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Aerial-Based Survey Using Unmanned Aircraft System (UAS) Technology for PTC Compliance

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Presenter

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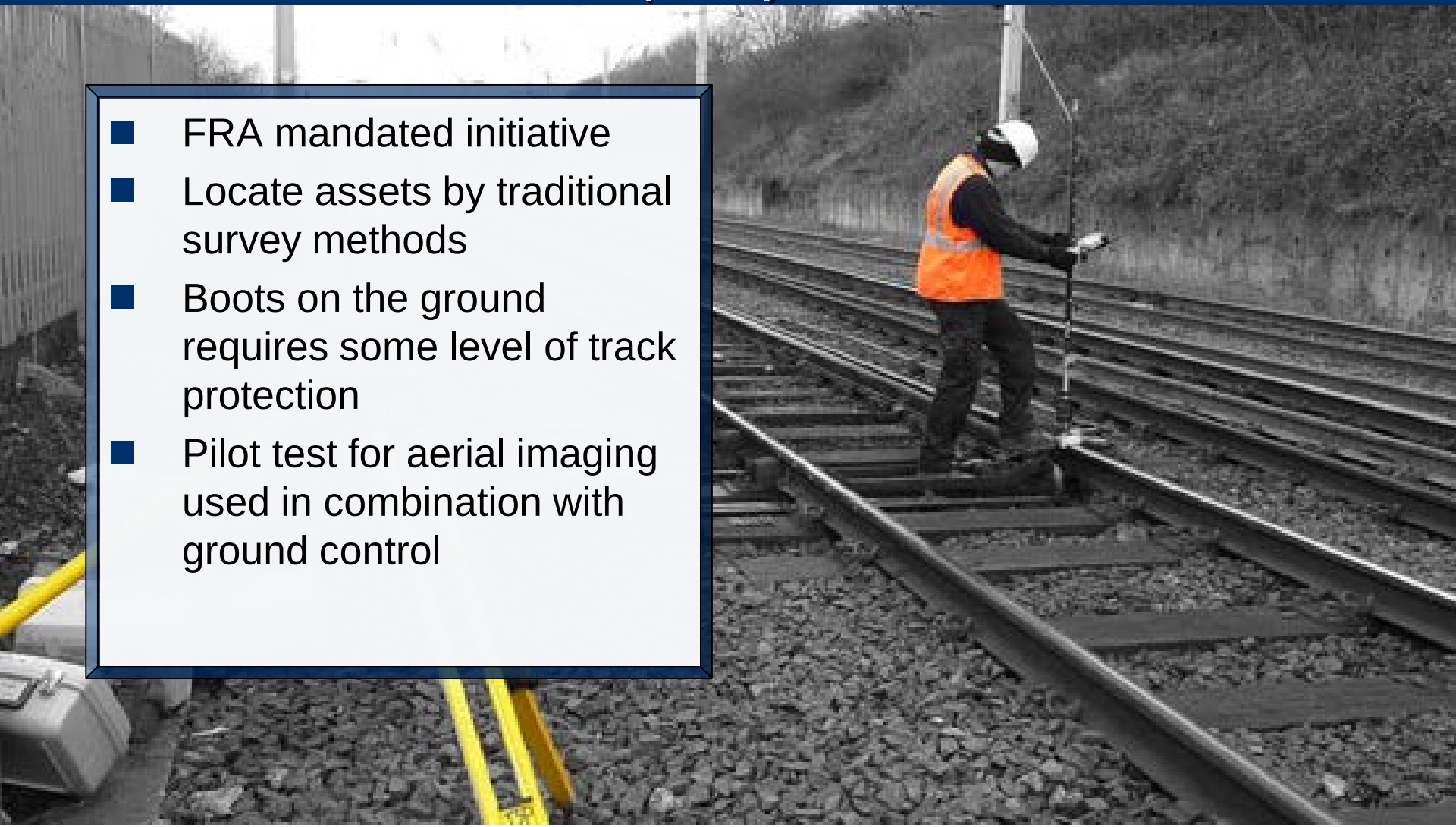
Arcadis

