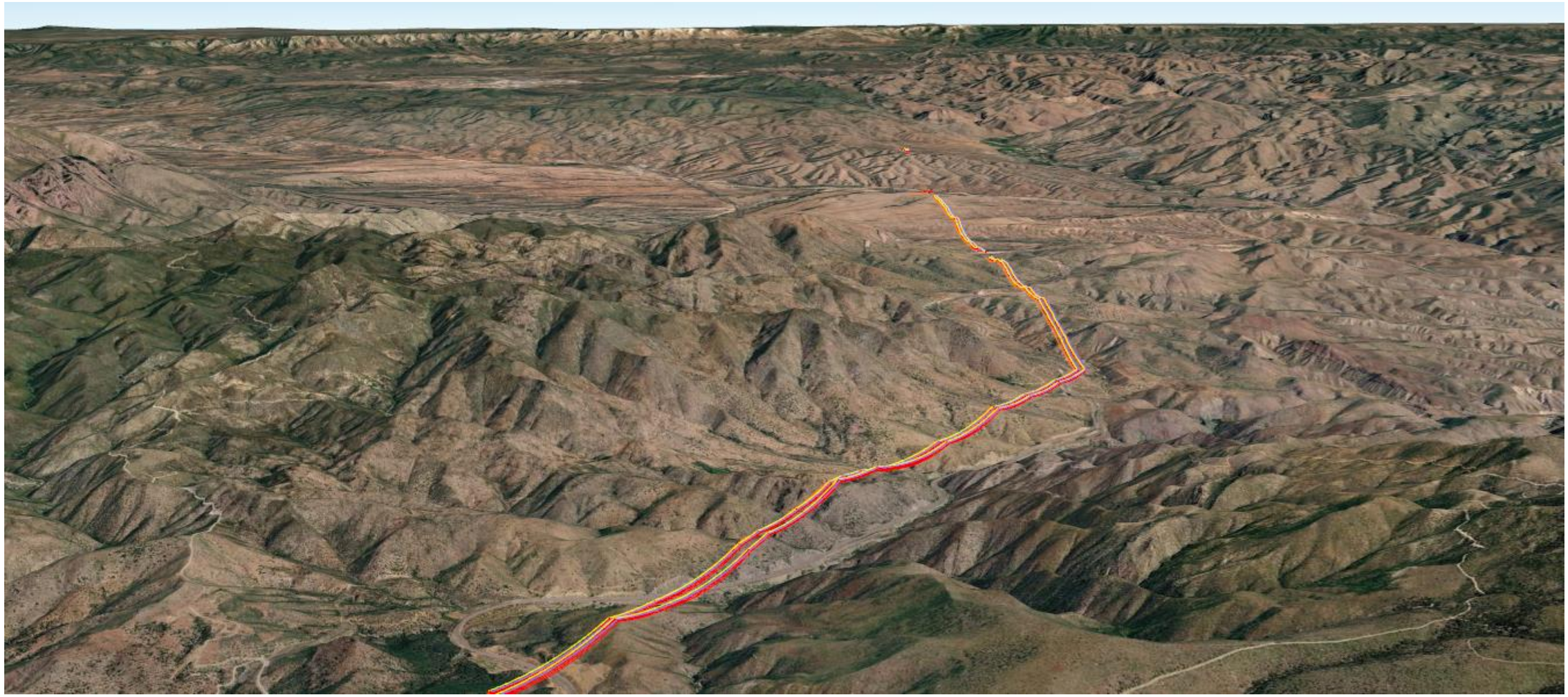
APS - Strategic Fiber East



Ralphie Adams
June 2026

POWER LINE® SYSTEMS
Part of Bentley Systems
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Agenda:

1 – Background (OPGW)

2 - Objectives

3 – Route Selection & Corridor Constraints

4 – Geotechnical & Vegetation Conditions

5 – Engineering & Structural Design (Optimization)

6 – Constructability & Maintenance Planning

7 – Clearances & Crossings

8– Risk & Mitigations

9 – Results & Key Findings

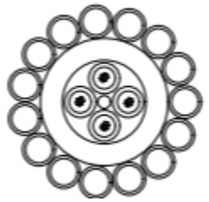
Questions…

1 – Background - APS Comm (OPGW)

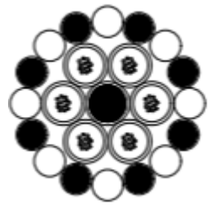
- Communications network in some Arizona regions is limited
- Emergency Services have challenges in some remote locations

