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Surveying From The Sky

Presented By:

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Agenda

- Safety Discussion
- Data Collection Best Practices
- Cloud Based Processing / Analytics / Storage
- Virtual Surveying – How Do We Design On 1 Billion Points?
- Life Cycle: Planning – Design – Construction– Maintenance

SAFETY

- Review the Project Scope
- Review the Job Hazard Analysis
- Avoid working alone.

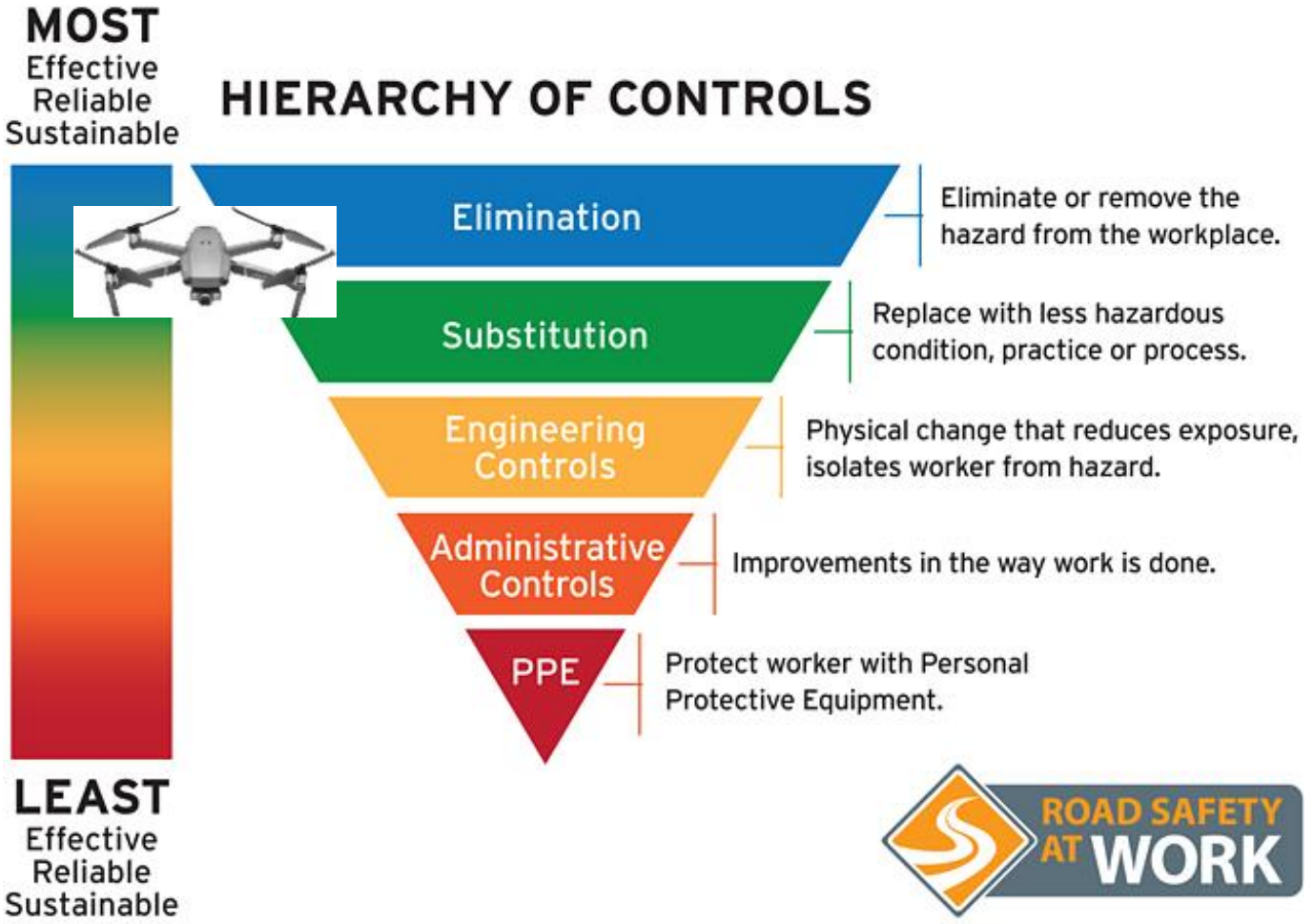

Image Source: https://roadsafetyatwork.ca/wp-content/uploads/2016/08/RSAW-Hierarchy-of-Controls-LS-Aug-10-16.png

Agenda

Data Collection Best Practices

Data Collection Best Practices

- Know Your Drone & Survey Equipment!
- Basics of Photogrammetry
- How to Set Out Ground Control
- What Is The Terrain Like Where We Are Flying?
  - Is the drone the best tool for the job?
- What Is The Weather Condition At The Site?

Drone & Survey Equipment

Our Current Aerial Survey Package!

1. DJI Mavic 3E with (5) AeroPoints
2. AeroPoints are smart survey targets
3. Trimble Survey Equipment

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Know Your Equipment!

Drone:

- Preferred Minimum Camera Properties
  - 1 – Inch CMOS Sensor – 20 MP
  - Mechanical Shutter – Prevent Motion Blur
  - RTK Capable Drone
- Preferred to have terrain follow ability

AeroPoints:

- Smart survey targets that collect static data.
- Capture time must overlap with drone flight.
- Minimum of 10 minutes of photo capture time.

propelleraero.com/gsd-calculator

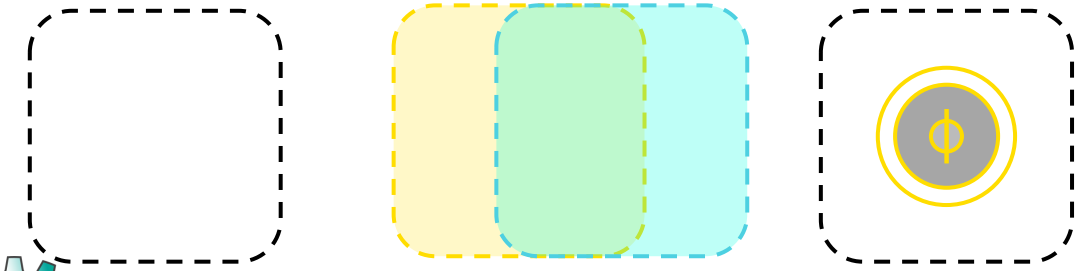
Accurate photo survey

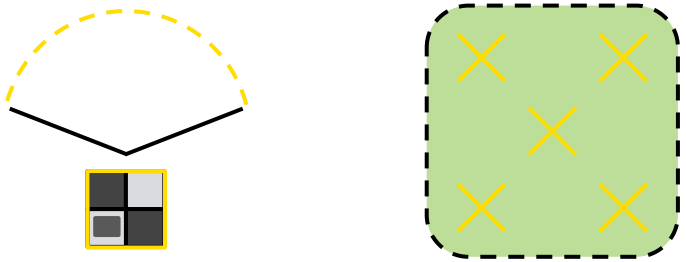
Imagery

- Clean, crisp, clear
- Appropriately overlapped
- Precisely geotagged

Ground control

- Placed in the clear
- Balanced across the site
- Accurately located





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Quality in → Quality out

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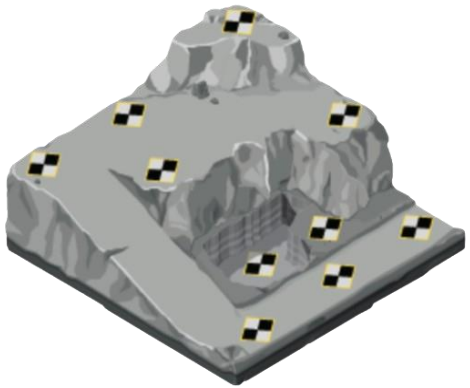
Components of Mission Success

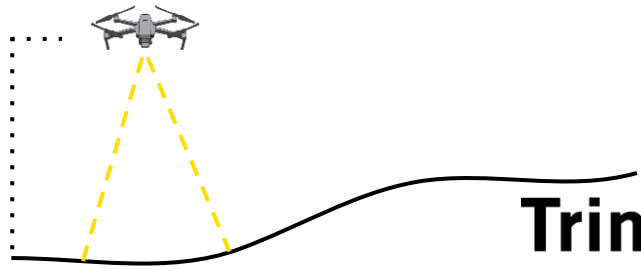


Ground control:

1. Each AeroPoint capture must be at least 10 minutes long.
2. All ground control must be within your mission boundary and balance the site.
3. AeroPoint collections should be static (do not move them while logging data).
4. Ground control coordinate system must match project coordinate system.

Drone flight:

1. Each flight must be at least 10 minutes long (this includes additional flights after battery changes).
2. Camera settings match assure high quality imagery.
3. Flight settings match PPK specifications.