Pilot Test Objectives

- Are there advantages over traditional survey techniques
- Safety and efficiency
- Aerial survey compared to traditional survey
- Lessons learned

Positive Train Control (PTC)

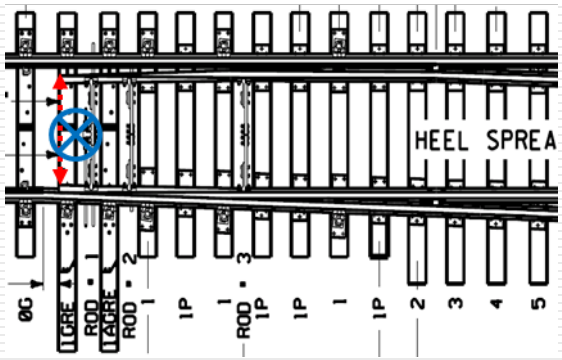


- FRA mandated initiative
- Locate assets by traditional survey methods
- Boots on the ground requires some level of track protection
- Pilot test for aerial imaging used in combination with ground control

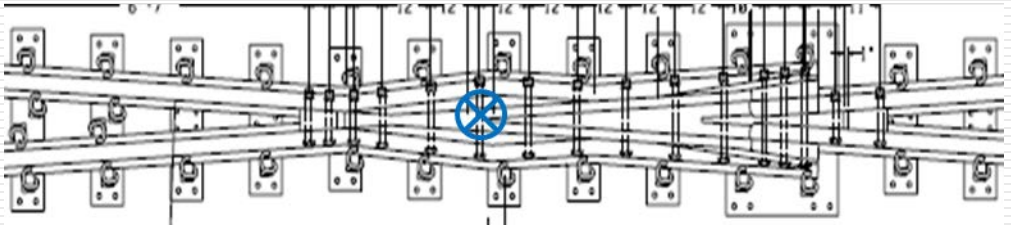
PTC – Ground Survey Requirements

- Asset Location Specifications
  - All assets -1.0 meters (3 feet, 3 inches) horizontally
  - Controlled Track Centerline - 1.0 meters (3 feet, 3 inches) horizontally and 0.8 meters (2 feet, 7.5 inches) vertical
  - Any assets that are collected need a photo taken