- Continue with building APS Comm backbone infrastructure

- 48 & 96 OPGW was the standard pre-2018

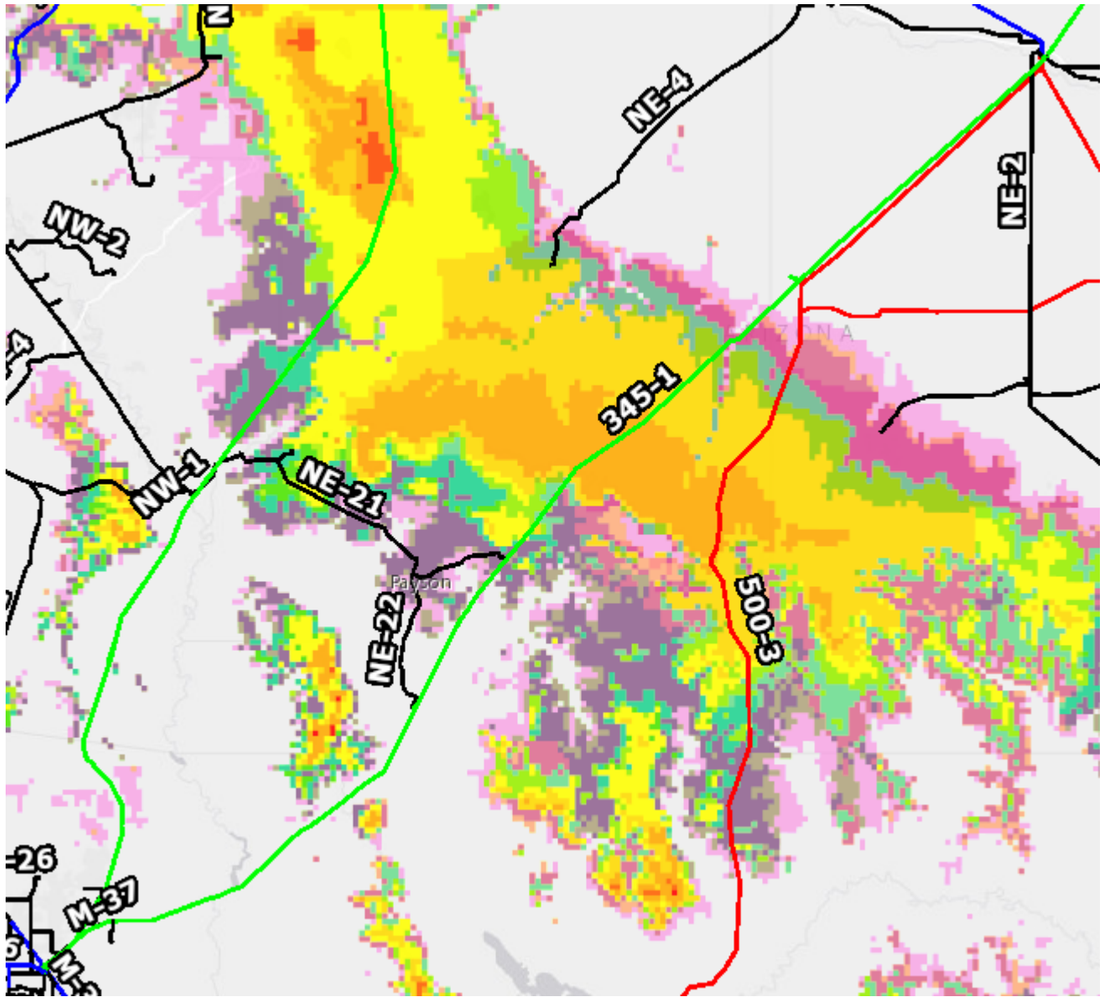


- 432 OPGW is proposed for backbone installation, post 2018



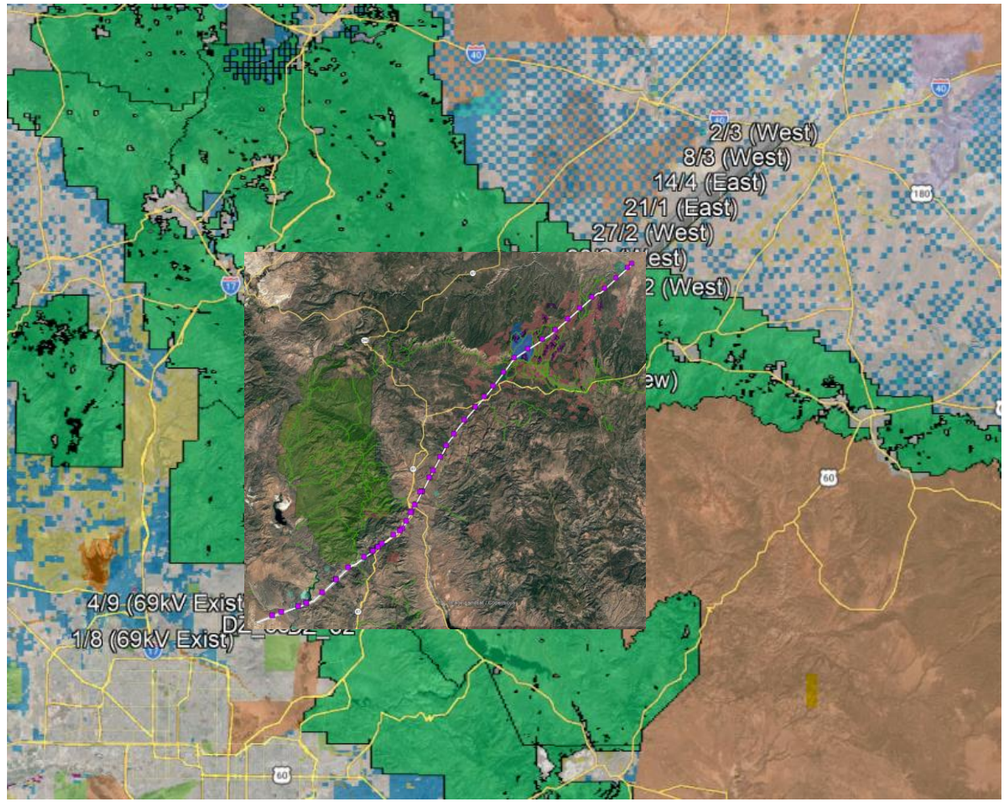
2 - Objectives

- Design characteristics:
  - Wood Pole design for easier like-like replacement & climbing in winter
    - Use standard class poles with guy for structural hardening
  - Establish design parameters for local weather magnitudes along alignment
  - Minimize environmental and permitting impacts
  - Ensure constructability and long-term maintainability



3 – Route Selection & Corridor Constraints

LOGAN SIMPSON



- Biology Conservation Measure Areas
  - Sonoran Desert Tortoise Monitor Area
  - MSO - NO WORK 3/1 - 8/31
  - Northern Leopard Frog
  - Bald Eagle - NO WORK 12/1 - 6/30
  - Golden Eagle - NO WORK 2/1 - 7/15
  - Yellow-billed cuckoo - NO WORK 5/25 - 9/30
  - Yellow-billed cuckoo and southwestern willow flycatcher
  - Northern Mexican Gartersnake Monitor Area
  - YBCU_and_SWFL_Road_Restriction_Poly
  - Chiricahua Leopard Frog - NO WORK 7/1 - 9/30
  - Northern Goshawk - NO WORK 3/1 - 9/30
  - NZ_mudsnail_avoidance_waters
  - Mazatzal Wilderness