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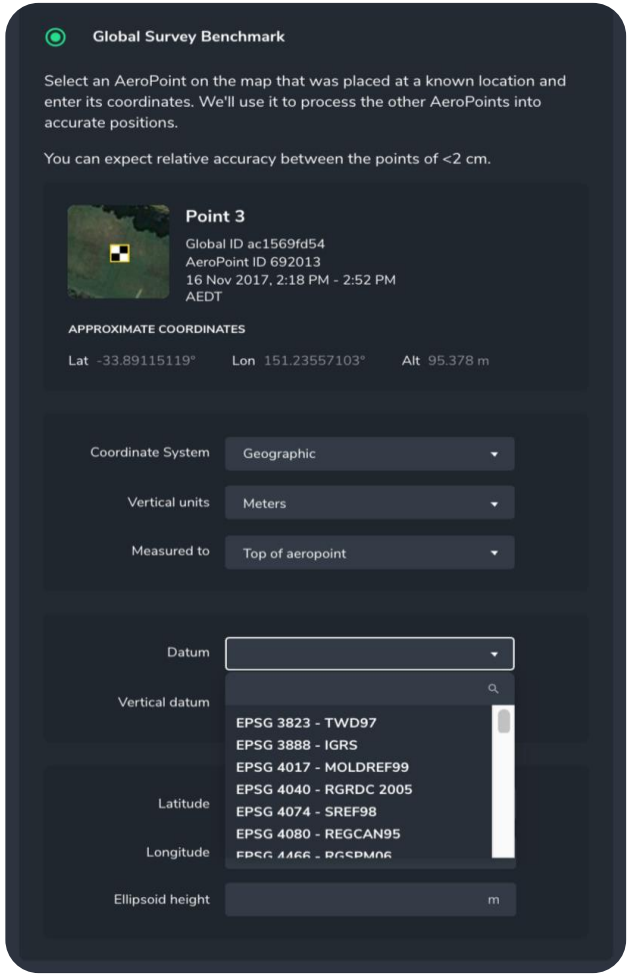
Working With Local Coordinates

Preferred Survey Method

- Known Point Method
  - Establish Coordinate Control Point
  - Set On Hard Surface



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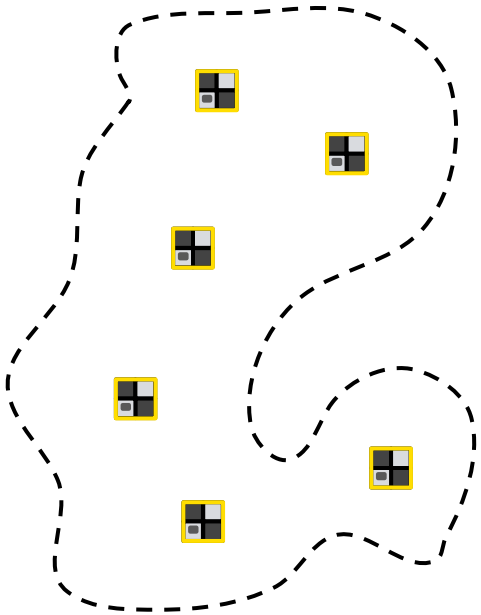
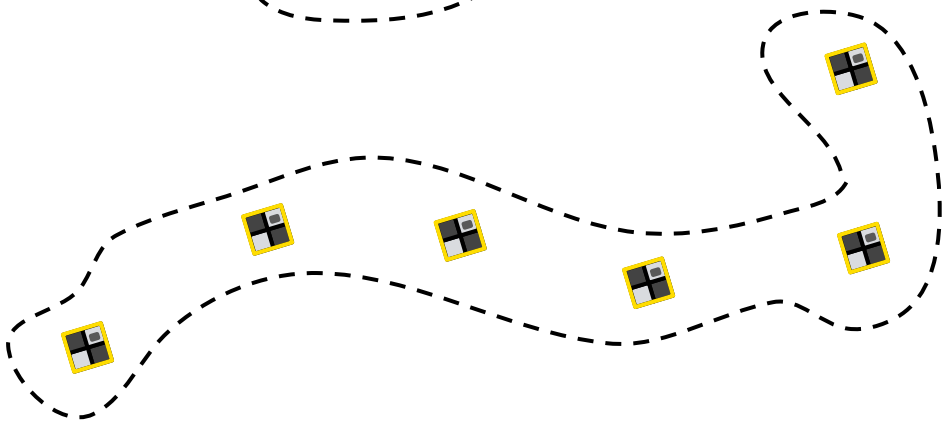
Placing AeroPoints on your site

Using AeroPoints for our PPK workflow is easy. Just make sure to keep in mind:

- 1-2 AeroPoints covers ~100 acres
  - Add 1 AP for each additional 50 acres
- Each AP position should be an unobstructed, uninterfered, ground-level placement.
- Consistency pays off!



Area missions



Linear missions

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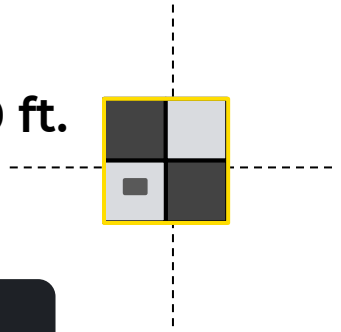
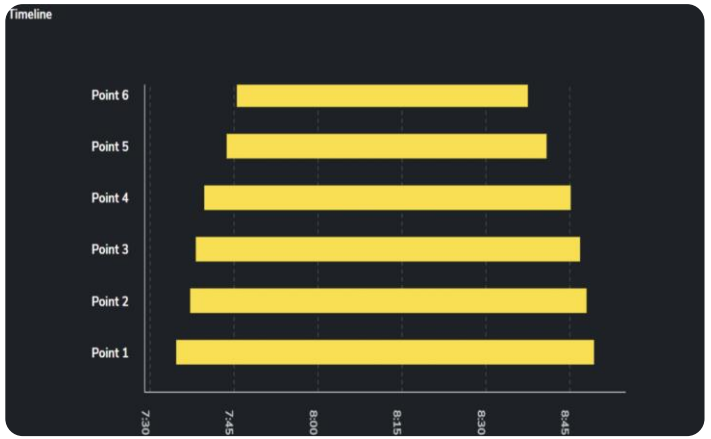
Ensure quality AeroPoint observations

Deploy best practices when using AeroPoints for Propeller PPK to ensure accuracy and consitency:

- Min. 3 AeroPoints
  - No more than ¾ miles between AeroPoints in linear missions.
- Given clear sky view (15° rule).
- Kept at least 30 ft. from magnetic interference (**trucks**, structures, guardrails, walls, etc.).
- Remain unmoved while logging data.
- Collected in reverse order after your mission is complete.





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What Is The Terrain Like?

- Drone is not a perfect solution

Photogrammetry: You can only survey what you can see.

- Tree Canopy Over Roadway
  - Manual flights are preferred to avoid Overhanging trees on roadway.
  - Rolling lane closures are preferred for extended low flights.
- Urban curb and gutters.
  - Add extra oblique photographs to help gain information on the vertical face of the curb.
- Rock Cuts
  - Overhead utilities
  - Manual Flights with oblique images to obtain more detail of rock face.

What Is The Terrain Like?

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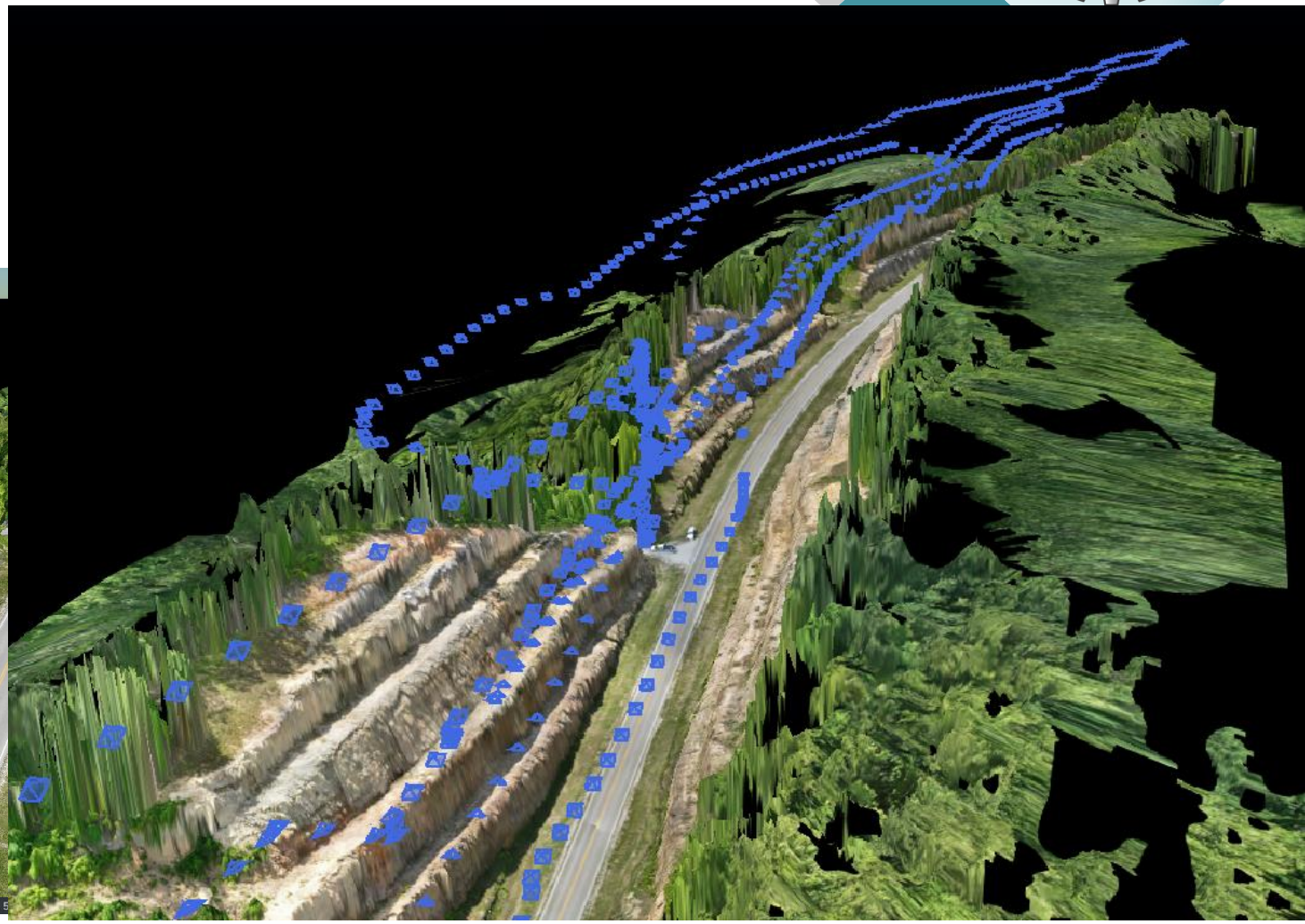
What Is The Terrain Like?