Switches



Frogs



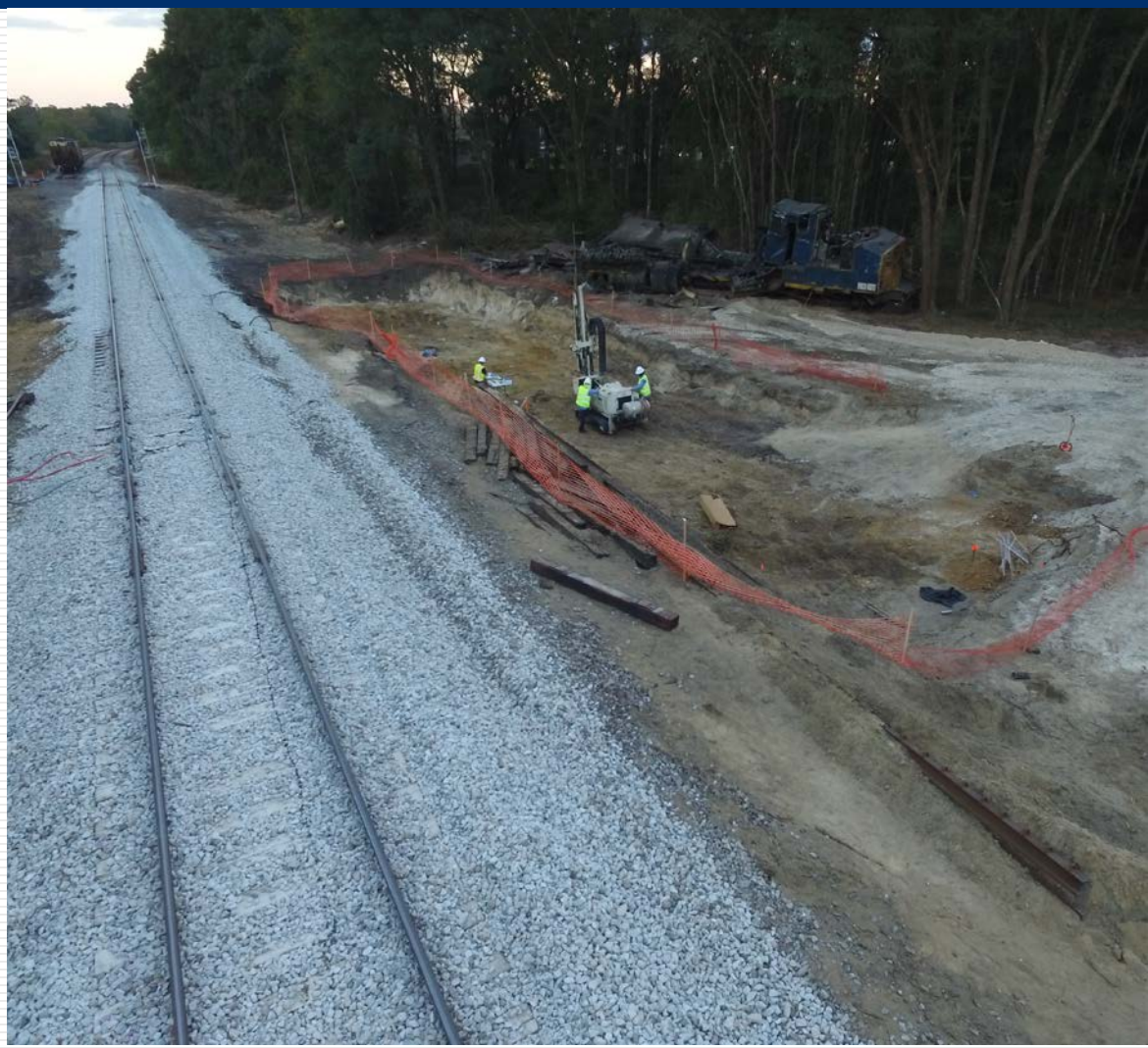
Considering UASs for PTC Survey

- Can we inspect and survey assets without fouling track?
- How can aerial imagery supplement traditional survey methods?
- **Can we expect survey grade accuracy from the air?**

UASs have potential for use in almost any field collection, and provides the data in a systematic and safe fashion.

UAS Advantages

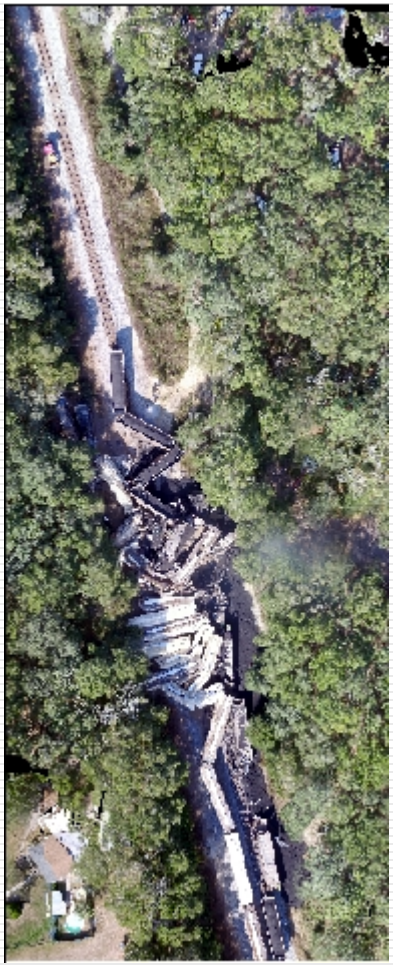
- Rapid deployment
- Enhances H&S
- Close up flexibility
- Repeated collection



UAS Limitations

- Flight time
- Airspace
- Visual contact

Emergency Response – Day 1



Emergency Response – Day 2

Emergency Response – Day 3

PTC Pilot Test

- Survey of rail construction and assets following derailment
- UAS used to collect imagery over 1.2 miles of track
- Pre-programmed flight path used to collect imagery