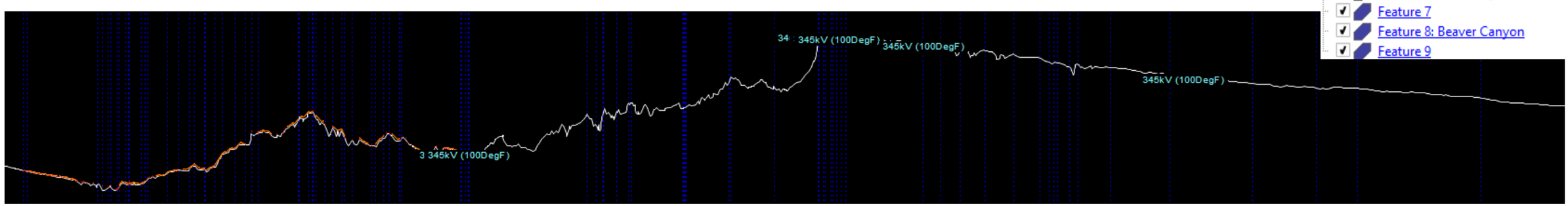
- Waters of the US - Permitted Impacts
  - Feature 5: Willow Creek
  - Feature 7
  - Feature 8: Beaver Canyon
  - Feature 9
  - Feature 10
  - Feature 13: Big Canyon
  - Feature 14
  - Feature 17
  - Feature 18: Gibson Creek
  - Feature 19: Sand Wash - See Notes
  - Feature 21: Hardt Creek
  - Feature 22: Gold Creek
  - Feature 24
  - Feature 29: Alder Creek
  - Feature 31

- Water of the US - Avoidance Areas
  - Feature 1: Chevelon Creek
  - Feature 11: Tonto Creek
  - Feature 13: Big Canyon
  - Feature 15: Green Valley Creek
  - Feature 16: Houston Creek
  - Feature 17
  - Feature 18: Gibson Creek
  - Feature 19: Sand Wash
  - Feature 2: Alder Canyon
  - Feature 20: Rye Creek
  - Feature 21: Hardt Creek
  - Feature 22: Gold Creek
  - Feature 23: Corral Creek
  - Feature 24
  - Feature 25: Slate Creek
  - Feature 26
  - Feature 27: Sycamore Creek
  - Feature 28
  - Feature 29: Alder Creek
  - Feature 3: West Chevelon Creek
  - Feature 30
  - Feature 32: Bartlett Lake
  - Feature 33: Verde River
  - Feature 34: Camp Creek
  - Feature 4
  - Feature 5: Willow Creek
  - Feature 6: Bear Canyon
  - Feature 7
  - Feature 8: Beaver Canyon
  - Feature 9

- Cultural Site Avoidance Areas
  - Cultural avoidance area
- Cultural Monitoring Area
  - Cultural monitoring area

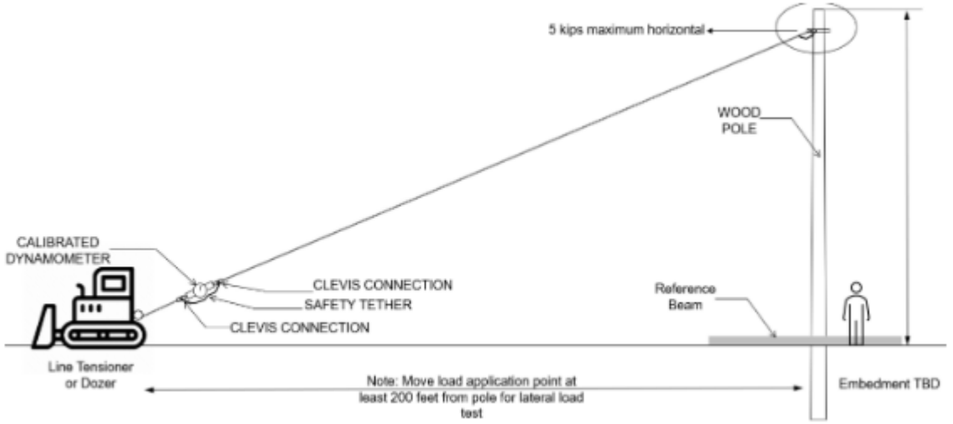
Archeological Sensitive regions throughout project

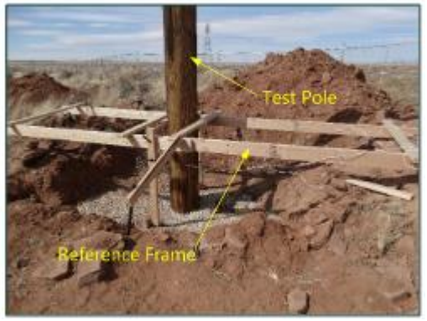
- Required several iterations of pole relocations



4a – Geotechnical Conditions

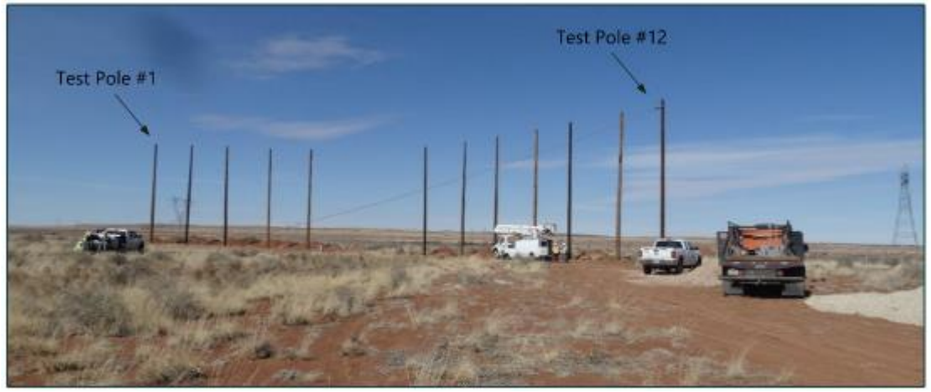
- Material used for annulus testing
  - Polyurethane foam (30 and 50lb kit)
  - Aggregate Base Course (ABC)
  - Crushed Rock (ASTM C33 #57 Stone)

