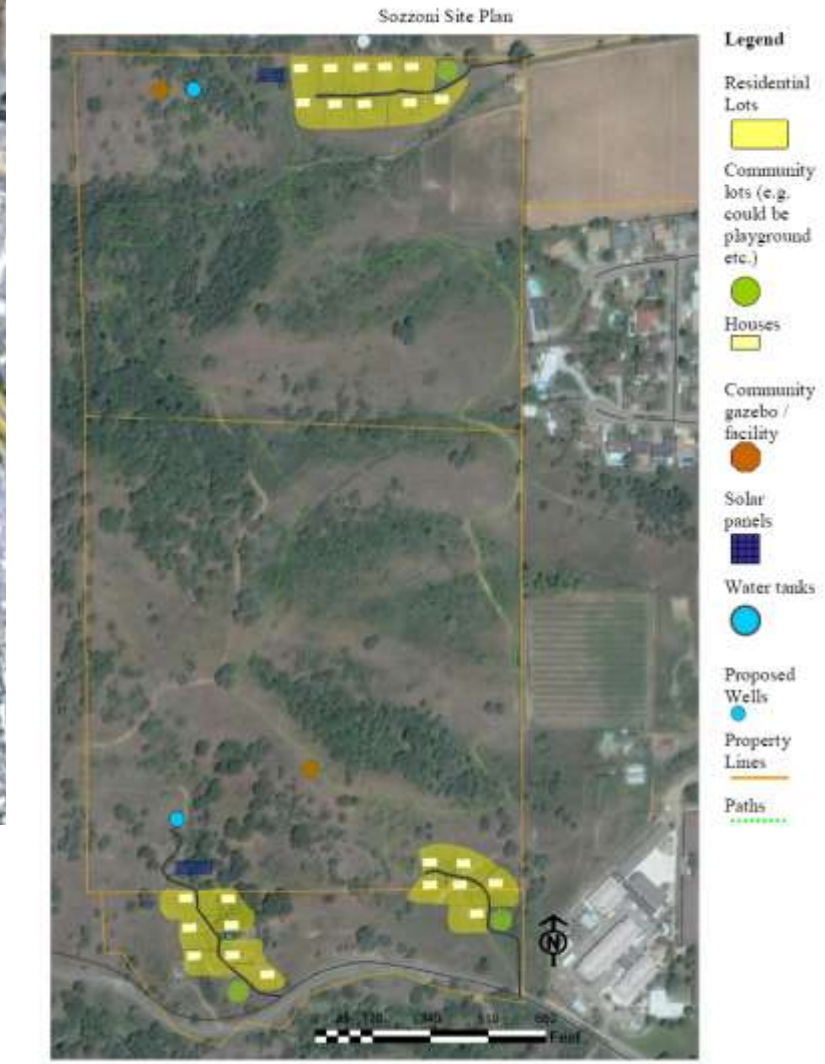
Report on theoretical feasibility

- Based on the framework established by the tribe:
  - Determined the theoretical solar and microhydro potential on PPN lands at three sites: Ukiah, Sozzoni, Lakeport
  - Developed initial conceptual models of PPN distributed energy sources based on macro-data from second and third party sources, and modeling software known as HOMER (Hybrid Renewable Energy Systems). Models outline choices for PPN.
  - Began integrating cost data into analysis