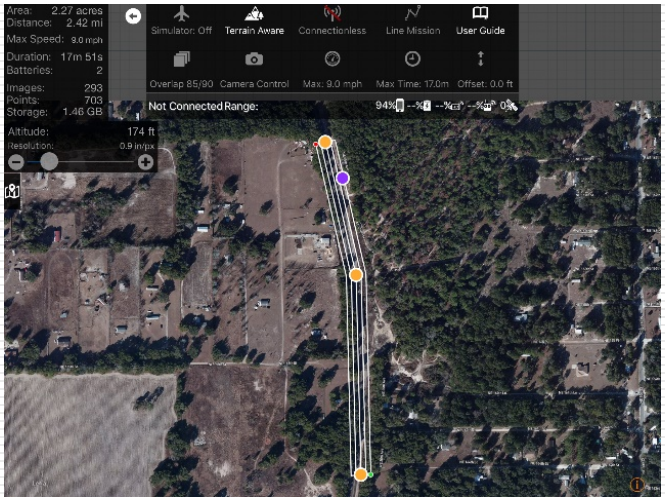


Image Processing

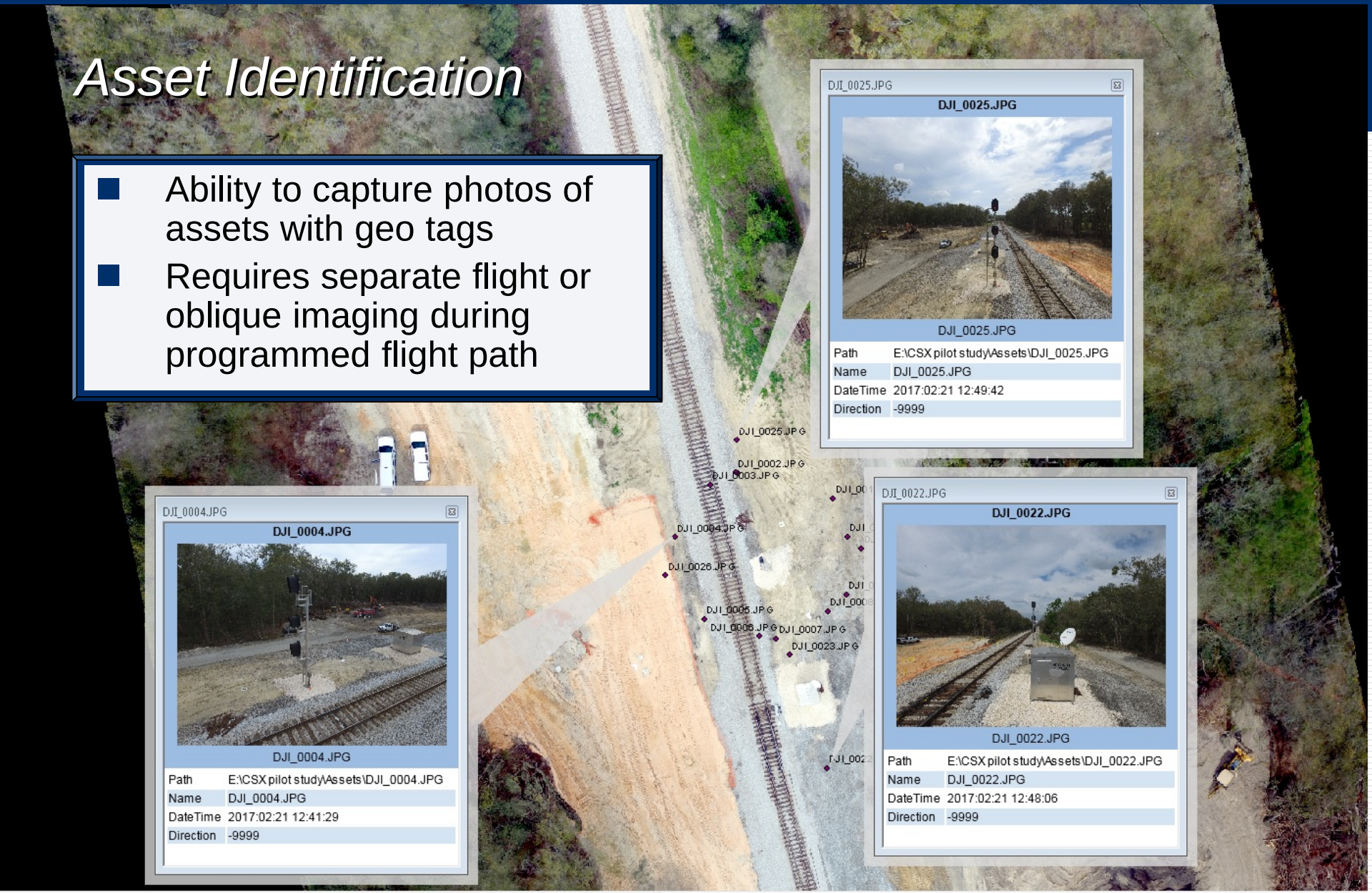
- Direct zoom imagery taken from the orthomosaic image