Agenda

Advantages of Cloud Based Processing / Analytics / Storage

Map, Measure, and Manage.

Step 1

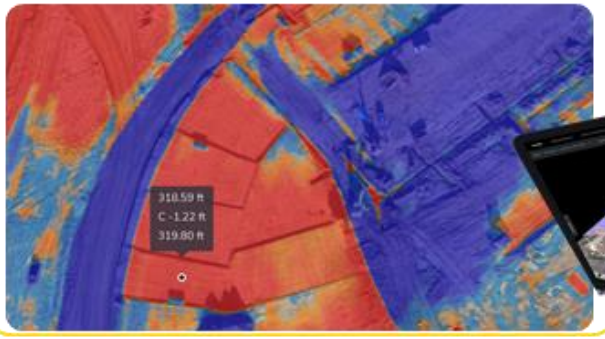
Map

Bundle AeroPoints, high-accuracy drones, and expert survey processing for survey-grade results.

Step 2

Measure

Calculate cut-fill, elevation, and cross-section comparisons in just a few clicks.



Step 3

Manage

Manage your geospatial data, media, and user base from one central hub.

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PPK, the easy way.

The only fully-integrated, survey-grade drone mapping workflow.

- ✓ **Fast:** Survey 100 acres in <30 minutes without the hassle and expense
- ✓ **Integrated:** Bundle AeroPoints, high-accuracy drones, and cloud-based software in one workflow.
- ✓ **Survey-grade:** Achieve 3cm (10mm) accuracy using a single AeroPoint (GCP) and an RTK drone
- ✓ **Scalable:** Process multiple datasets at once with outsourced survey processing (6-hour average turnaround)

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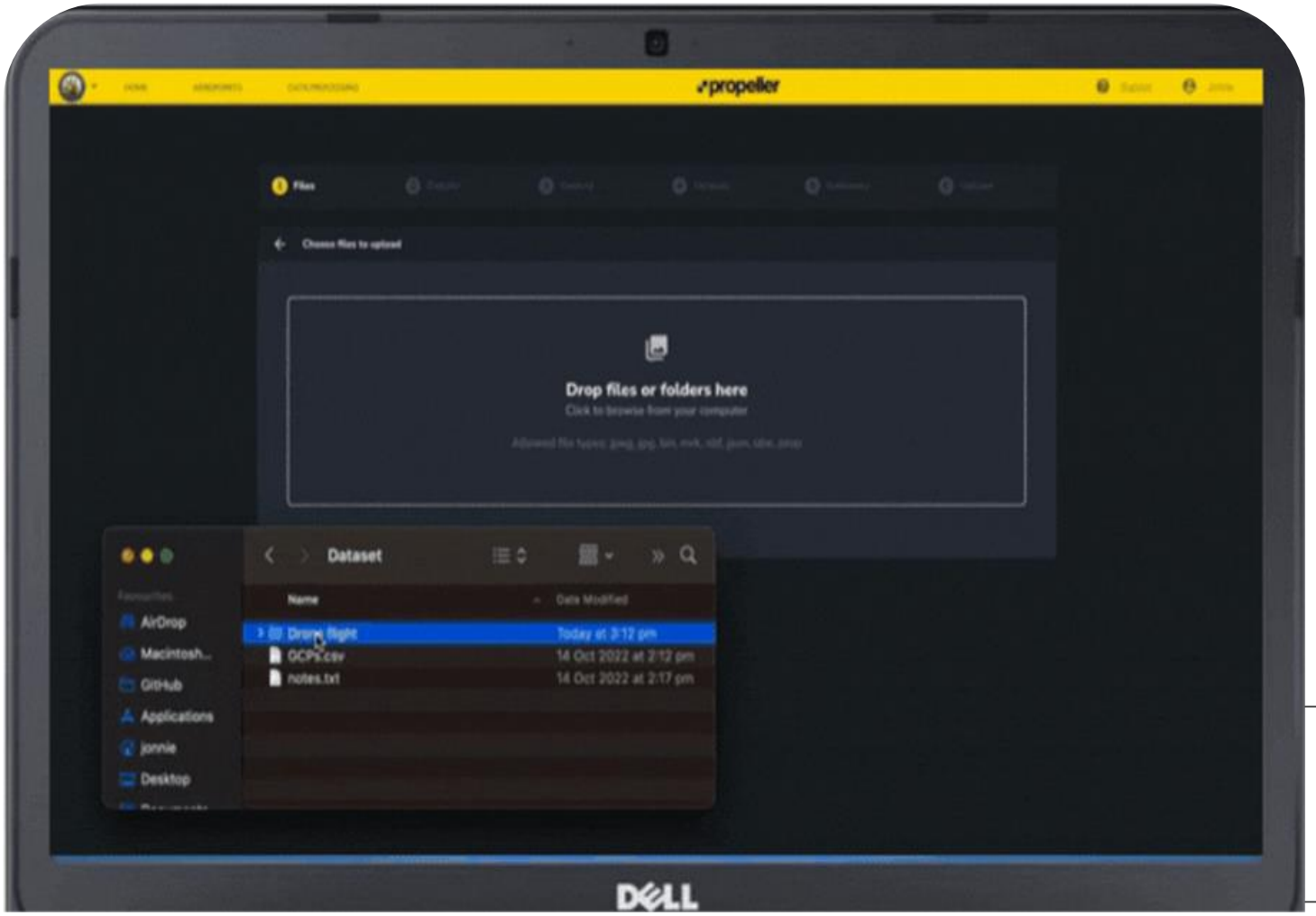
Advantages of Cloud Based Processing

Drag-and-drop upload

24/7 access to our GIS experts
6-hour average turnaround
Data accuracy reporting



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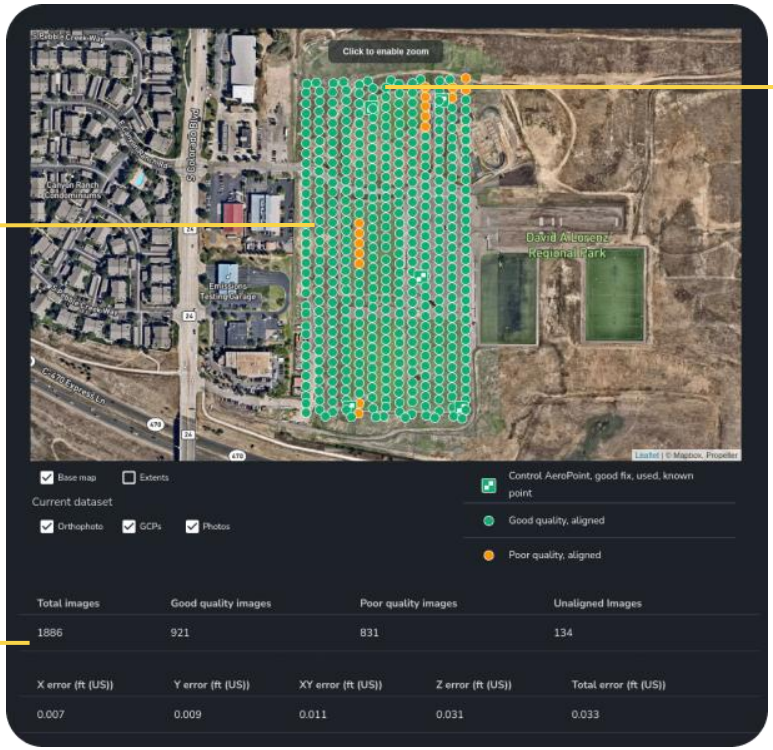
Enjoy verifiable, survey-grade results.

See which photos met our quality standards and the location of each photo taken



Visualize the location of your control points and accuracy report.

See a breakdown on accuracy and adjustments made to the geotag locations.

Expect 3cm (1/10ft) accuracy for surveys captured with one of our recommended drones and AeroPoints.