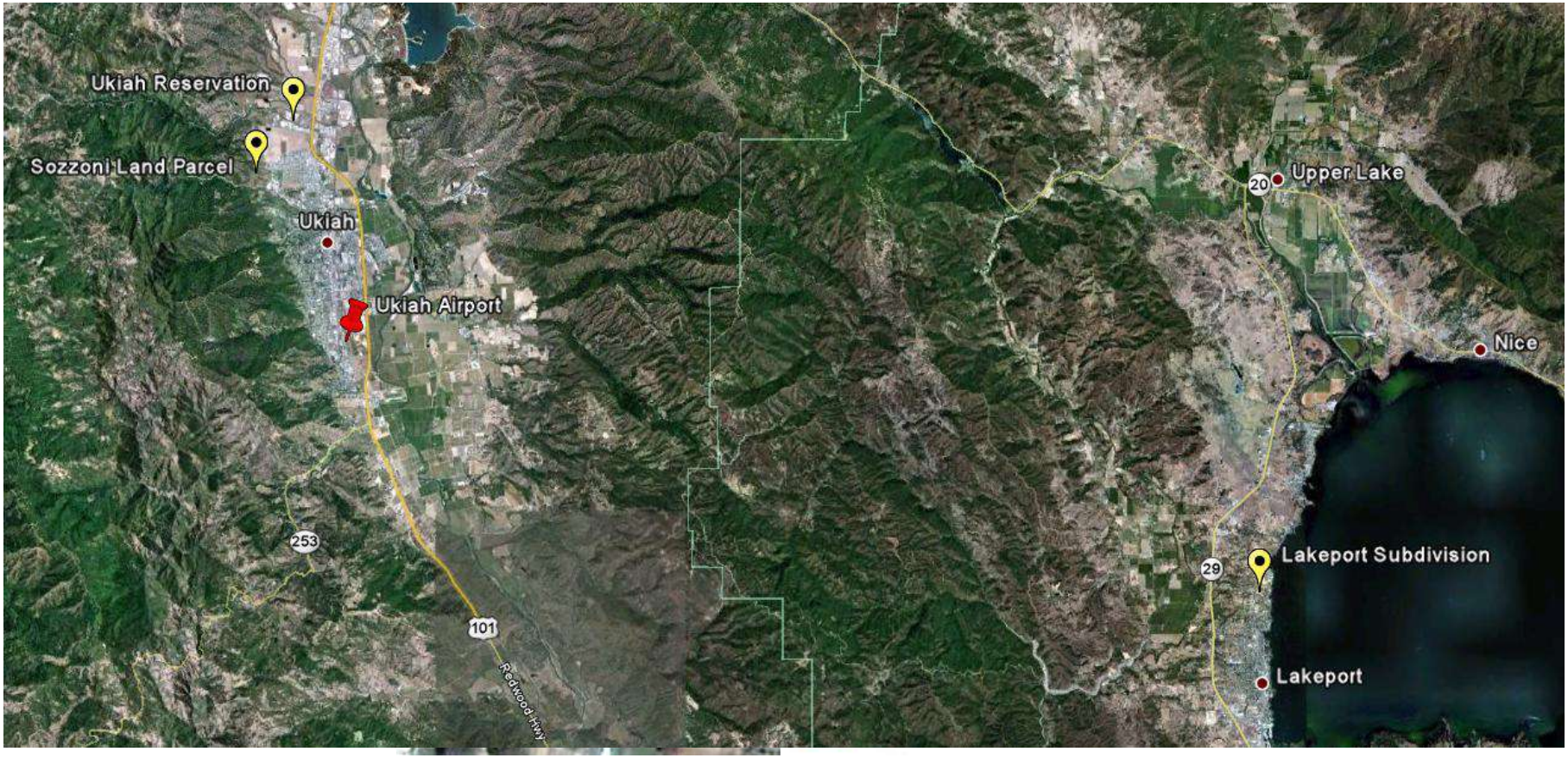
Pinoleville Pomo Nation Reservation

Sozzoni property

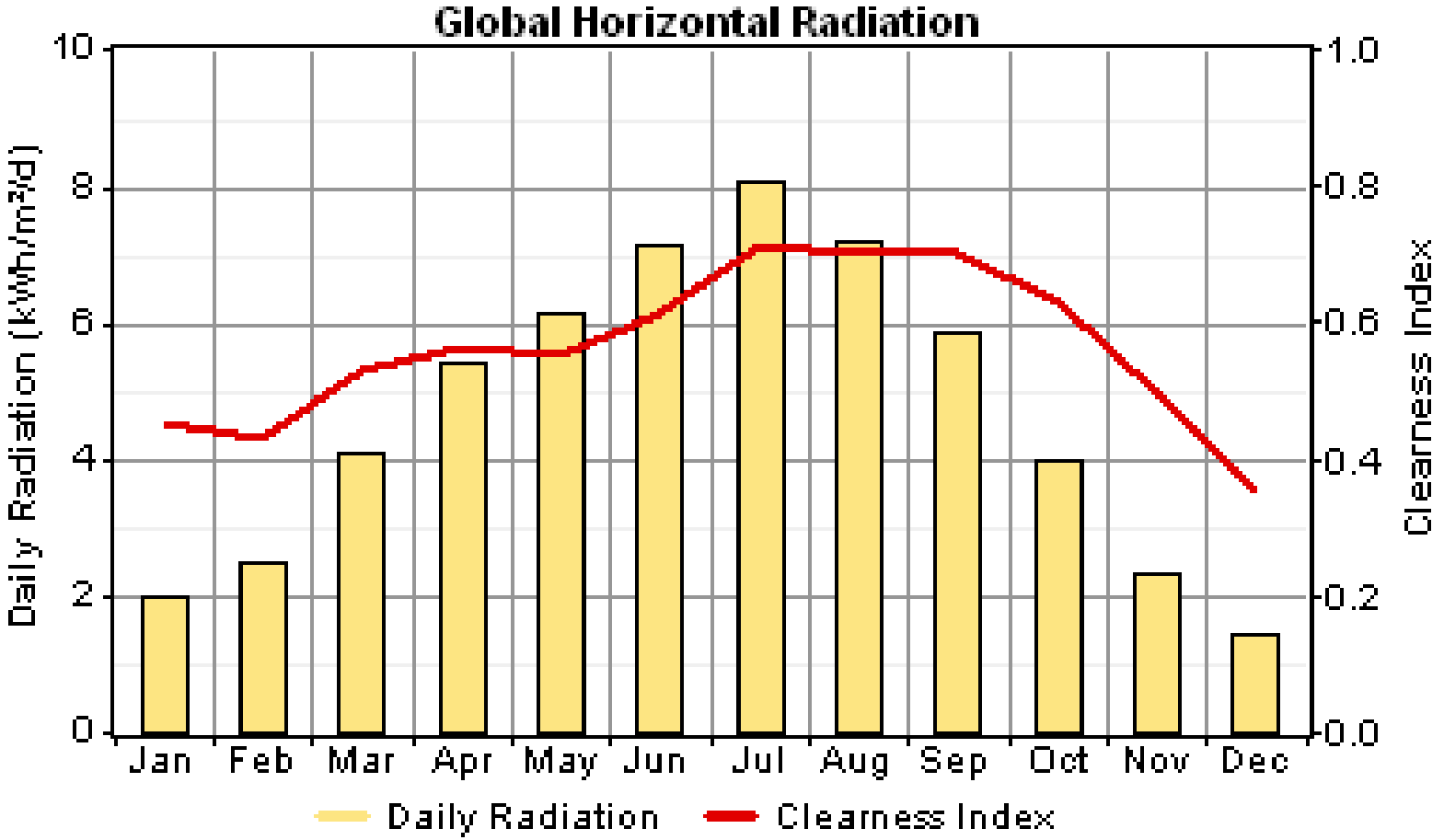




Lakeport site



Theoretical Solar Energy Potential

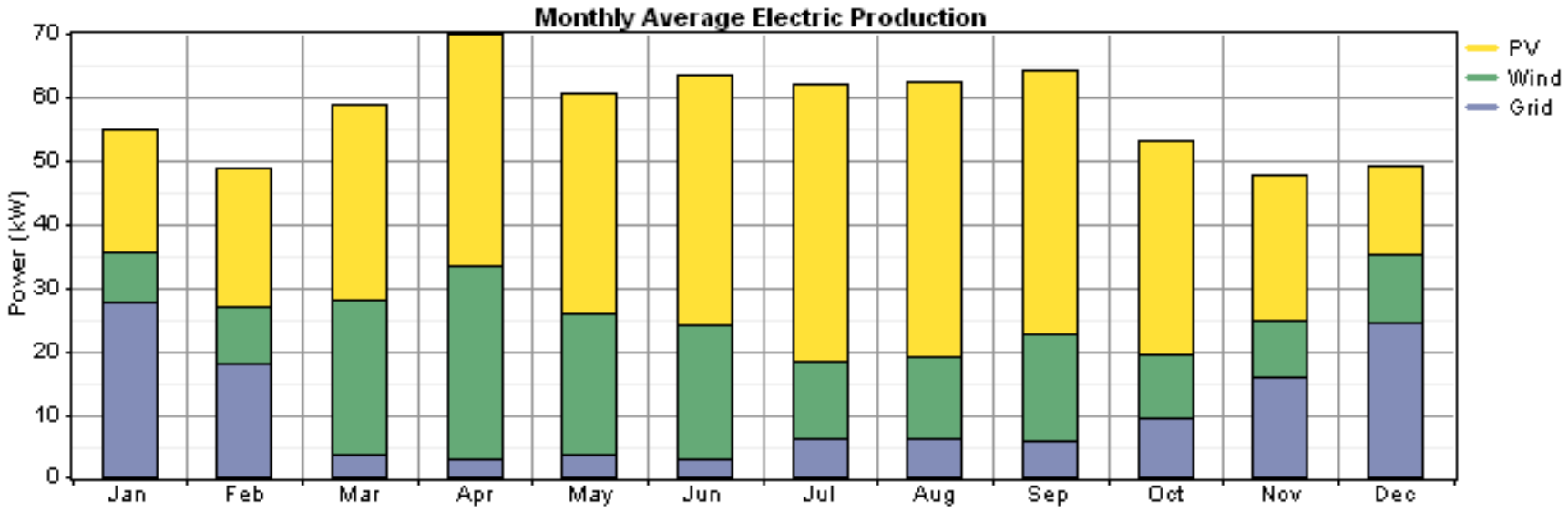


Theoretical potential refined

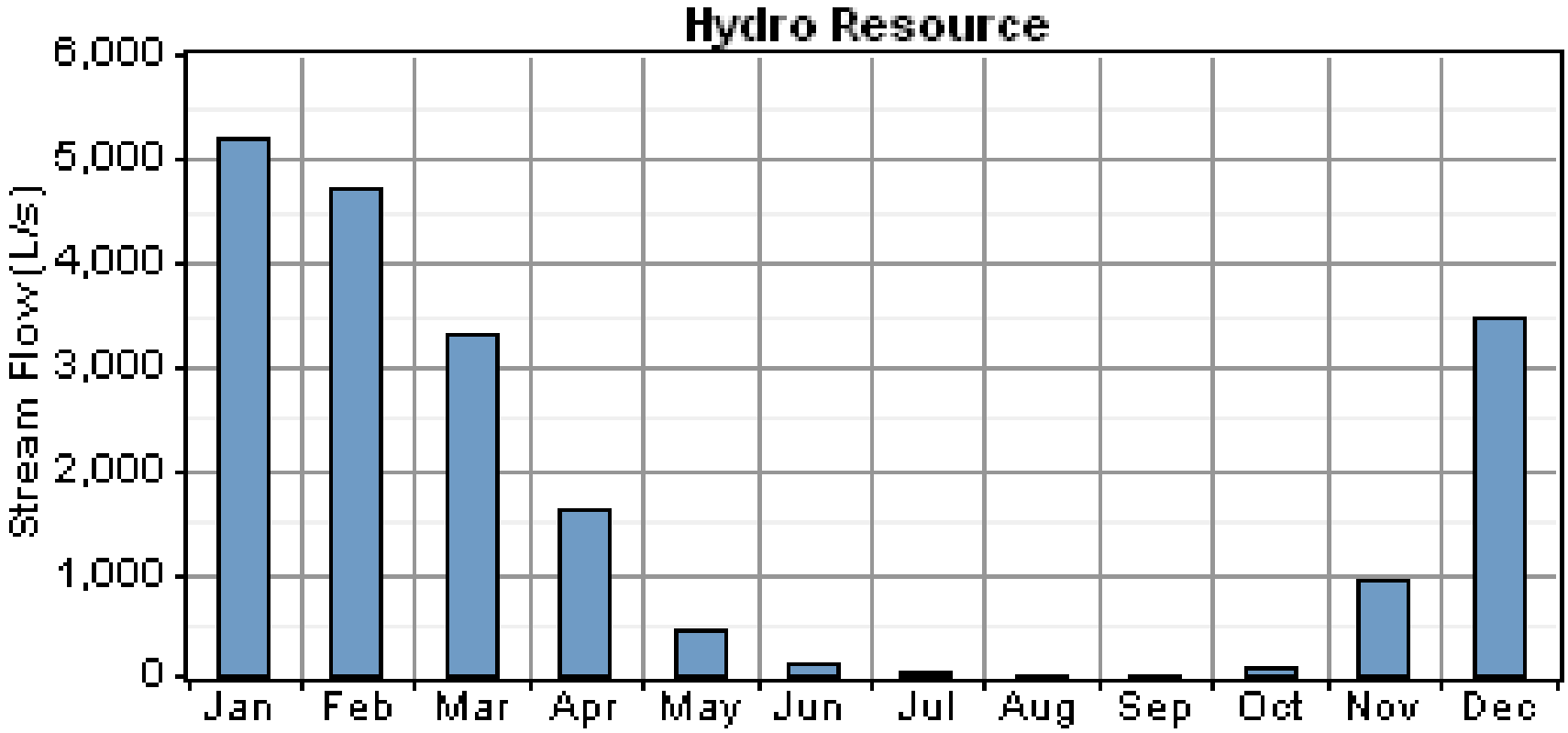
Table 9: Summary of potential sites available for solar development at the Ukiah Reservation.

Site	Projected Panel Tilt	Mount Type	South-North Length (ft)	East-West Length (ft)	Area (ft^2)	Max. Size Solar Array (kW)	Annual Energy Generation (MWh/yr)	Site Potential
