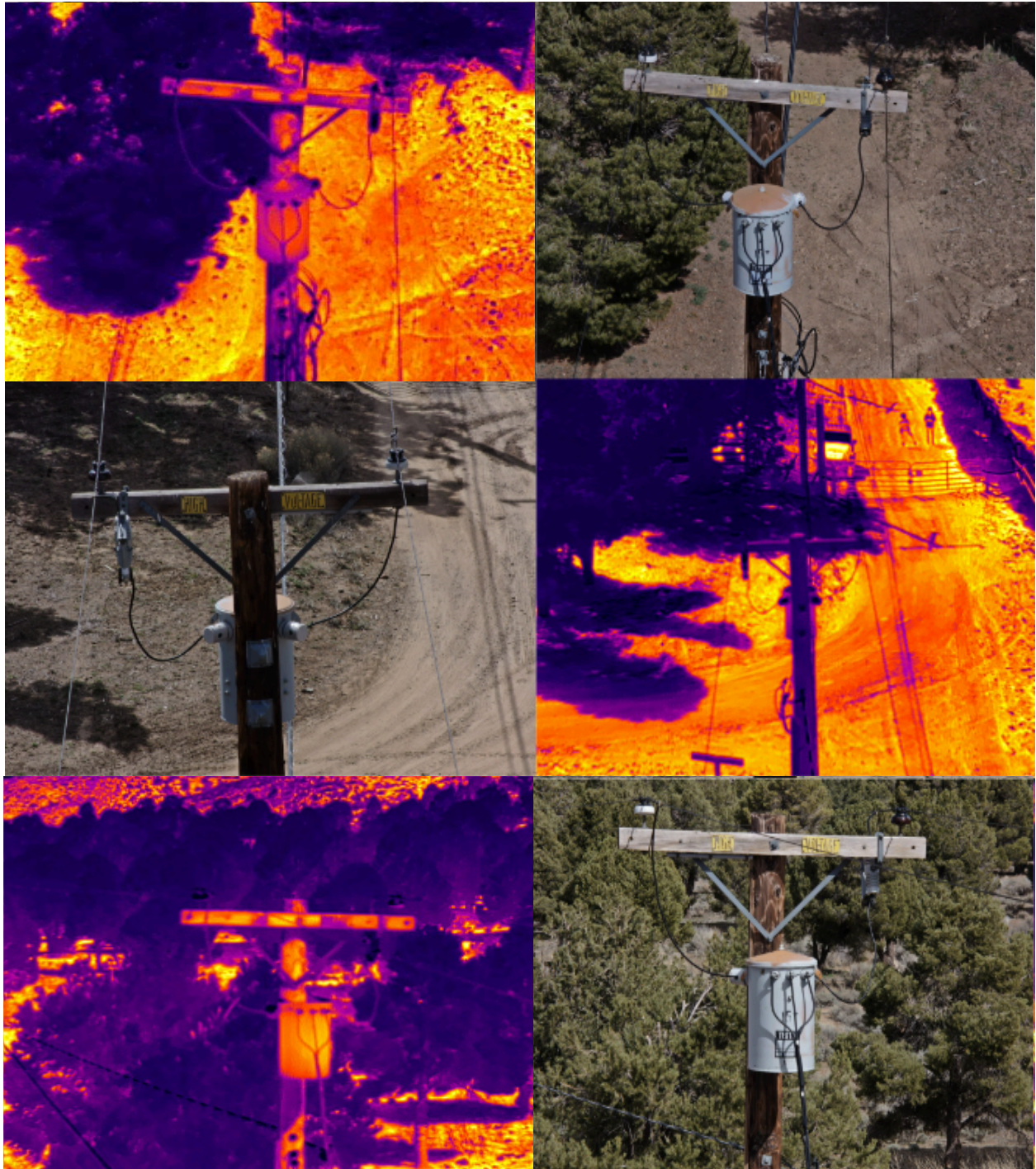


## BVES Drone Collection Methodology



Data collection procedures for pole inspection using drones involve meticulous planning, efficient coordination between team members, and utilization of advanced sensor capabilities. The procedure outlined below ensures comprehensive data capture for analysis and evaluation of pole infrastructure.