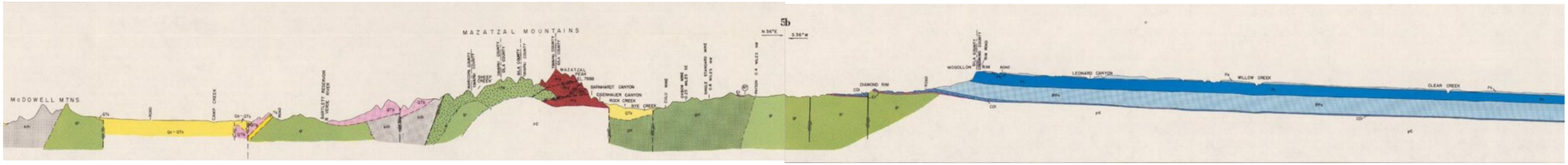




Aggregate Base Course (ABC) – “MAG 702” selected

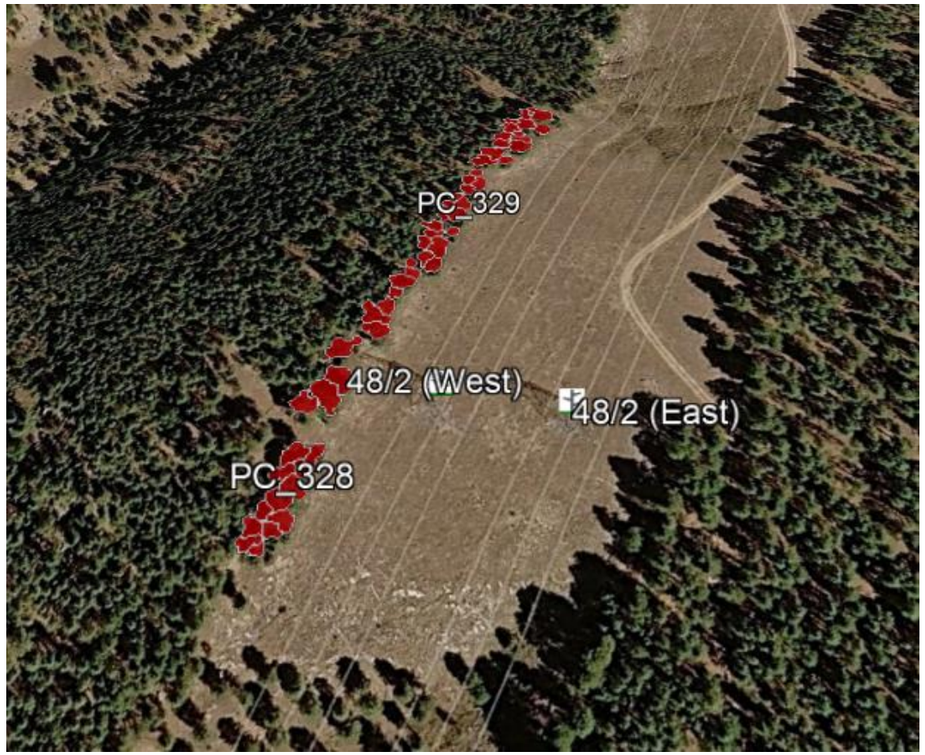
- No moisture conditioning required
- Installed with compacted and controlled lifts produced nearly double GL capacity (vs. #57 stone)

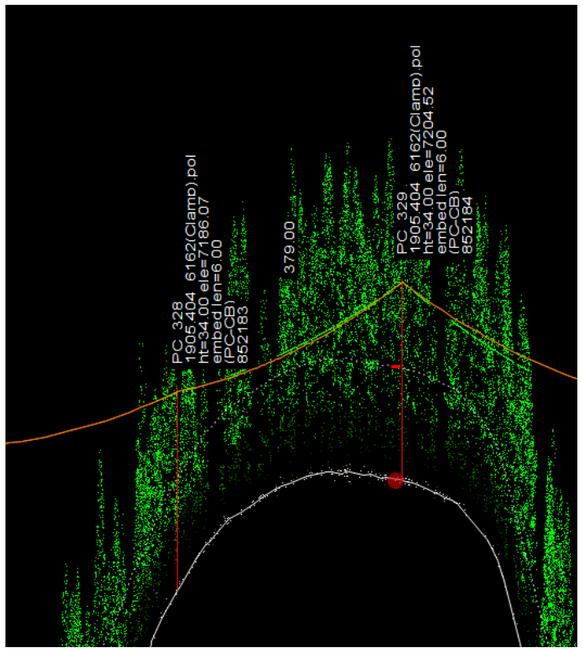


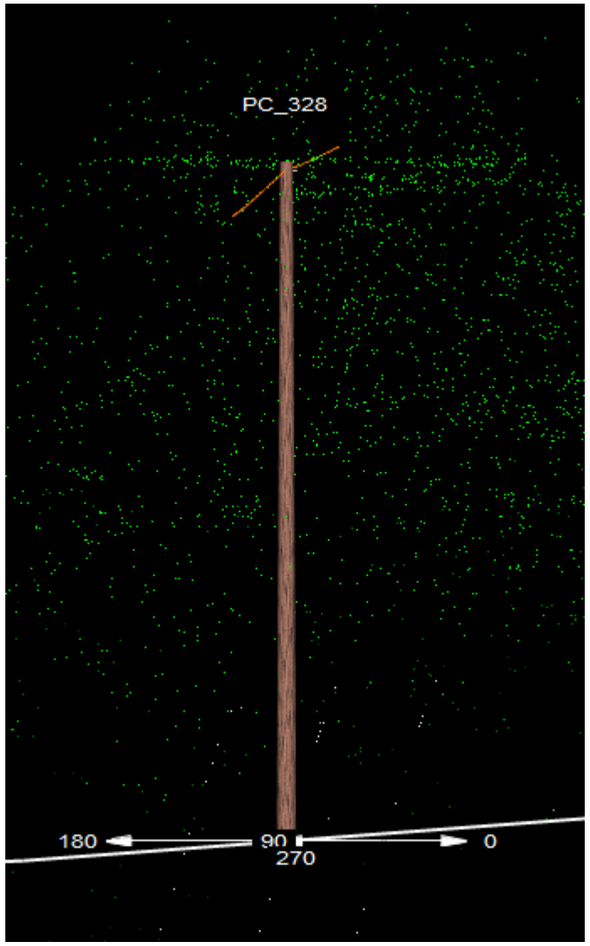


4b – Vegetation Conditions

- Leveraged LiDAR data-sets to map out the vegetation conflicts with the structure locations and conductor + blow-out + electrical clearances