Roundhouse 1	14	Roof				4.375	6.7	Excellent
Roundhouse 2	14	Roof				4.375	6.7	Excellent
Upper Garden 1	30	Ground	163	91	14,833	77	120	Medium
Upper Garden 2	30	Ground	111	59	6,549	35	54	Medium
Lower Garden 1	30	Ground	65	111	7,215	39	61	Excellent
Lower Garden 2	30	Ground	345	155	53,475	275	426	Excellent
Admin. 1	30	Ground	60	120	7,200	39	61	Medium
Admin. 2	30	Ground	80	115	9,200	49	76	Medium
Admin. 3	30	Ground	218	136	29,648	154	238	Excellent
Williams Land 1	30	Ground	195	175	34,125	177	275	Good
Williams Land 2	30	Ground	380	185	70,300	361	560	Excellent
Highway 1	30	Ground	385	155	59,675	306	475	Excellent
Highway 2	30	Ground	475	175	83,125	426	660	Excellent
Adm. Bldg. 1	0	Roof	52	110	5,720	61	83	Poor
Adm. Bldg. 2	0	Roof	41	82	3,362	36	49	Poor
Adm. Bldg. 3	0	Roof	205	50	10,250	108	148	Medium
Adm. Bldg. 4	0	Roof	43	82	3,526	38	51	Medium
Totals					398,203 (9.14 acres)	2,190 (2.19 MW)	3,350	

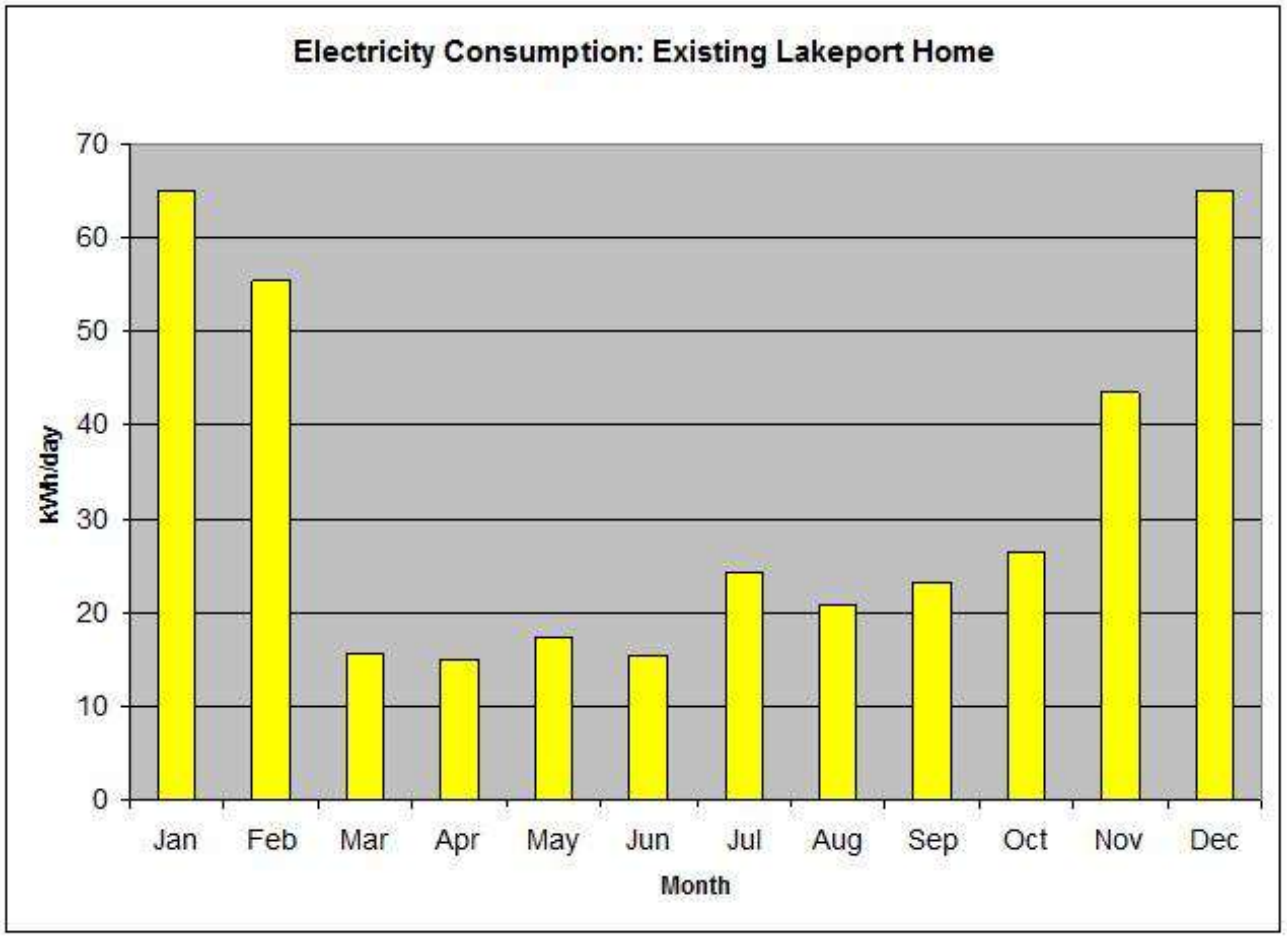
Theoretical wind and PV potential in Ukiah