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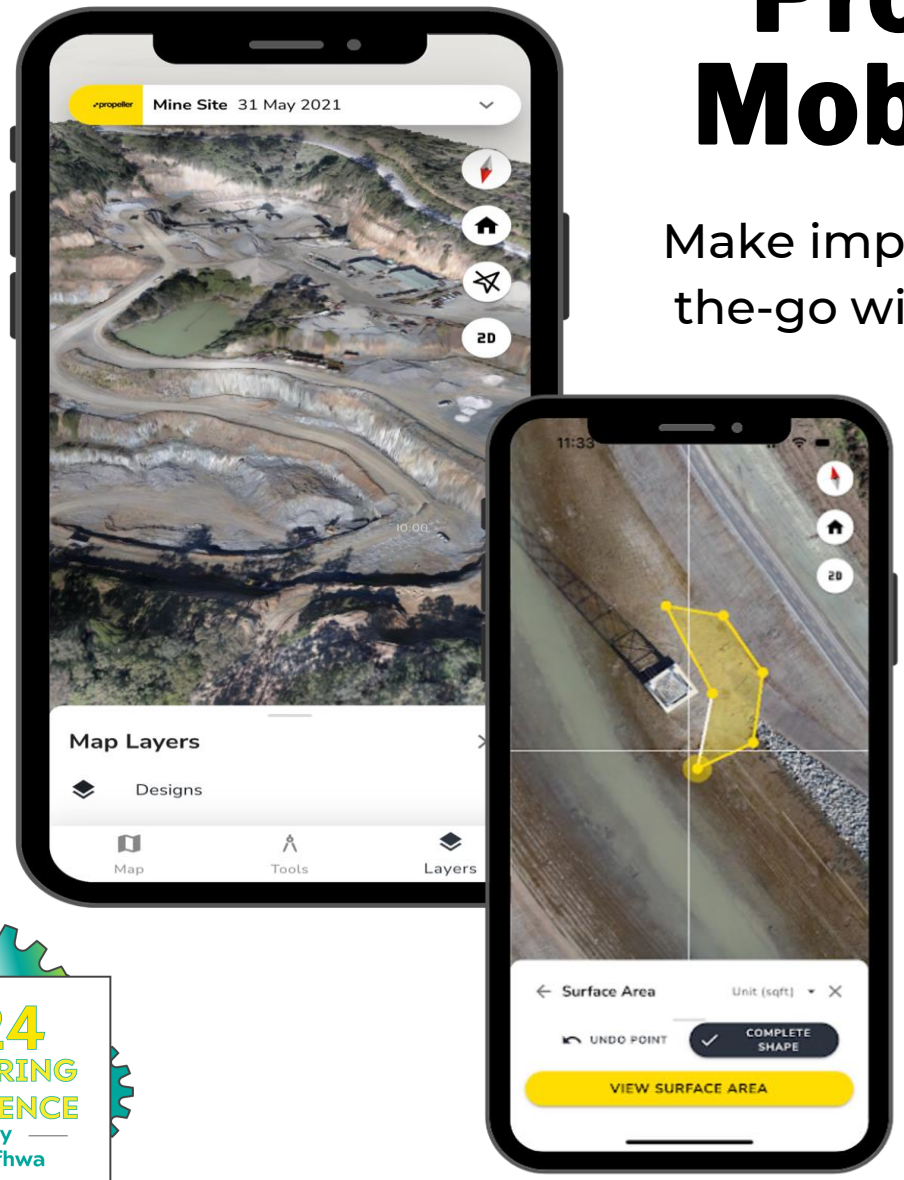
Propeller Mobile App

Make important decisions on-the-go with Propeller Mobile



View all your Propeller Platform site maps in **high quality 3D.**

Easily review your design (DXF) files within two taps of the app, or add layers to your map.

Make quick measurements on site, so you can **keep your workflow moving along.**

Track your location on site, communicate and share information **in real-time.**

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IMPORT

Survey
- GEOTAGGED JPEGS
- AEROPOINTS
- GCPs

Pre-processed
- GEOTIFF

Designs
- GEOTIFF
- TTM
- KML
- KMZ
- LAND XML
- DXF
- PDF
- CZML
- IFC

Point cloud
- LAS/LAZ

Media
- JPEG
- PNG
- 360° JPEG
- CSV

EXPORT

Terrain
- GEOTIFF
- DXF
- TTM

Orthophoto
- GEOTIFF
- JIFF
- PDF
- JPEG

Contours
- DXF

Measurement outlines
- DXF
- KML

3D model
- DXF

Survey boundary
- GEOJSON

Point cloud
- LAZ

Shapefile
- CZML
- GeoJSON

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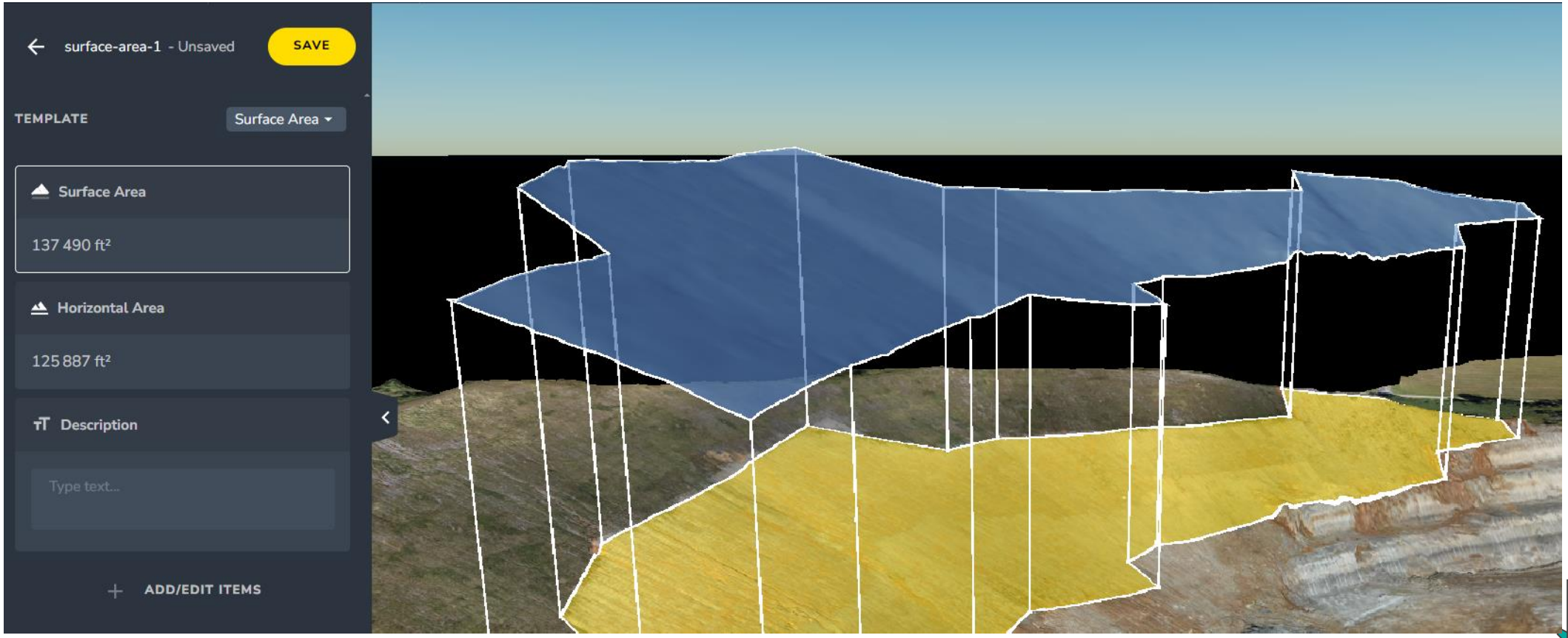
Advantages of Cloud Based Analytics



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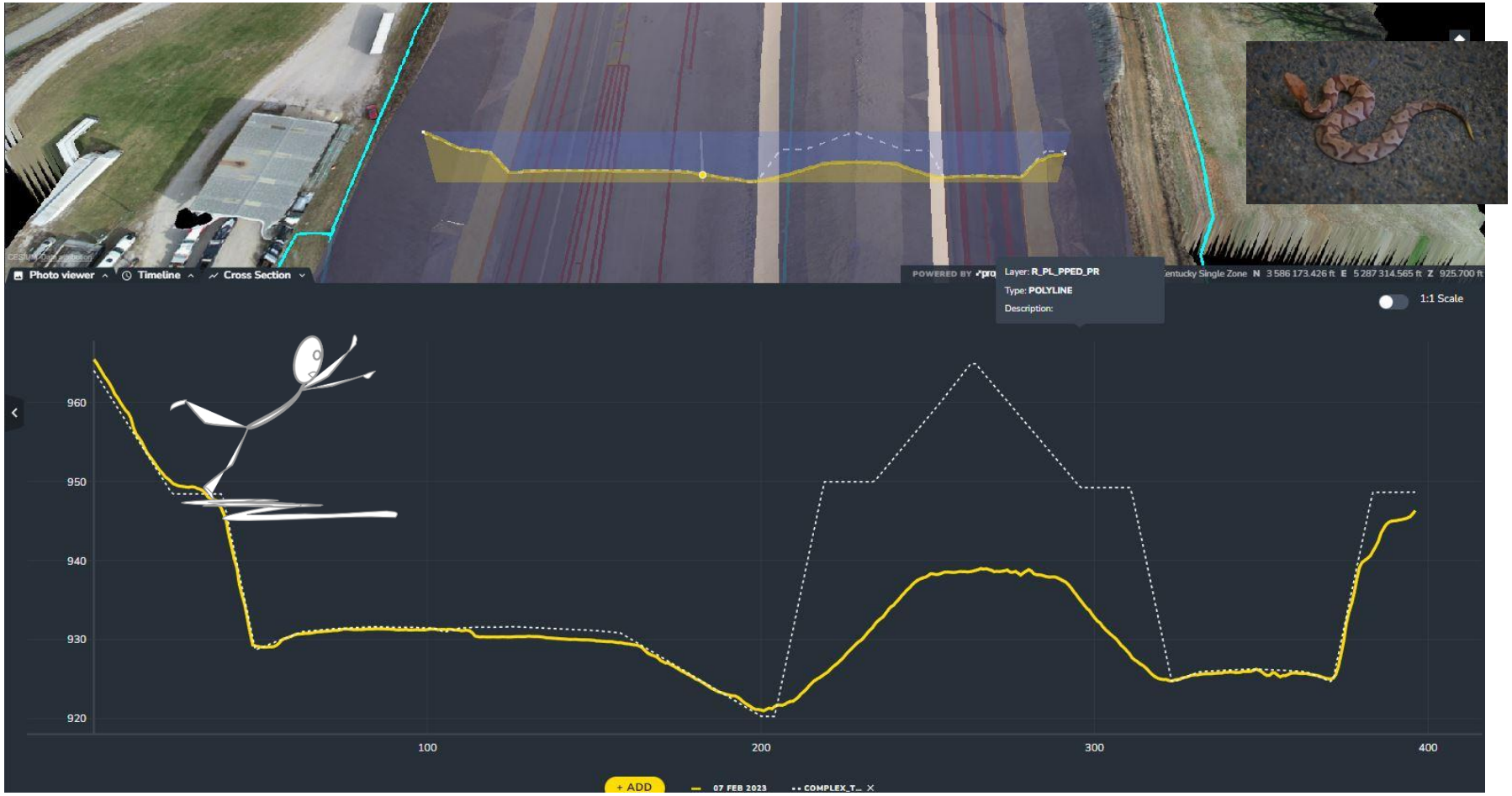