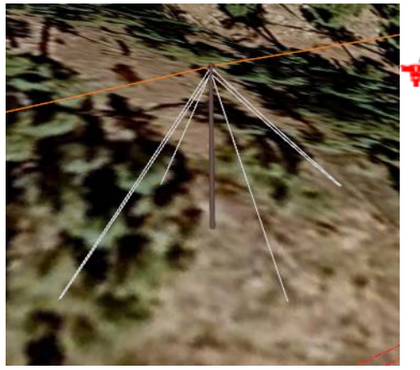


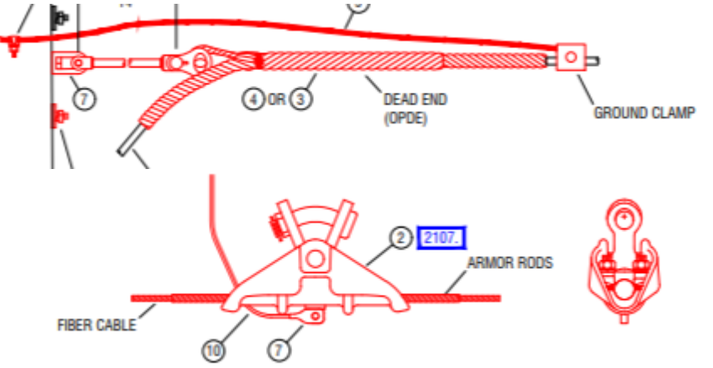


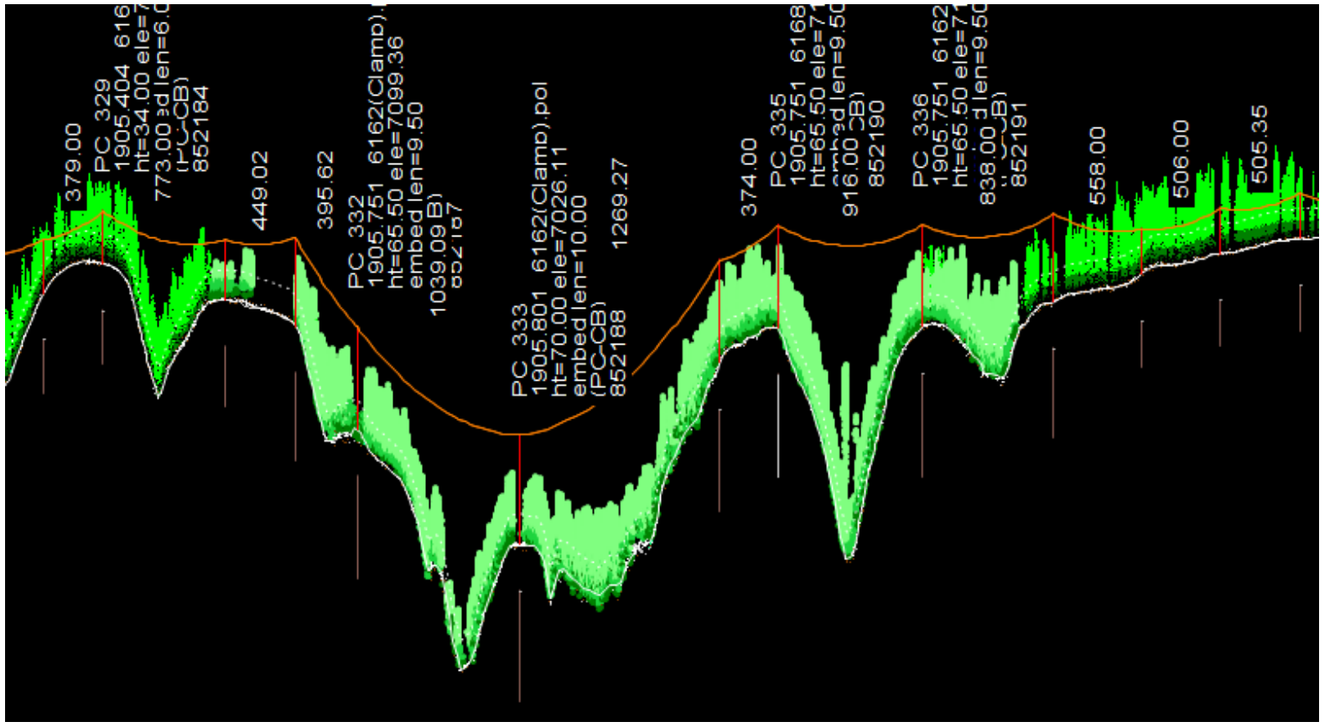


5 – Engineering & Structural Design

- OPGW cable and hardware specs
  - Typical tangent and DE framing + down-guying as needed
- Pole Loading classifications (weather & load cases)
  - NESC + APS criteria
  - Site-Specific 250C (90 thru 163 mph, w/ terrain)
  - 250D conditions (0.2 thru 7 lbs/ft)
  - Structure Groups using “Station Based” loading
- Structure Family Development
  - Standard class DF wood poles (30 thru 90ft)
- PLS Optimization Process
  - $$$ for material, construction based on Str type