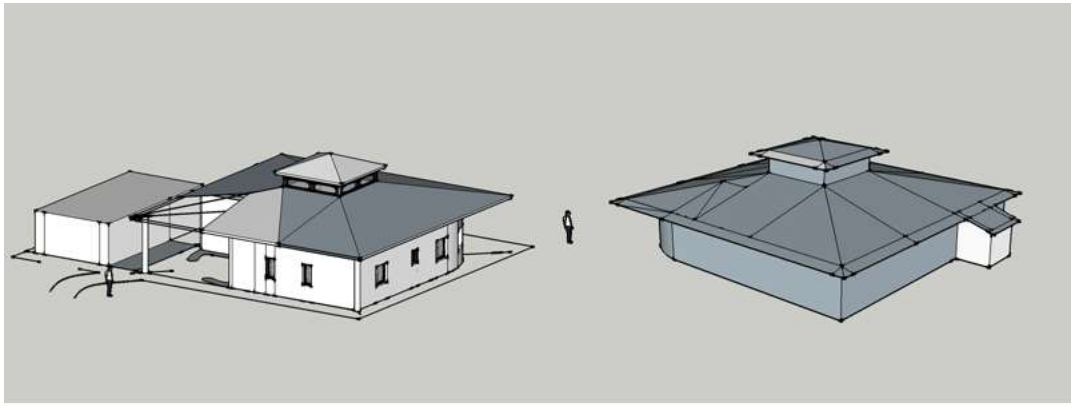
Theoretical micro-hydro potential

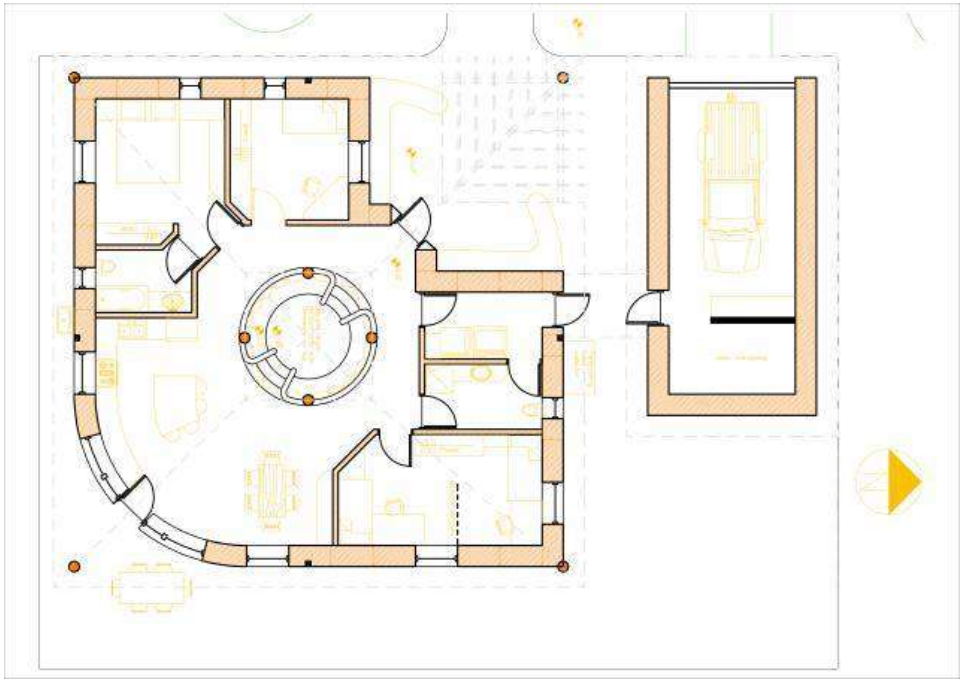


Demand: old house design

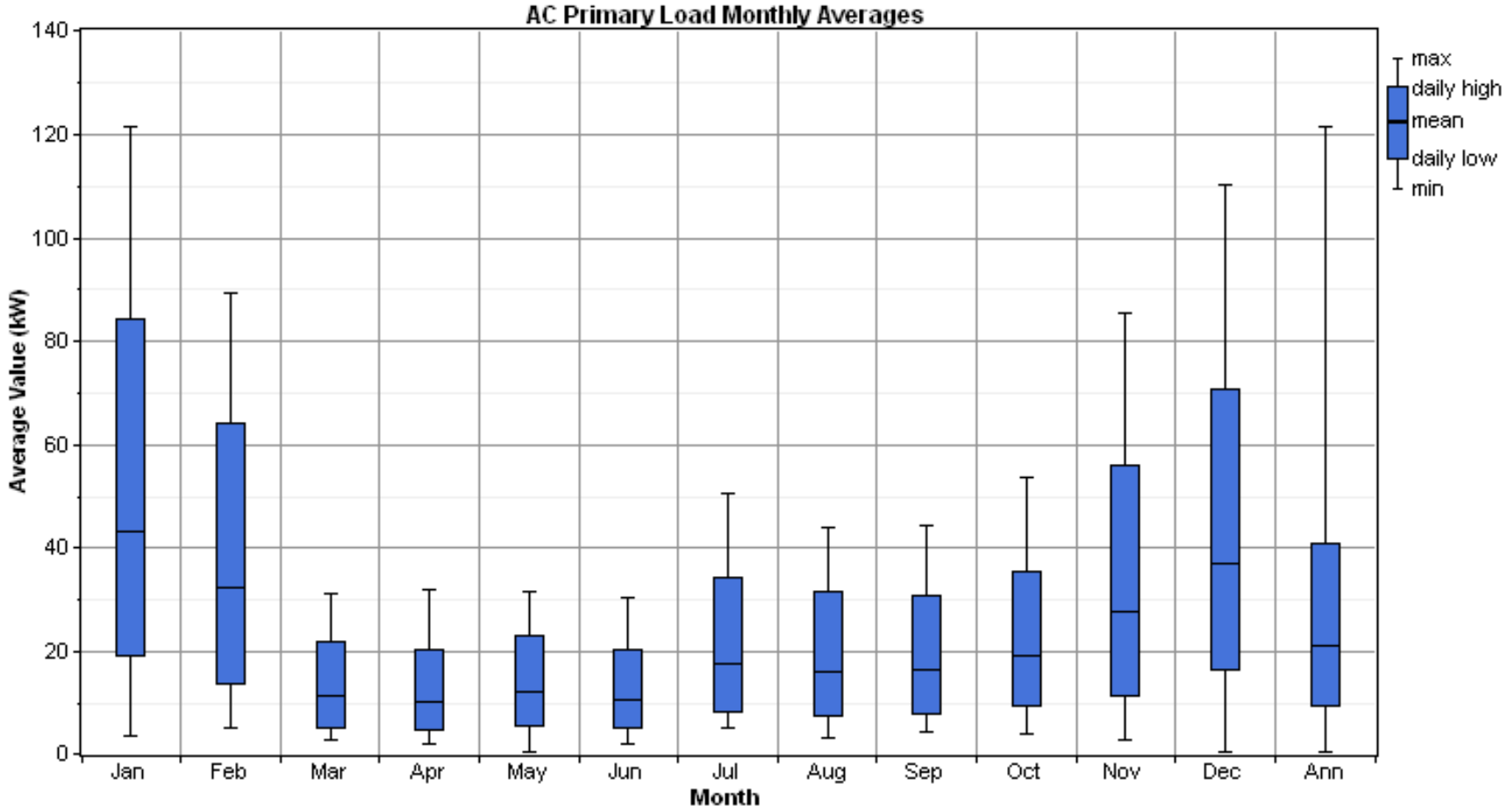


Pinoleville Pomo Nation House