Modeling

- Post processing of images produces an orthomosaic and creates point cloud file that can be used to create 3-D models

Asset Identification

- Ability to capture photos of assets with geo tags
- Requires separate flight or oblique imaging during programmed flight path



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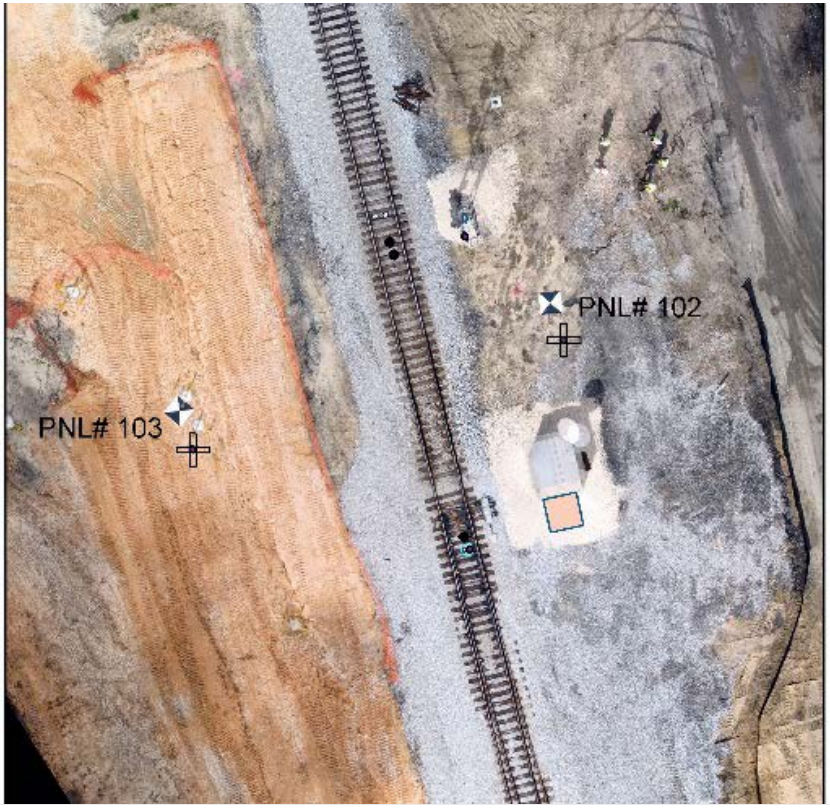
Placement of Ground Control

- 6 targets were used over the 1.2 miles of track
- Targets were staggered in pairs on the X axis
- Accuracy was approximately 1 foot in this configuration
- Incorporating know asset locations from traditional survey brought accuracy to 0.1 feet