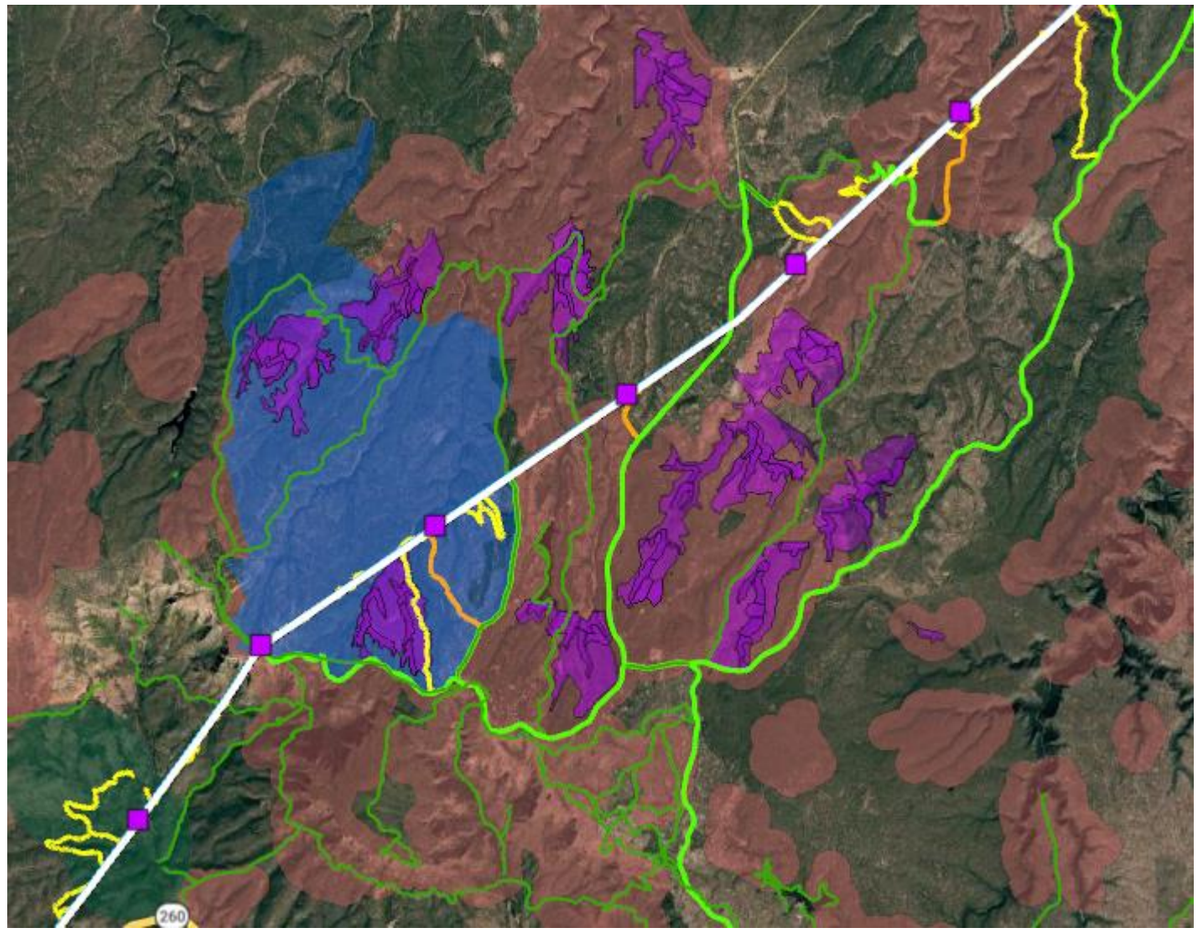




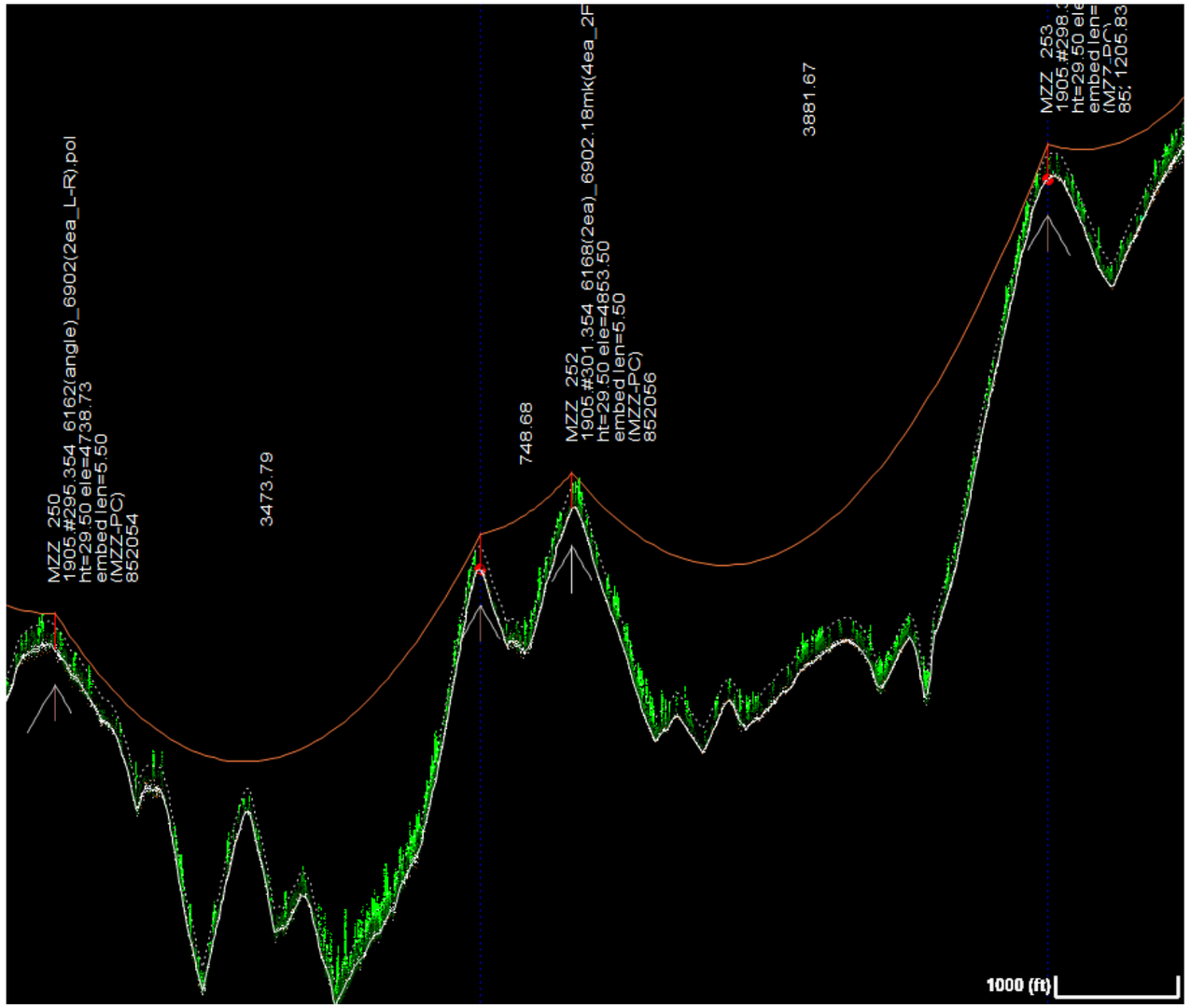
6 – Constructability & Maintenance Planning