### Equipment Required:

- Drone with sensor capable of capturing RGB and IR imagery for each team
  - M300 drone equipped with Zenmuse H20T
  - DJI Mavic 2 Enterprise Advanced
  - Skydio X10
- Necessary safety gear (hard hats, high visibility vests, eye protection, safety cones)
- Radios or communication devices for seamless coordination
- Charged batteries for uninterrupted flight operations
- Vehicle

### Team Composition:

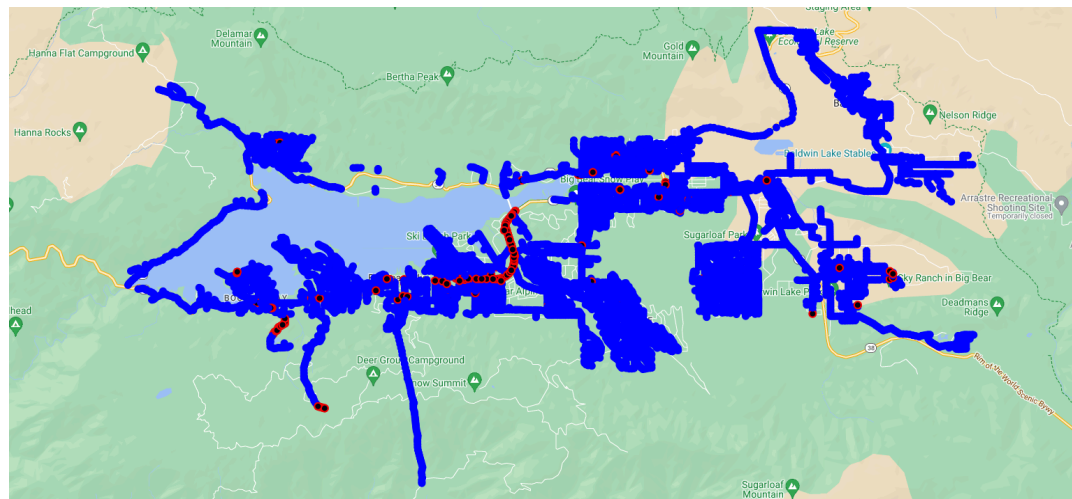
A team of one or two is deployed on equipment used for data collection, consisting of:

- Pilot: Responsible for piloting the drone safely and efficiently.
- VO/Sensor Operator: Operates the Zenmuse H20T camera to capture images as per the specified requirements.

\*Coordinate planning with all teams to work in designated areas.

### Safety Considerations:

- Prioritize safety at all times during drone operations, adhering to Davey and Bear Valley regulations and guidelines.
- Maintain a safe distance of 10ft from power lines and other structures to avoid collisions.
- Monitor weather conditions and avoid flying in rain, snow, or high winds
- Conduct a pre-flight safety inspection of the drone and equipment in the beginning of the day and prior to each flight





## Data Collection Procedure:

**Shot Sheet Summary** ~3-10 shots/6-20 total images per structure (Dual RGB/Thermal sensors) each side of pole, additional closeup shots if defects are identified

1. **Overview RGB/Thermal (2 shots if able, one shot per side)**- entire structure and base as well as surrounding vegetation on both sides of pole
2. **Detailed RGB/Thermal (2 shots per crossarm/per side, one straight on and another at a diagonal)**- each crossarm should fill a majority of the FOV, while also having the camera angled at a 45 degree angle downward to also capture the top of the pole.  
\*\*Thermal to only be taken on poles with equipment\*\*
3. **Zoom RGB (If Applicable)**-If additional defects or encroachments are found, additional images need to be taken.
4. **Detailed/Close Up Thermal (3 additional shots per transformer, if applicable)**- Please avoid using zoom as much as possible as this can distort the infrared captures. Make sure to take images of the front of the transformer and both sides of the transformer (if possible) to identify any hot spots. Solar loading/false positives are possible so additional shots focused on different areas of the equipment are best, especially if one side is in direct sun exposure. Make sure images are captured perpendicular to equipment. The closer to the equipment the better and no further away than 10-15ft. (Straight on, as well as a shot of each side connected to the pole)  
\*\*Thermal to only be taken on poles with equipment\*\*
5. **Pole Tag Image (new poles added)**-Make sure all pole data is clear and legible.



### 1. Overview Photo:

- Capture an overview photo of the pole to include guy wires.
- Check for any signs of damage or leaning in the pole or the guy wires.



- Capture additional photos if there are tree branches encroaching near the lines, obstructing the view, or posing a potential risk.



## 2. Top Down Inspection:

- Take a shot from as close to directly above the pole as possible.