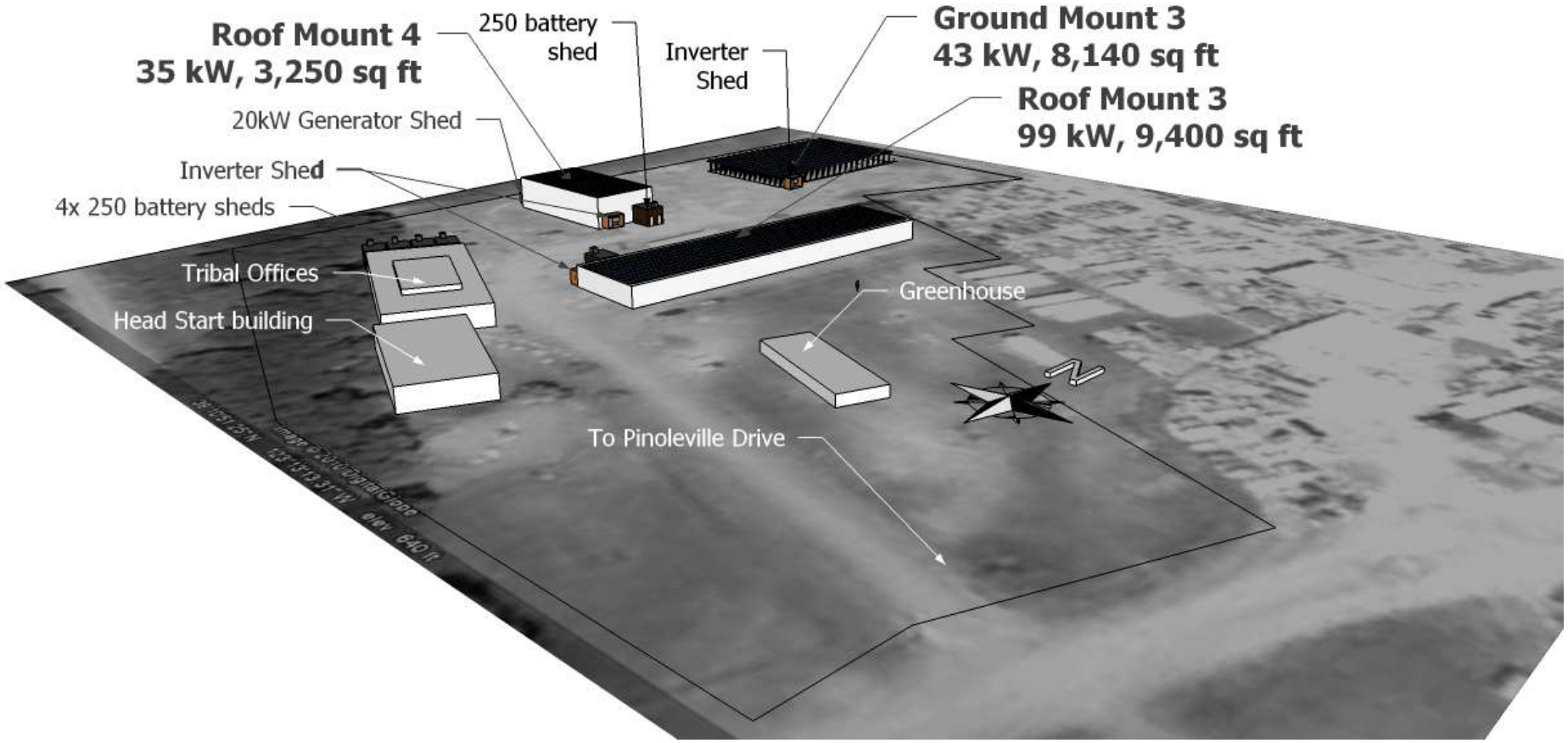


Demand in new homes

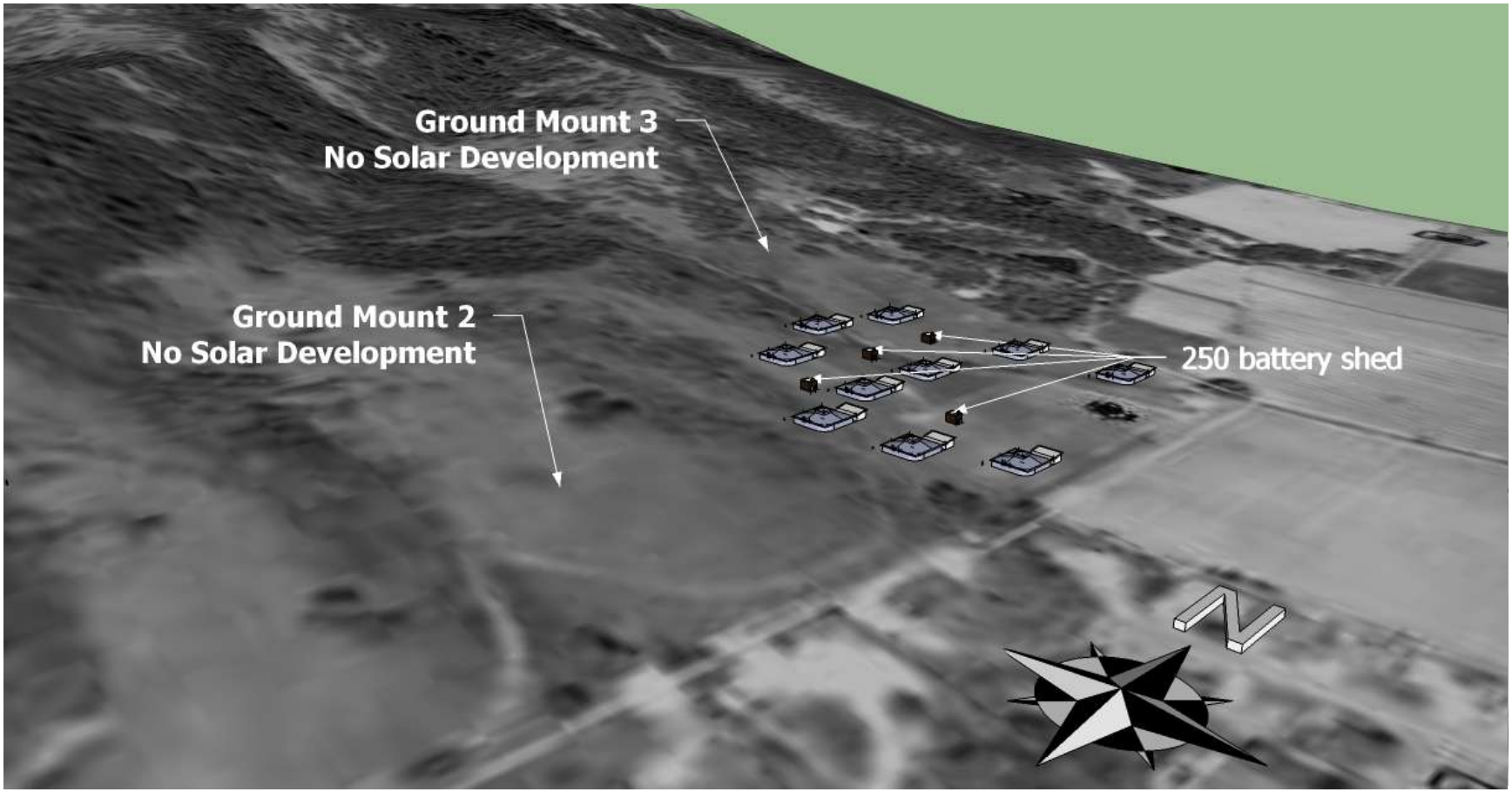


Sketch ups of Ukiah

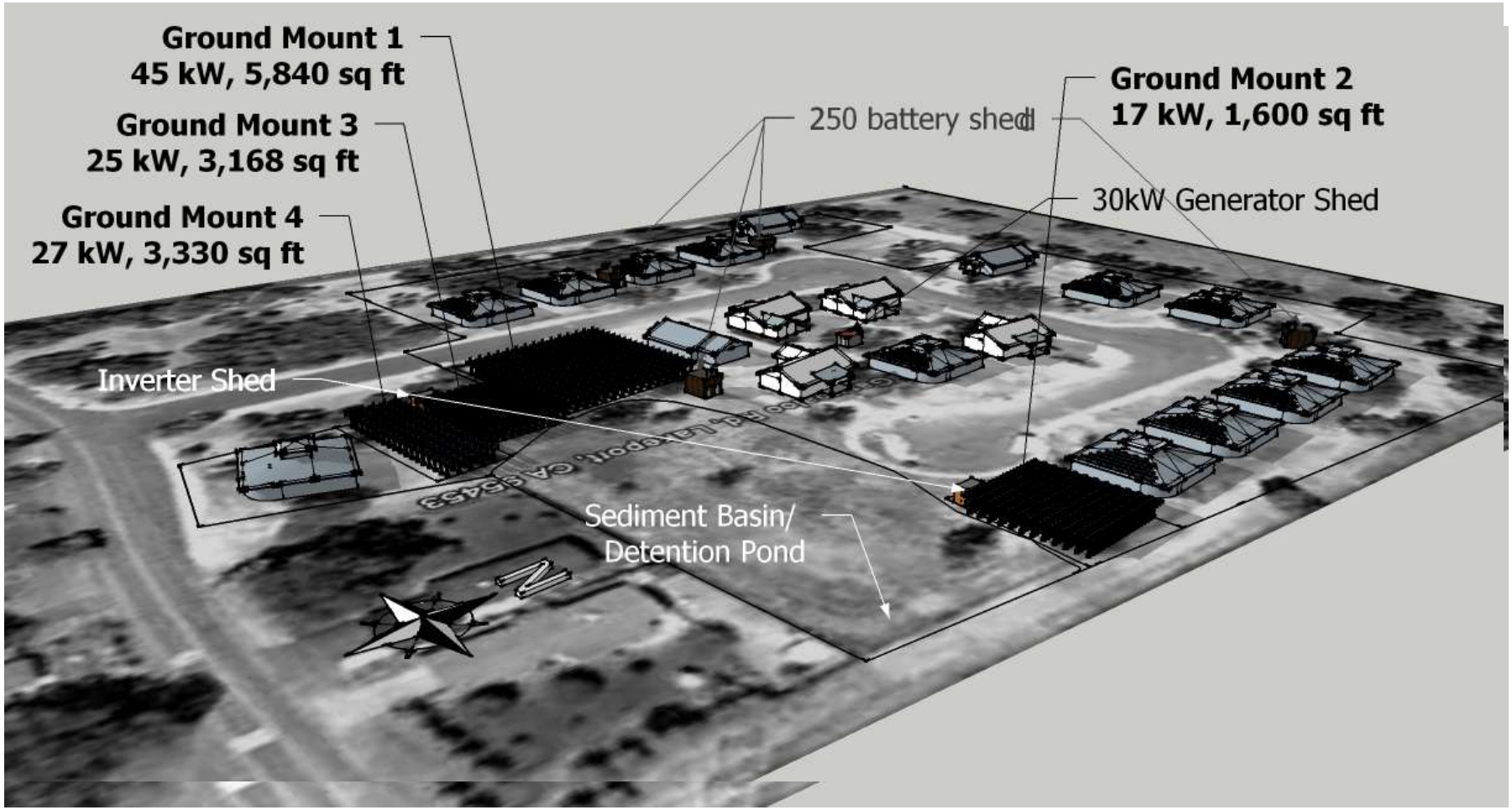
Two scenarios: with batteries and without