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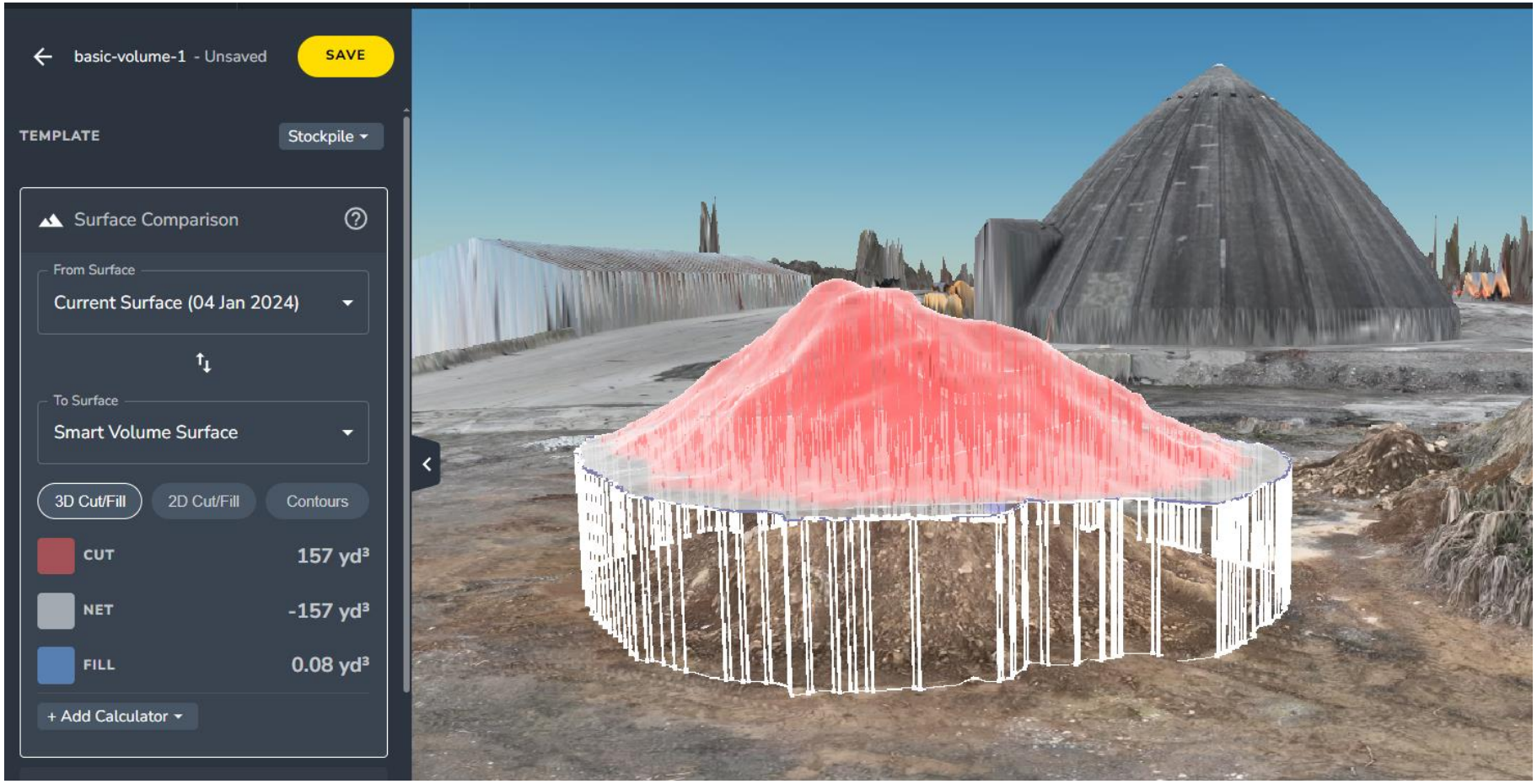

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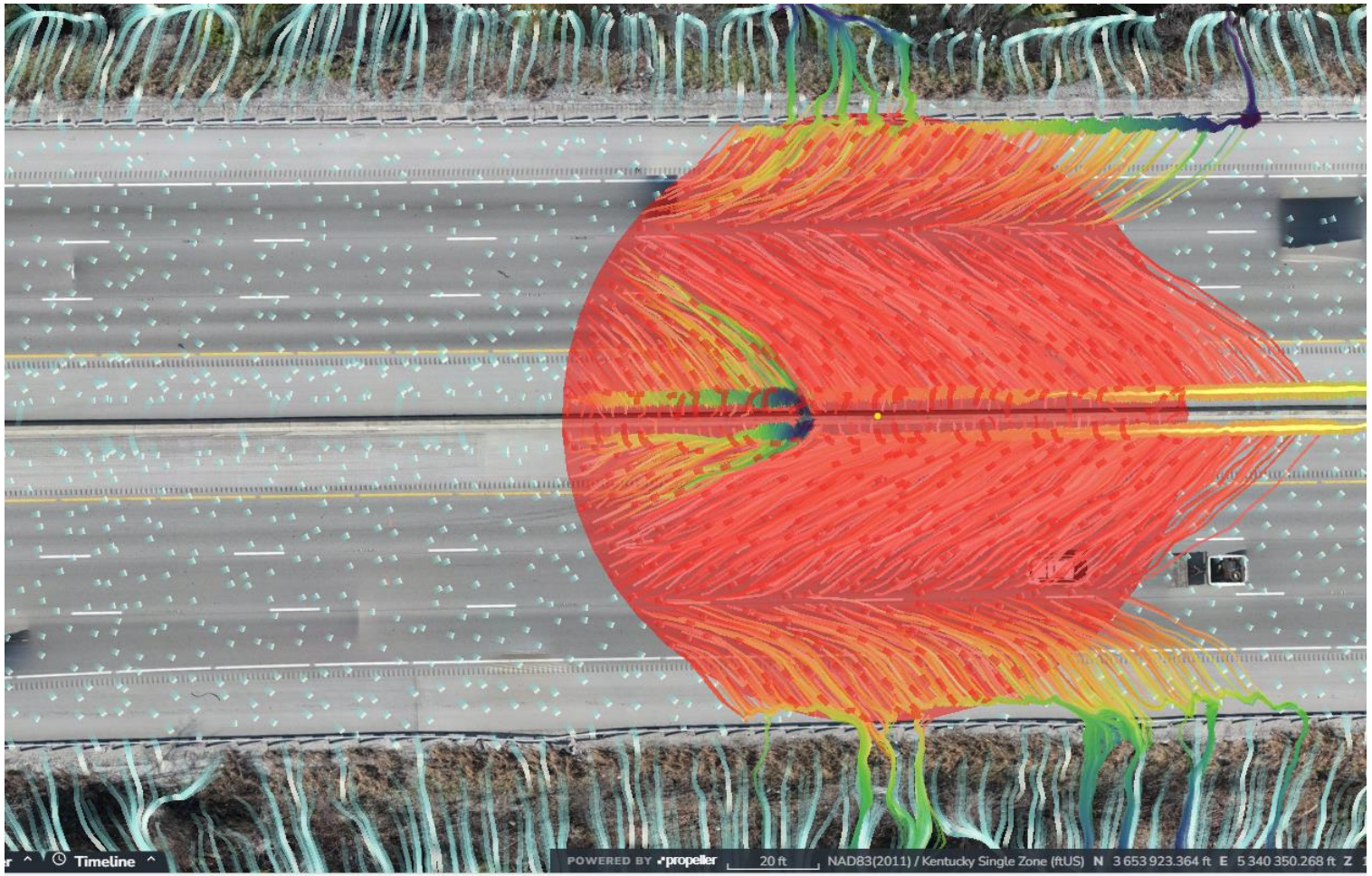
Advantages of Cloud Based Analytics