Ground Control

- With Ground Control



- Without Ground Control

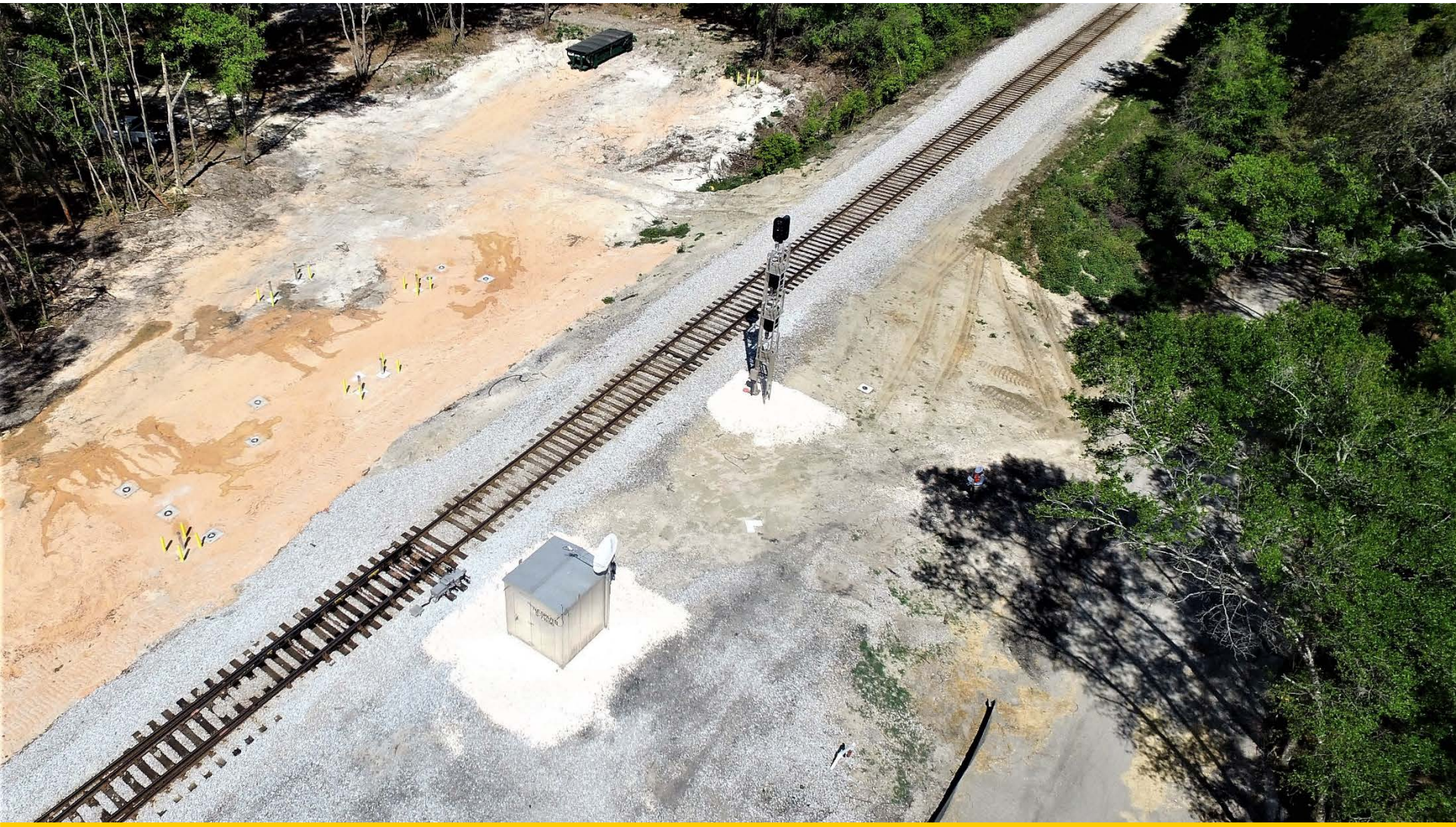
Lessons Learned

- Ground control spacing directly affects the accuracy of the model
  - Using GCP in pairs essential equaled 3 points instead of 6
  - GCP need to be staggered throughout the corridor to be surveyed
- Free flight to capture photos of assets

In Summary

- UAS can improve the efficiency and repeatability of large data collection
- Provides increased worker safety
- Allows for the collection of data for all site features, not just the targeted assets
- UAS-based survey can meet PTC accuracy

Questions?



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