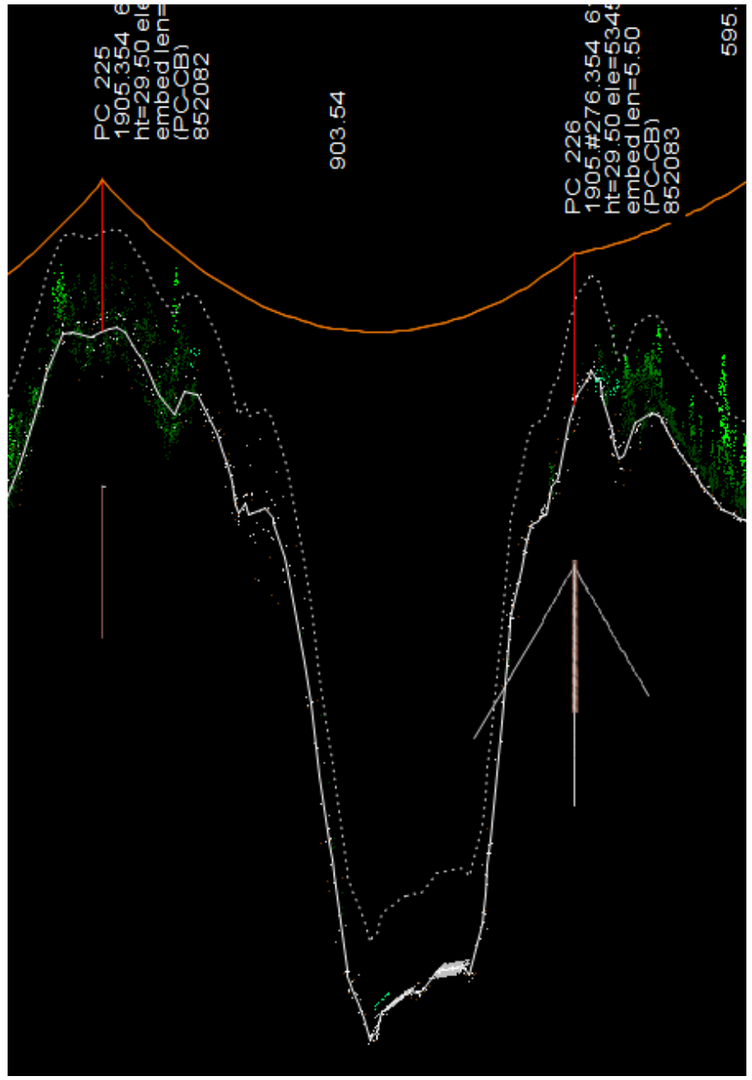
- OPGW Reel Pay-Out & Pulling Sites
  - Approved set-up sites only (NF)
  - Ingress & egress routes
  - Road conditions, classified for permitting
  - Civil road work mapping

- Splice Case Accessibility
  - Full time access to splice case(s)
  - Specialized splicing trainer for terrain