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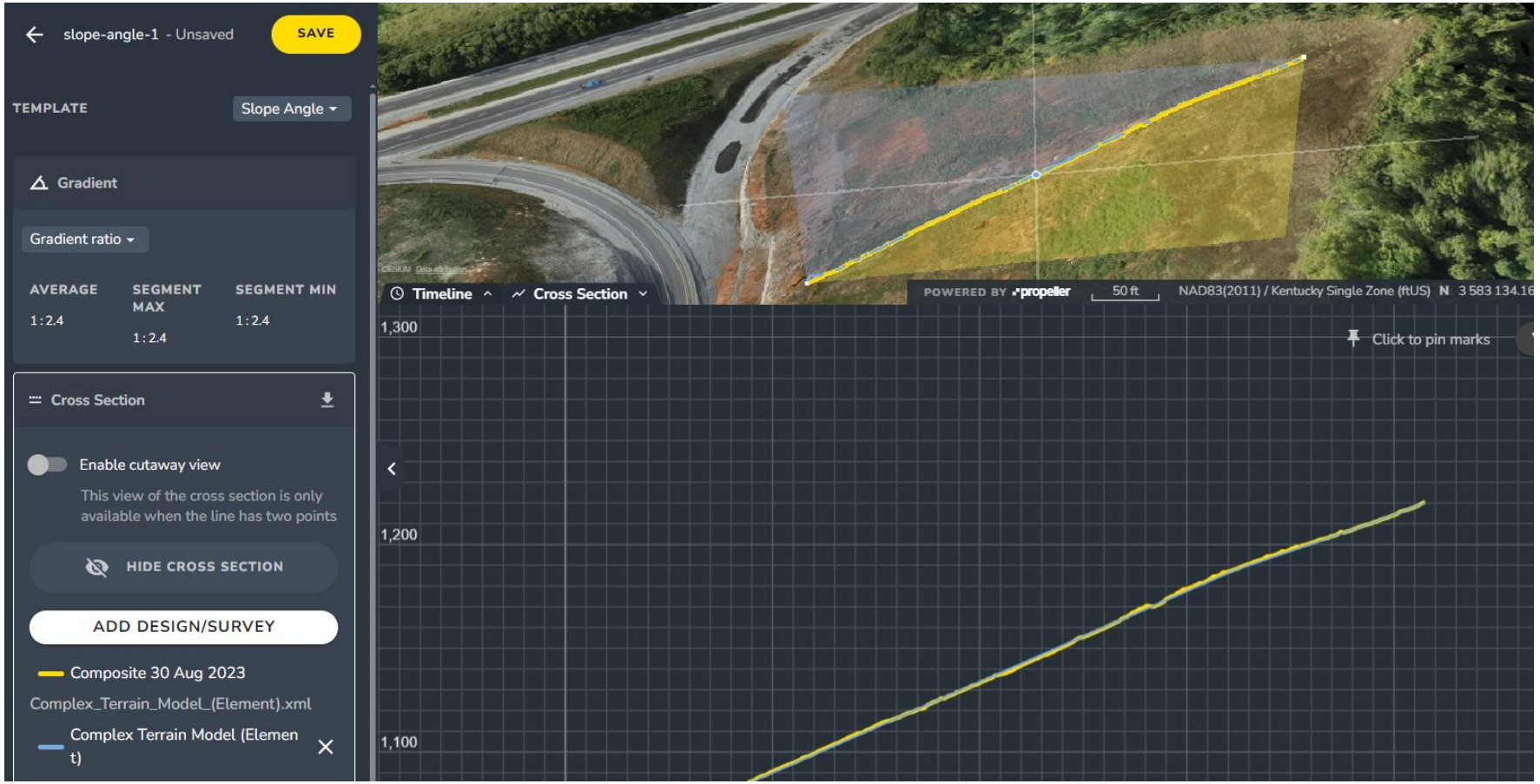
Advantages of Cloud Based Analytics



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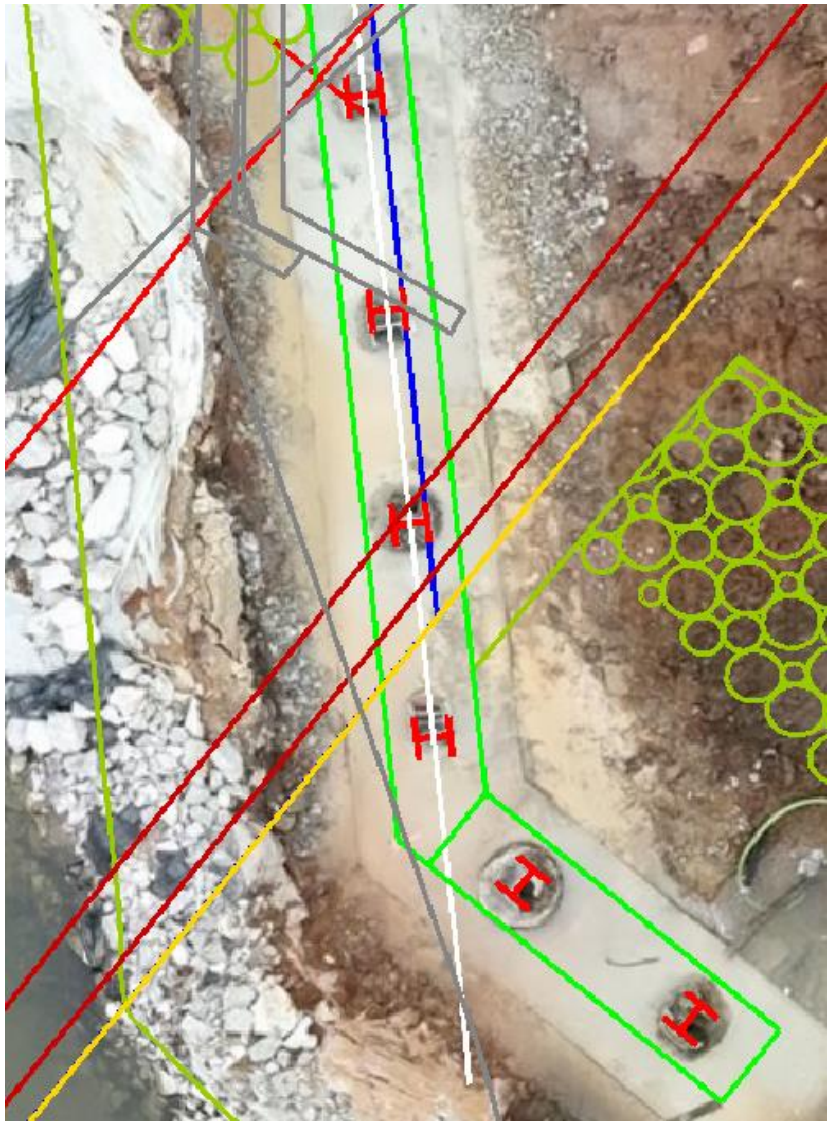
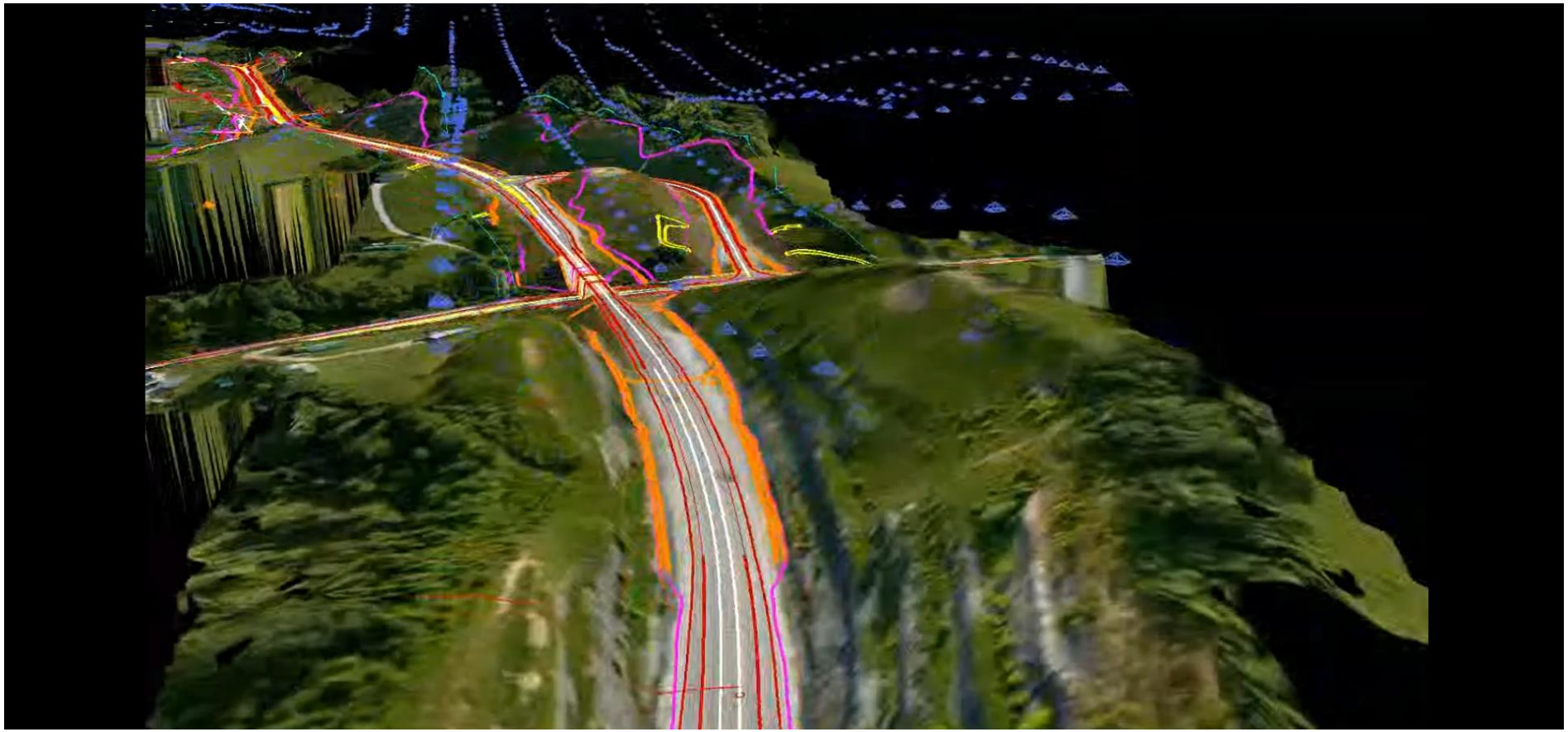
Advantages of Cloud Based Analytics



Sample



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Advantages of Cloud Based Storage