Sketch up for Sozzoni: with ground mounts and without



Sketch up for Lakeport: grid-tied and off-grid



Preliminary efficiency analysis

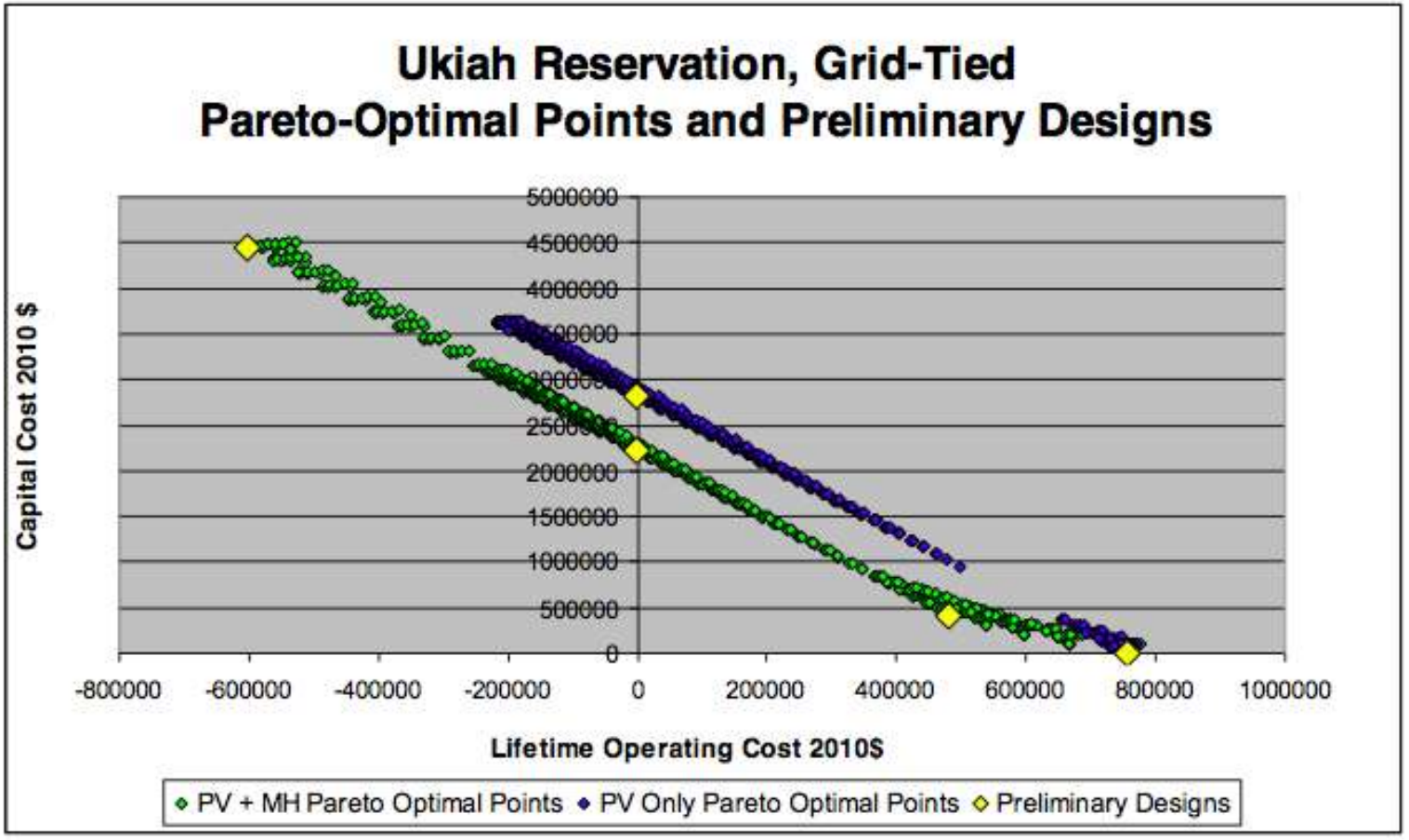


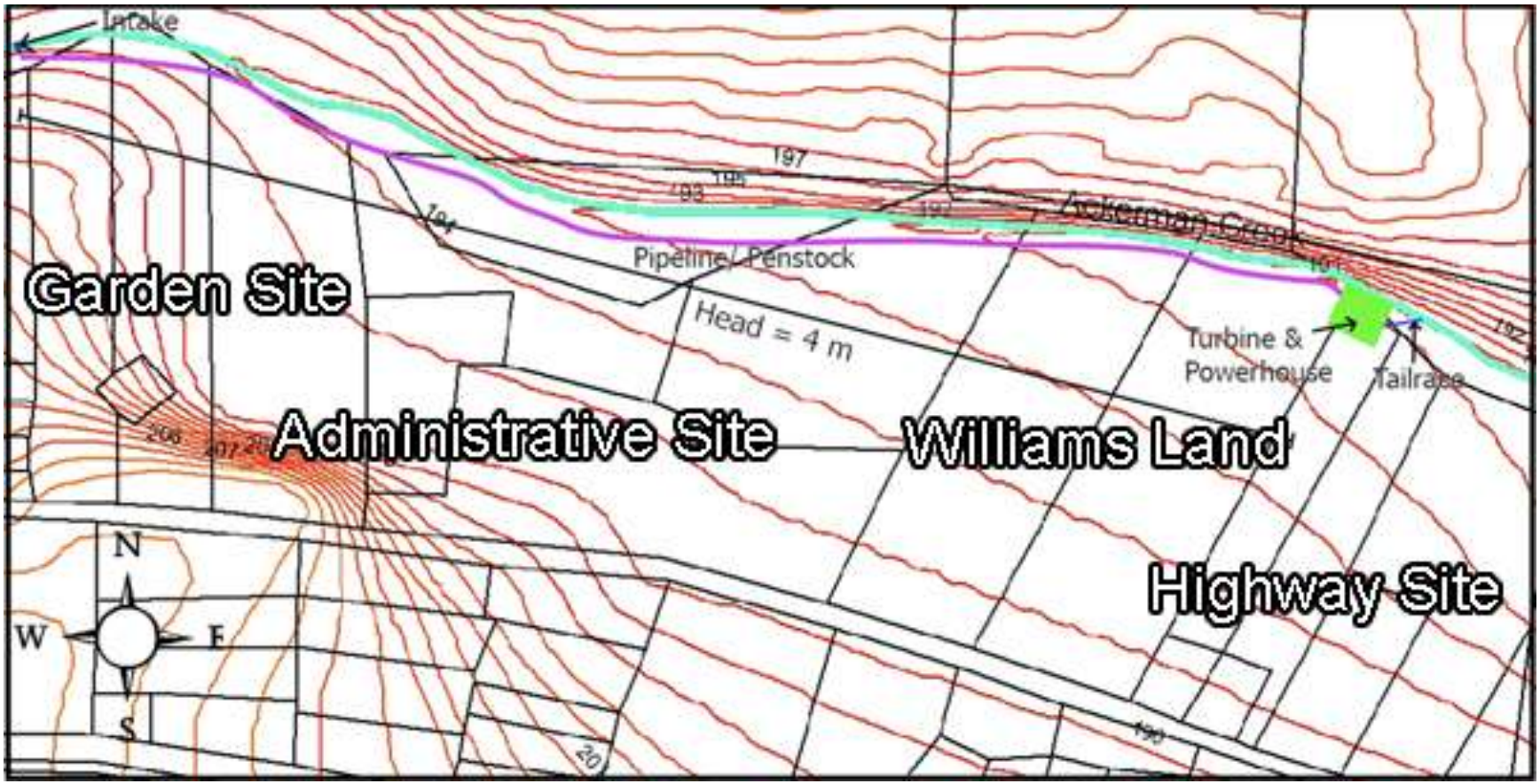
Figure 25: Pareto curves for the Ukiah grid-tied designs. PV only and PV + MH designs were both considered, and represent the two curves.

Site planning workshops

- Identified where and how wind potential should be tested
  - Where we could control access
  - Where cultural knowledge indicated wind could be found
  - Impact on wildlife, local aesthetics and noise
- Identified where and how to test micro-hydro potential
  - Impact on wildlife
  - Where we could control access
  - Timing of hydro potential

Wind potential sites

Micro hydro sketch



Measurement

- Metering of renewable energy sources has started
  - 20 m (60ft) anemometer was installed on September 17, 2010 in Ukiah
  - 2 Licor pyranometer with base station have been purchased; September 24, 2010
  - Testing plan for pyranometer is being finalized
  - Microhydro sensor and testing plan is being researched

Solar thermal potential

Renewable Energy Feasibility Study: Pyranometer Details

(2) Licor LI-200SA Pyranometer Sensor with 10 ft cable with BNC connector

(2)Licor 2003S Mounting and Leveling Fixture

(1)Licor LI-1400 Datalogger

I.Specifications

a. Sensitivity: ~90 μA per 1000 W m-2.
b. Stability: < 2% change over a 1 year period.
c. Response Time: 10 μs.
d. Temperature Dependence: 0.15% per C maxim
e. Operating Temperature: - 40 to 65 C
f. Detector: High stability silicon photovoltaic detector