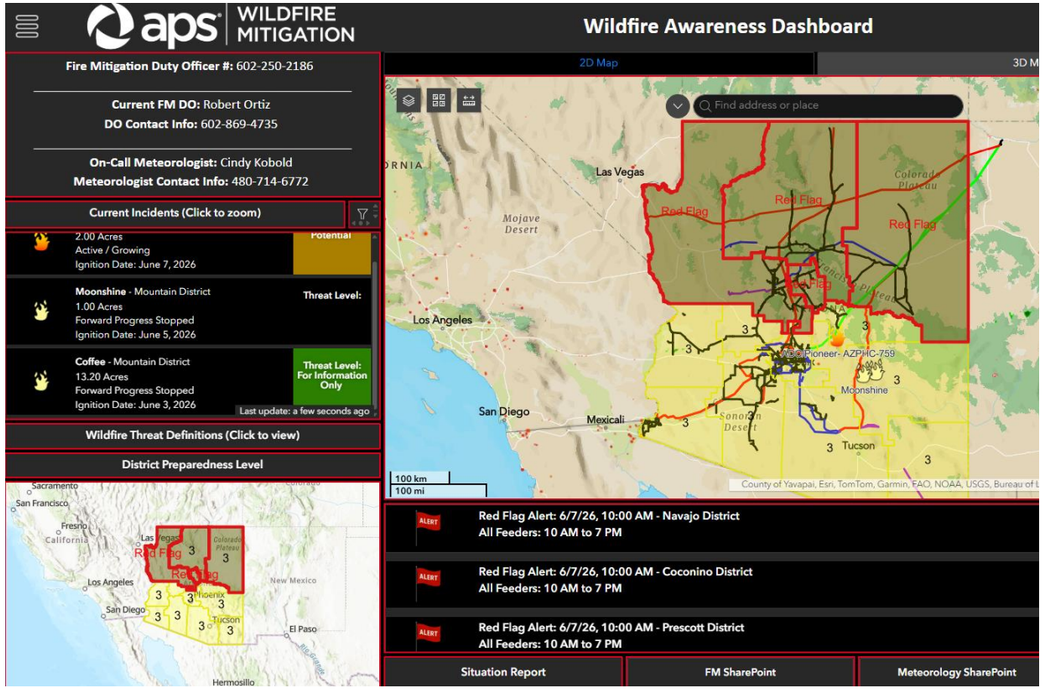
7 – Clearances & Crossings

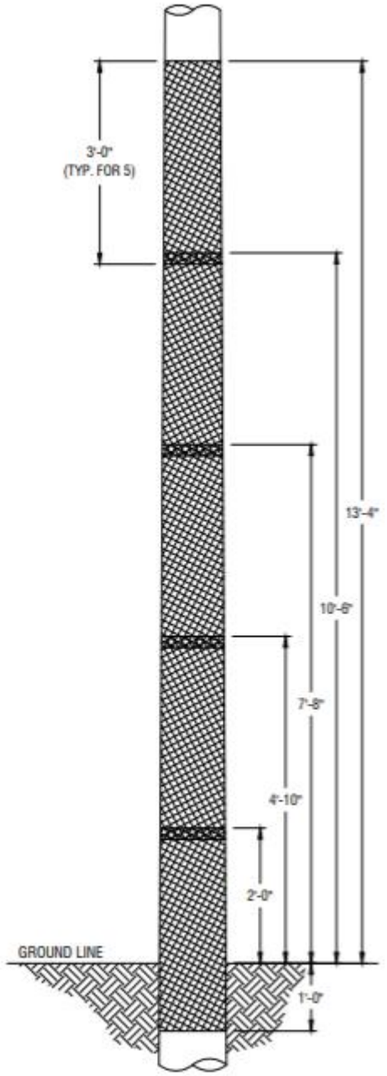




8 – Risk & Mitigations

- Fire danger risk(s) throughout project duration
  - Defensible Space Around Poles (DSAP)
  - Fire Mitigation Meteorology
  - Hazard Tree Program
  - Elevated Fire Conditions (Map)
  - District Preparedness Levels
  - Operational Dashboards
  - Fire-Wrap



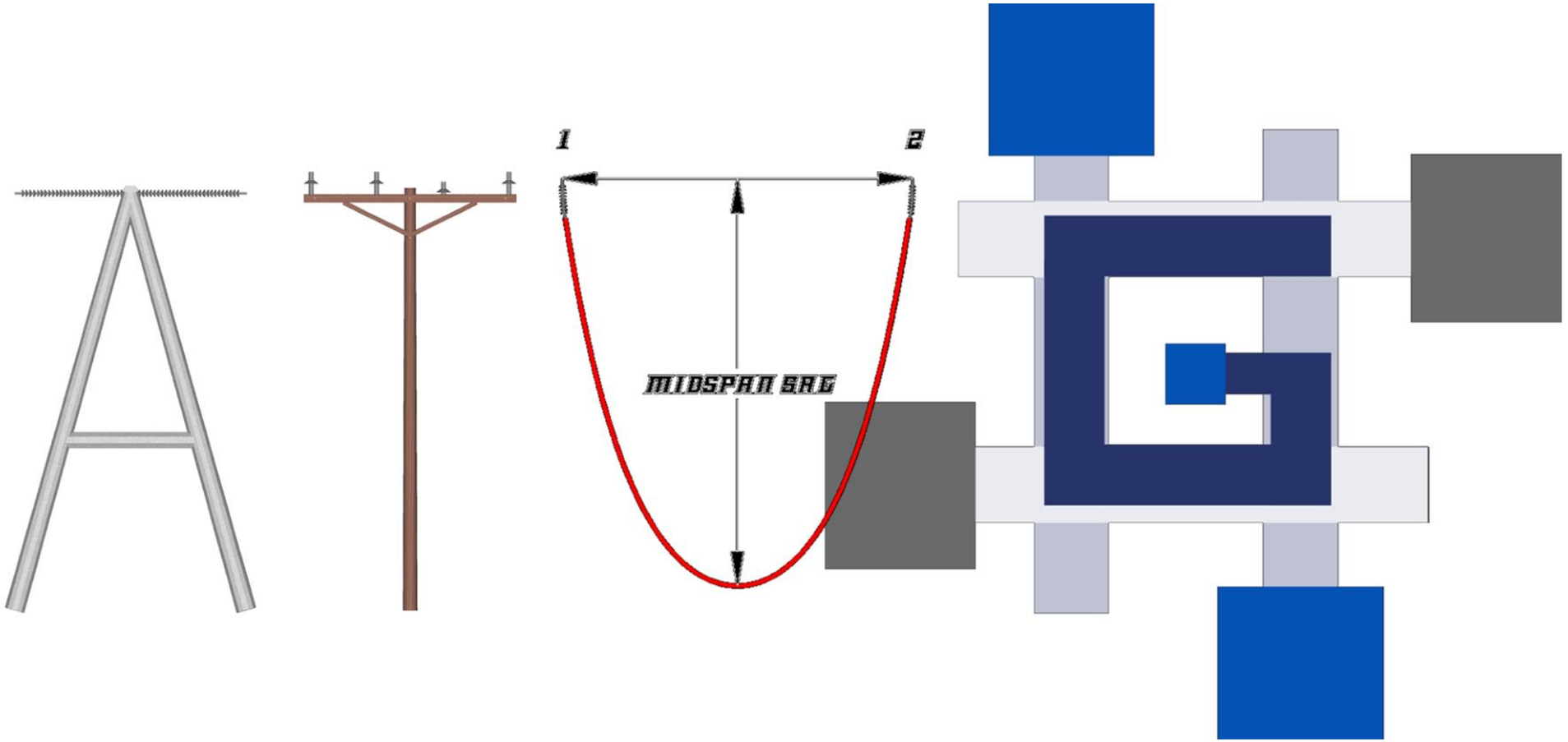


9 – Results & Key Findings

- 6+ years in the making:
  - Design version 39 and counting…
  - Permitting completed
    - TNF, SNF, ADOT, AZSLD and Private
  - Construction Planning & Implementation (ongoing)

- Optimized structure layout
  - Ongoing management of material ordered versus emergency needs for system restoration
- Verified clearances + site-specific weather loading details
- Reduced environmental impact
- Improved long-term maintainability

Questions...



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