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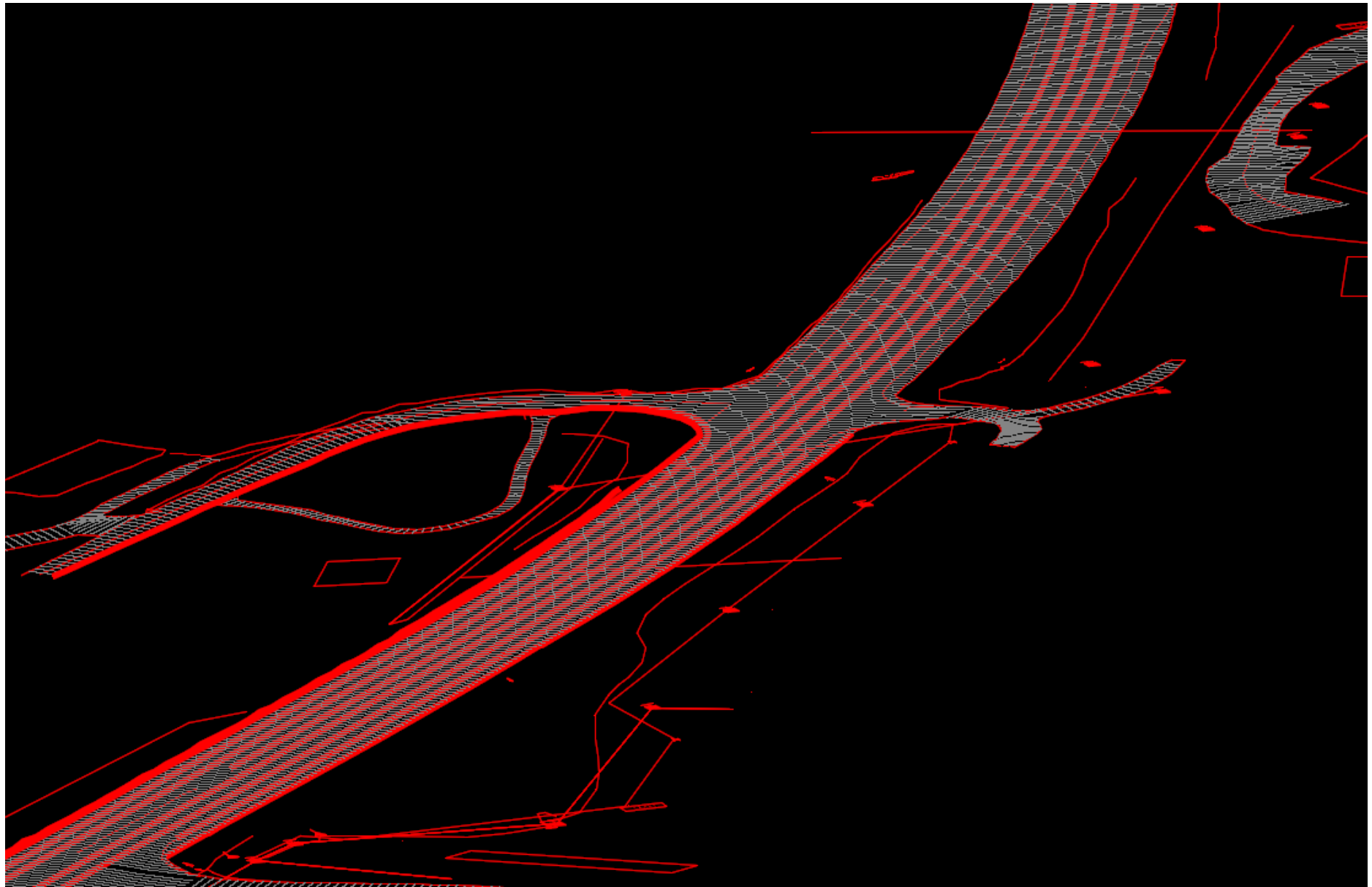
Virtual Surveying

How Do We Design On 1 Billion Points?

Virtual Surveying

- We can use a Virtual Surveying software like TopoDOT or TBC
- Goal is to extract needed data:
  - Roadway Shots – We use 0.2 ft spacing perpendicular to CL
  - Ground Extraction – Not perfect, know your terrain
  - Break Line Extraction – Drawing planimetrics
  - Underground Utility Locates – Need to be boldly field marked
  - Utility Poles

TopoDOT Samples



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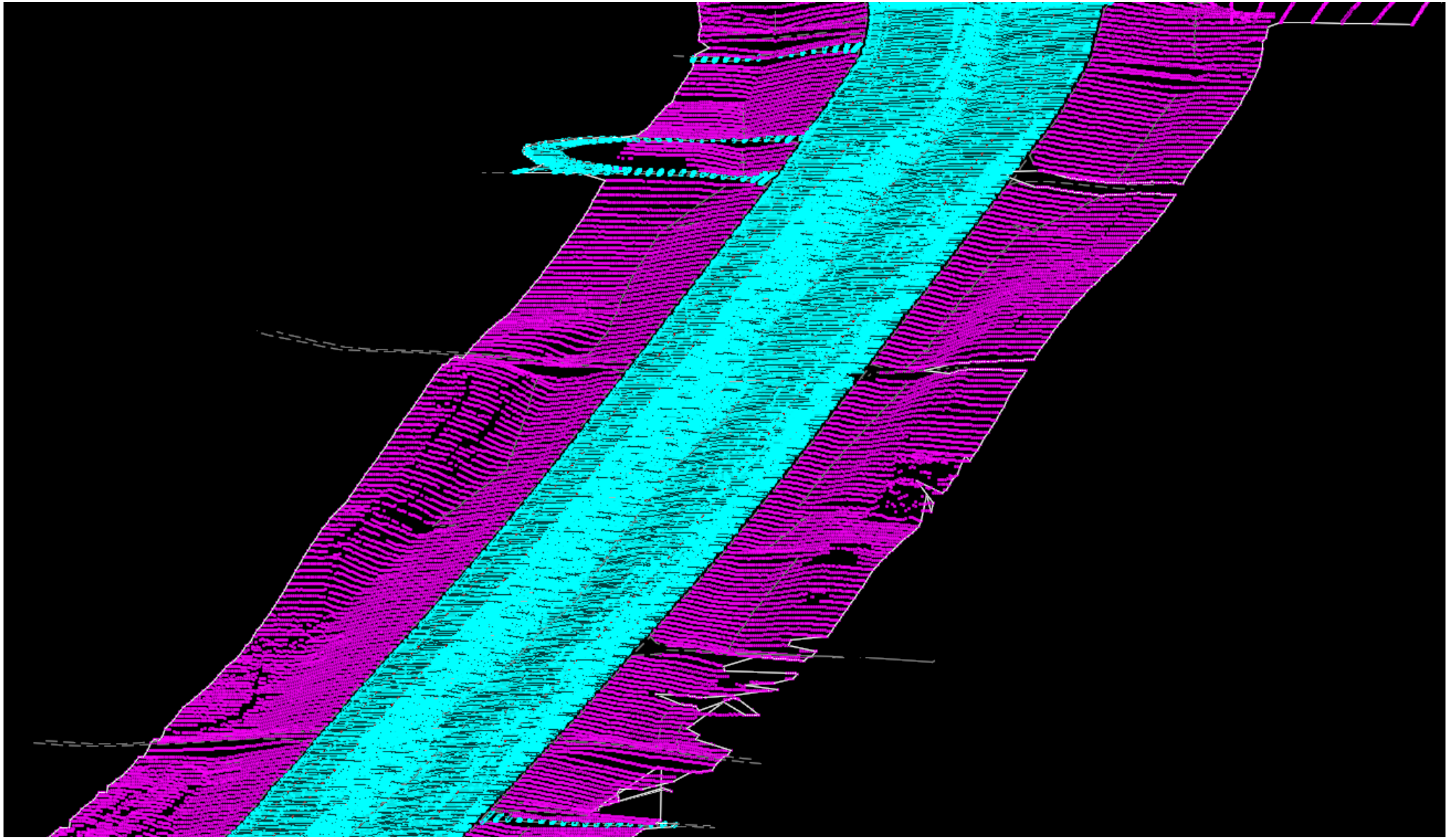
TopoDOT Samples