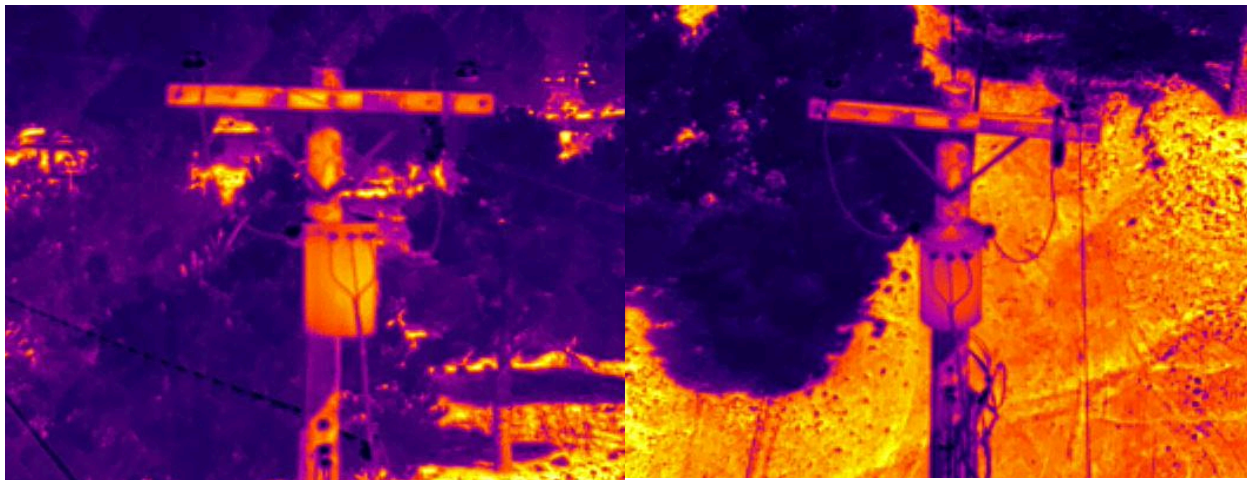
## 3. Detailed (Cross Arm) Inspection:

- Take two shots per "level" of crossarm equipment, angled somewhat downwards to capture the top and front of the beams.
- Ensure that the crossarms occupy approximately about 70% of the photo frame
- Capture photos from both sides of the pole to provide a comprehensive view.
- If any defects or abnormalities are noticed, capture additional close-up pictures for detailed analysis.





**4. Zoom RGB (If Applicable): Examples of Additional Shots of Defects or Encroachments**



**5. Detailed/Close up Thermal (Transformer) Inspection:**



- Capture a RGB and thermal image of the transformer.
- Ensure that the thermal image provides a full capture of the transformer, minimizing background heat interference. When possible, position the transformer against the sky as the background to enhance thermal imaging clarity. Take images from multiple angles if the transformer is reading hot.
- Make sure to capture any switches, reclosers and tripsavers.

#### 6. Pole Tag Image





## Sorting Images

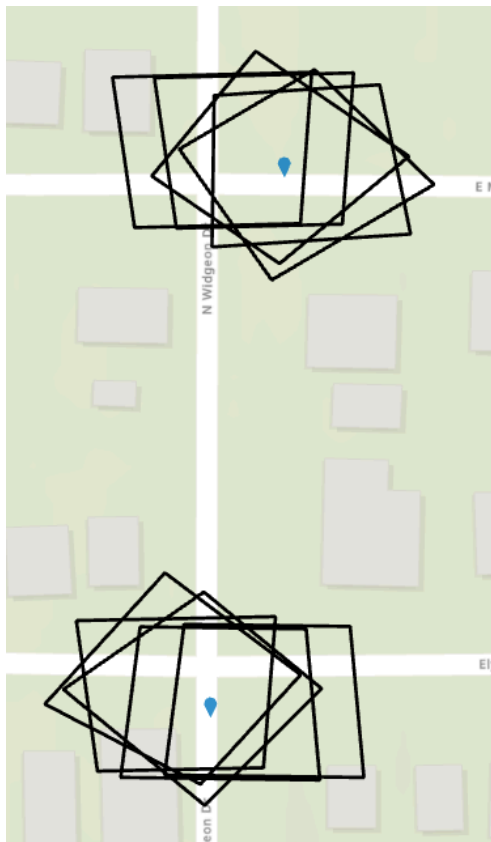
Take images out of any subfolders and compile them directly into one folder.  
Have a pole locations CSV formatted "Pole Number", "Latitude", "Longitude"

	A	B	C
1	polenum	latitude	longitude
2	8059BV	34.24653547	-116.8360031
3	15807BV	34.24288251	-116.8340918
4	7513BVA	34.24260357	-116.8348745

- Run polesorting.py, and input the path to your folder, and the pole locations CSV

```
Input folder path: D:/3-25Photos  
Path to pole CSV file: D:/polelocations.csv
```

Clean up any photos which did not find a match, or that have multiple matches, using ArcGIS/ArcPro and the provided Shapefile



- Move identified photos to the corresponding folder, within the output/sorted folder.

- Upload all pole folders to FTP under your Team Name and date.