Renewable Energy Feasibility Study: Anemometer Details

(1) NRG #40C 3 Cup Anemomter

(1) NRG Wind Explorer Datalogger with Dataplugs

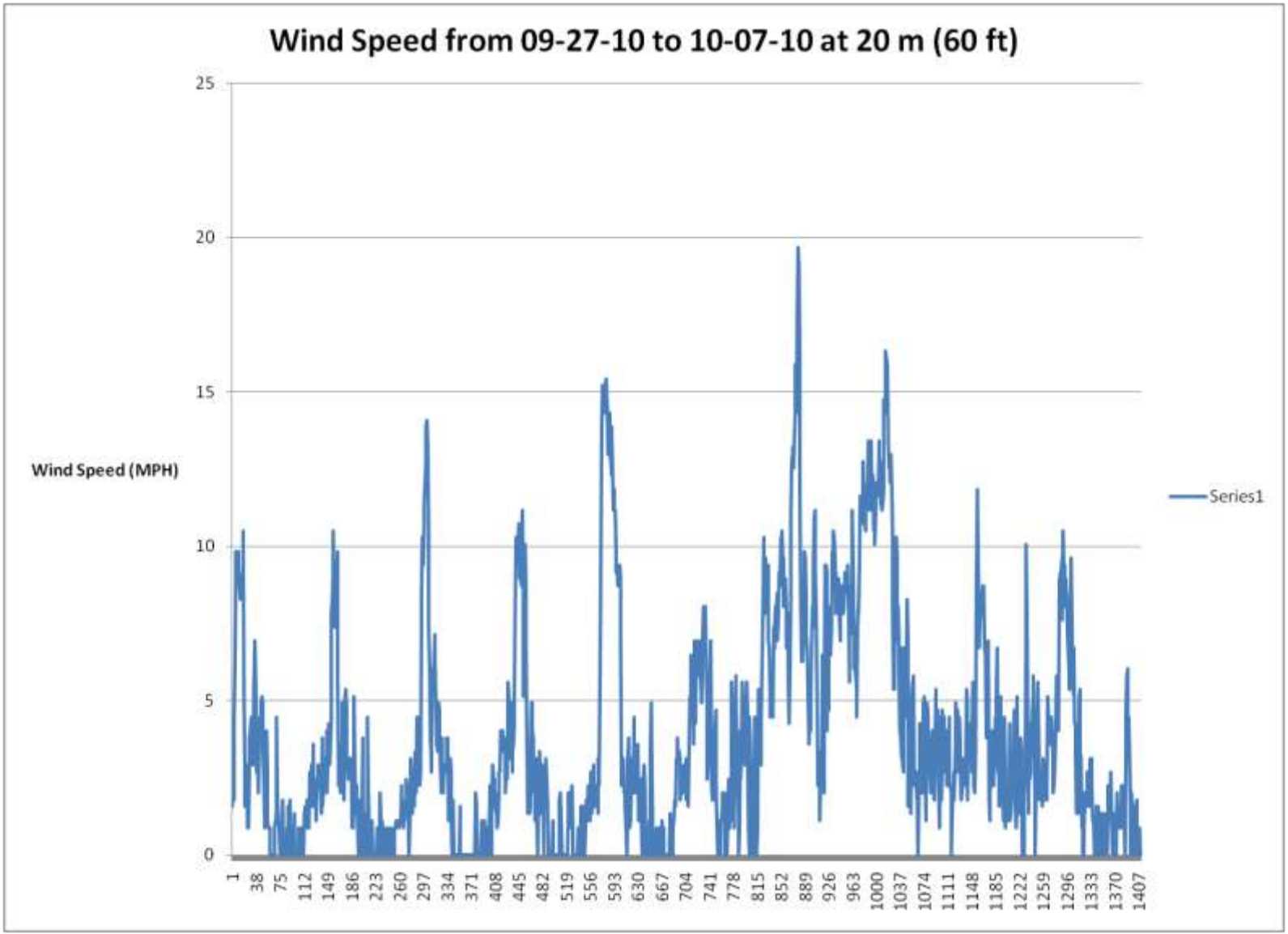
I.Specifications

a. Sensitivity: 2.2 mph to 214 mph
b. Accuracy: within 0.2 mph for the range 11 mph to 55 mph
c. Signal type: low level AC sine wave, frequency linearly proportional to windspeed
d. Transfer function: miles per hour = (Hz x 1.711) + 0.78

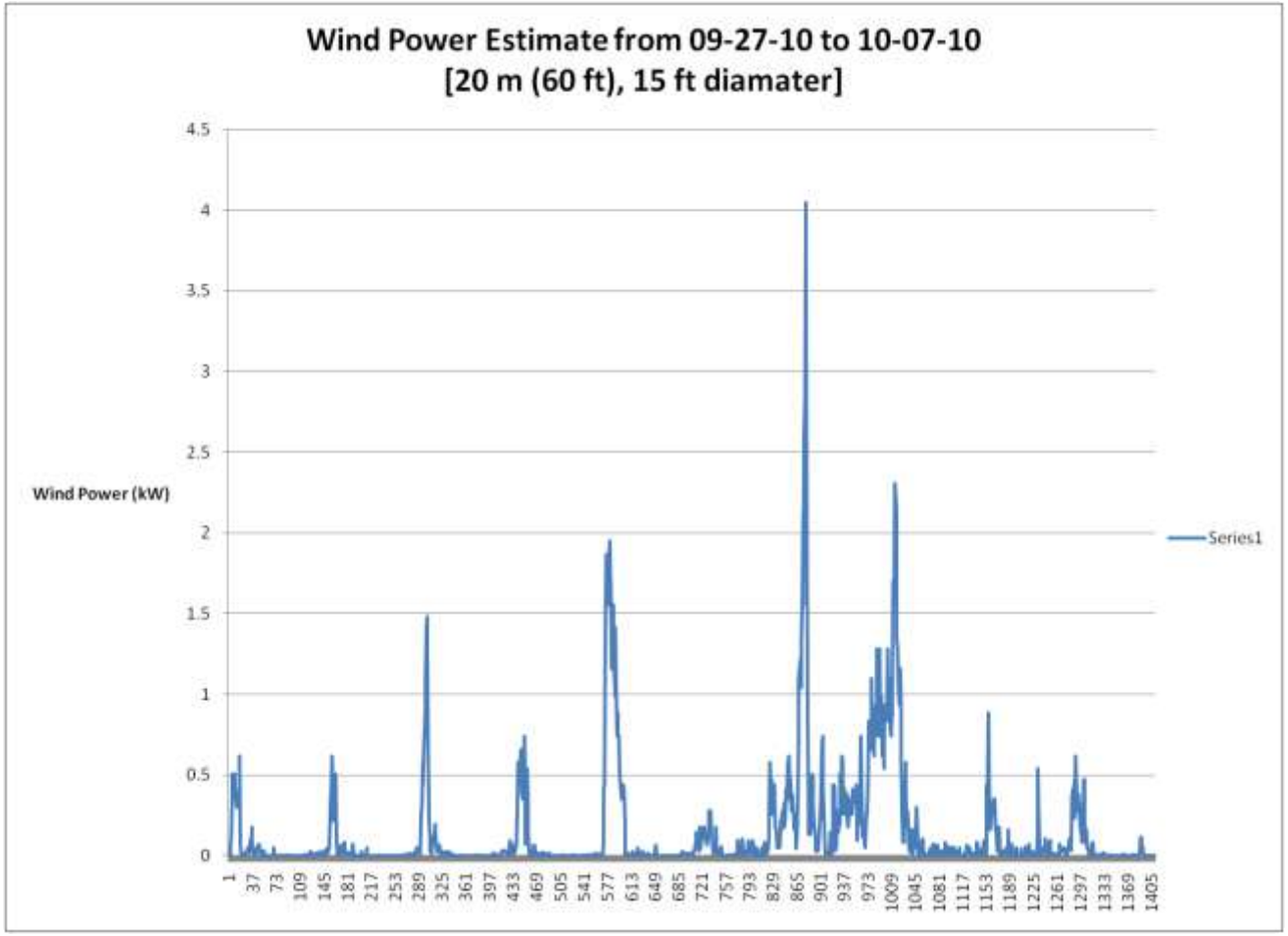
Renewable Energy Feasibility Study: Anemometer Details

More images here:
http://www.ryanlshelby.com/2010-pinoleville-pomo-nation-anemometer-installation.html

Preliminary wind data



Power estimates



What we like about the project

- ❖Deeply collaborative, co-design process
- ❖Building self-reliance in multiple ways
- ❖Integrated with green building, water and restoration projects

Thank you

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