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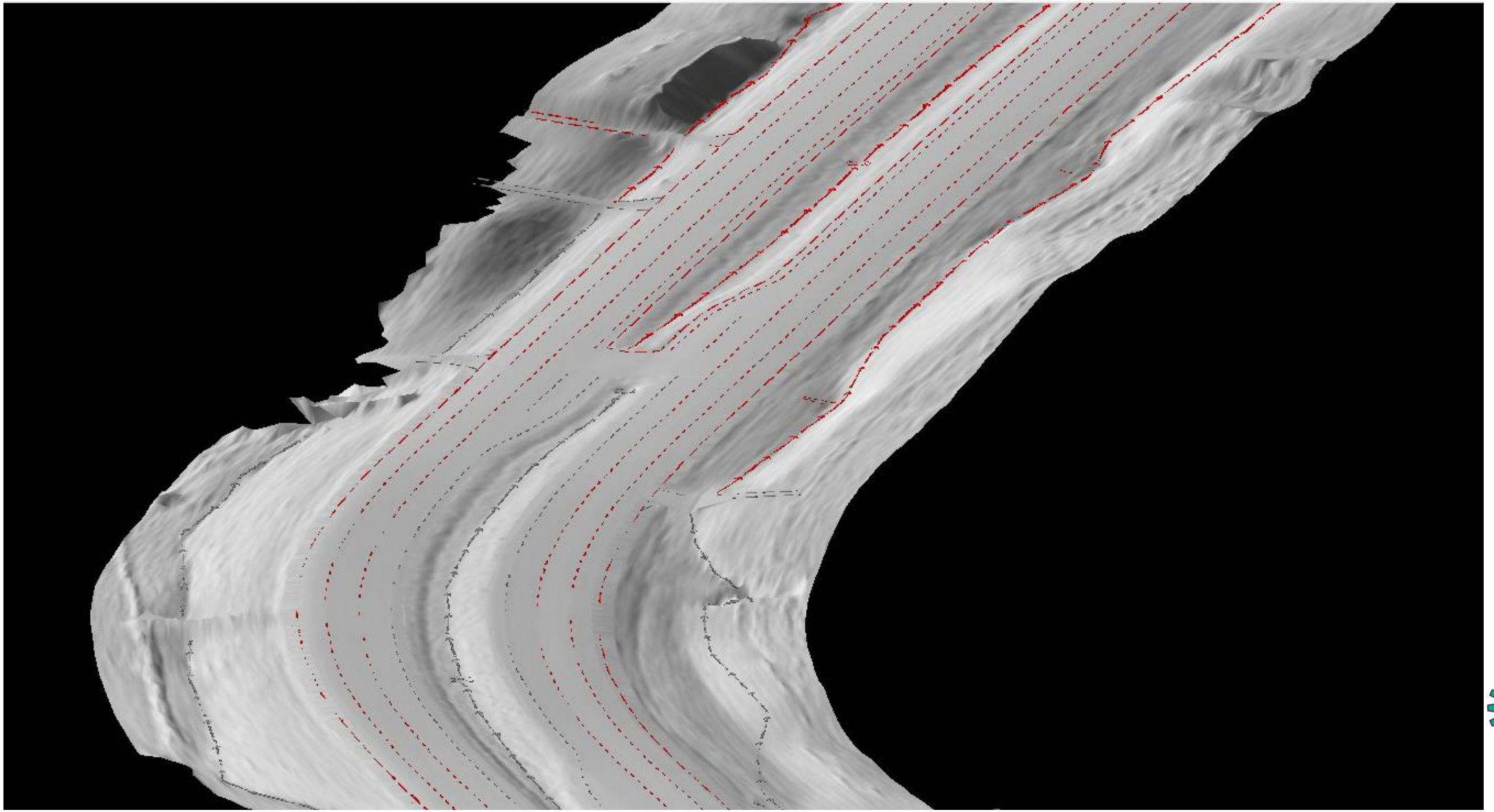
TopoDOT Samples



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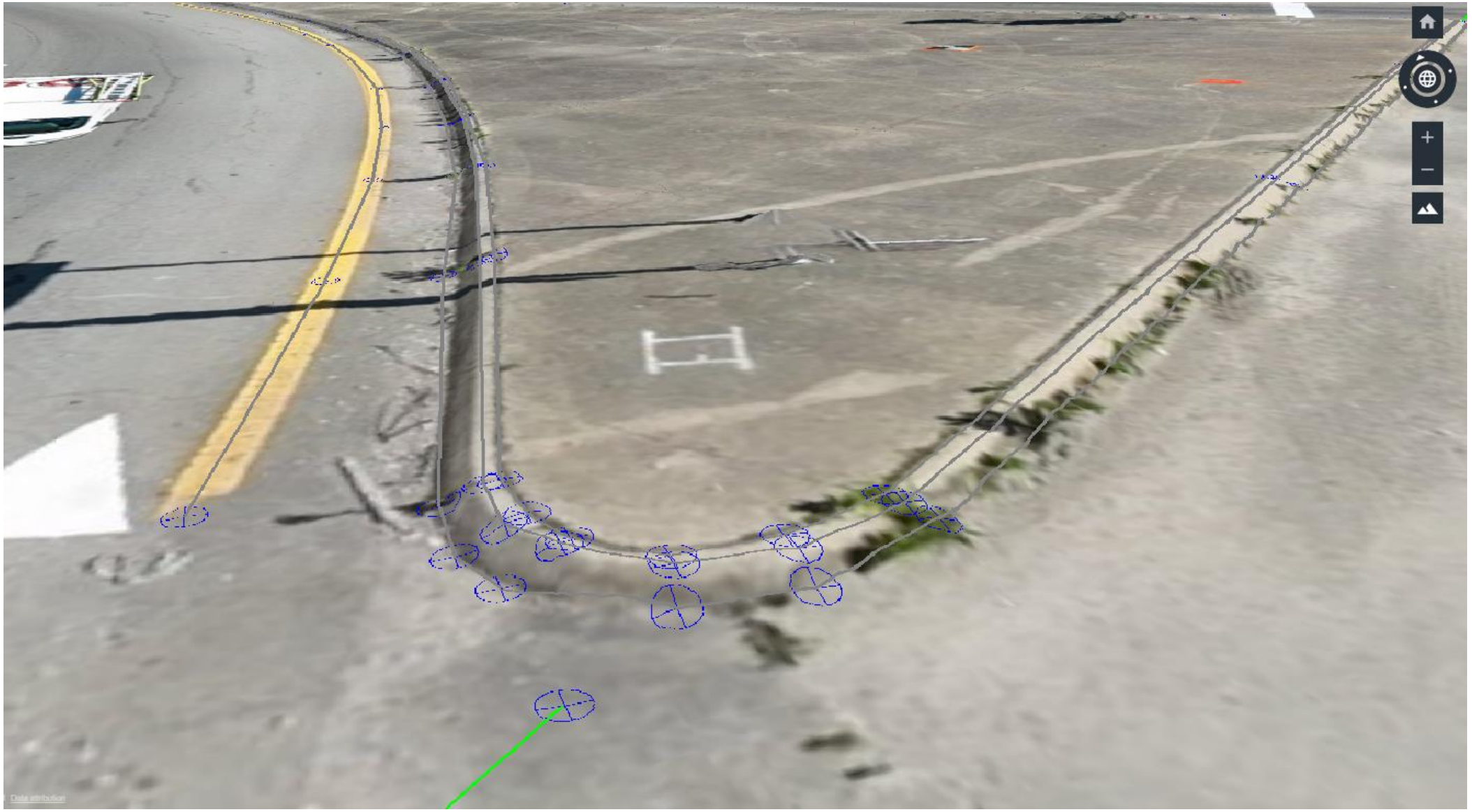
Samples



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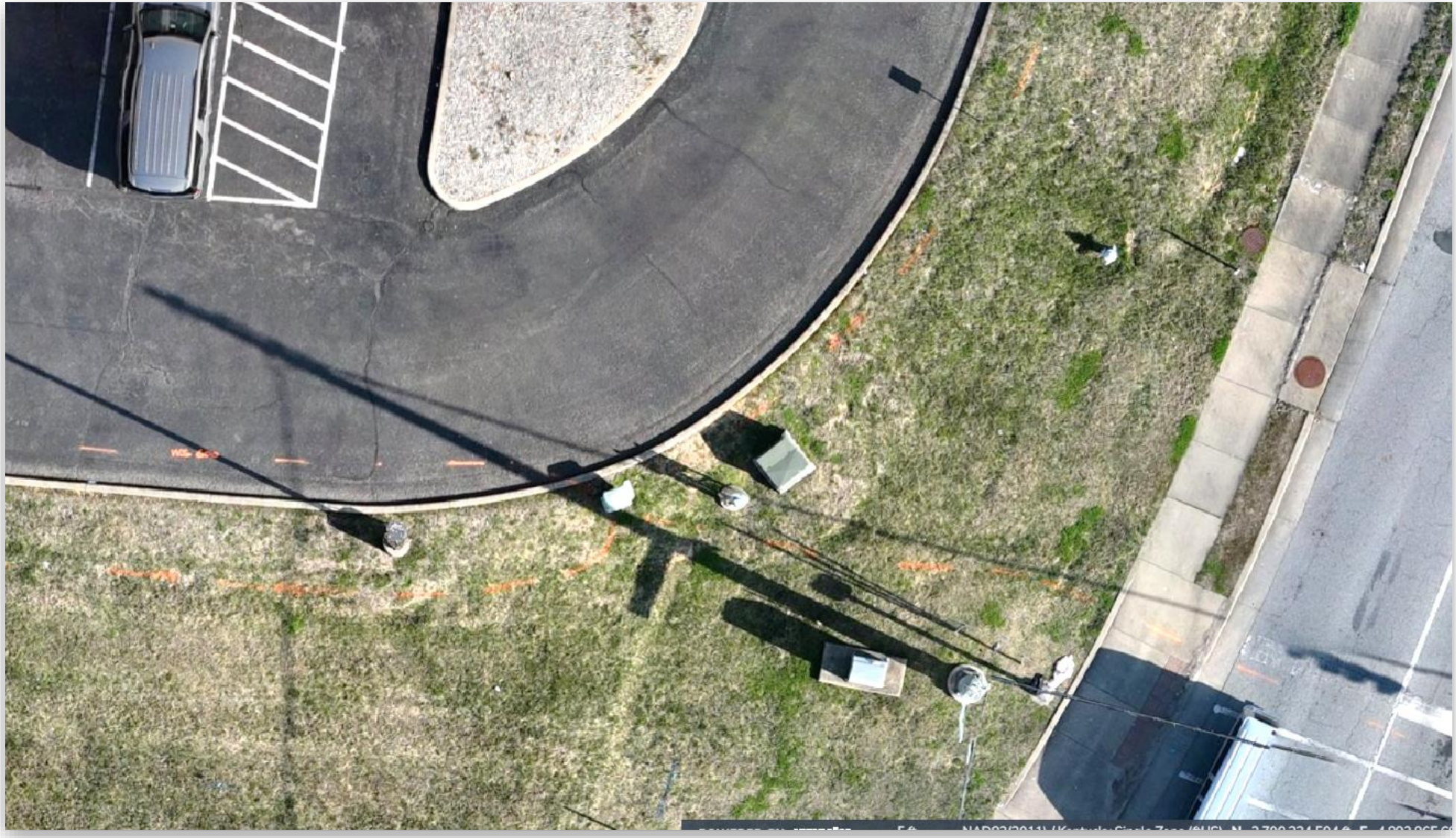
Field Marked Utilities



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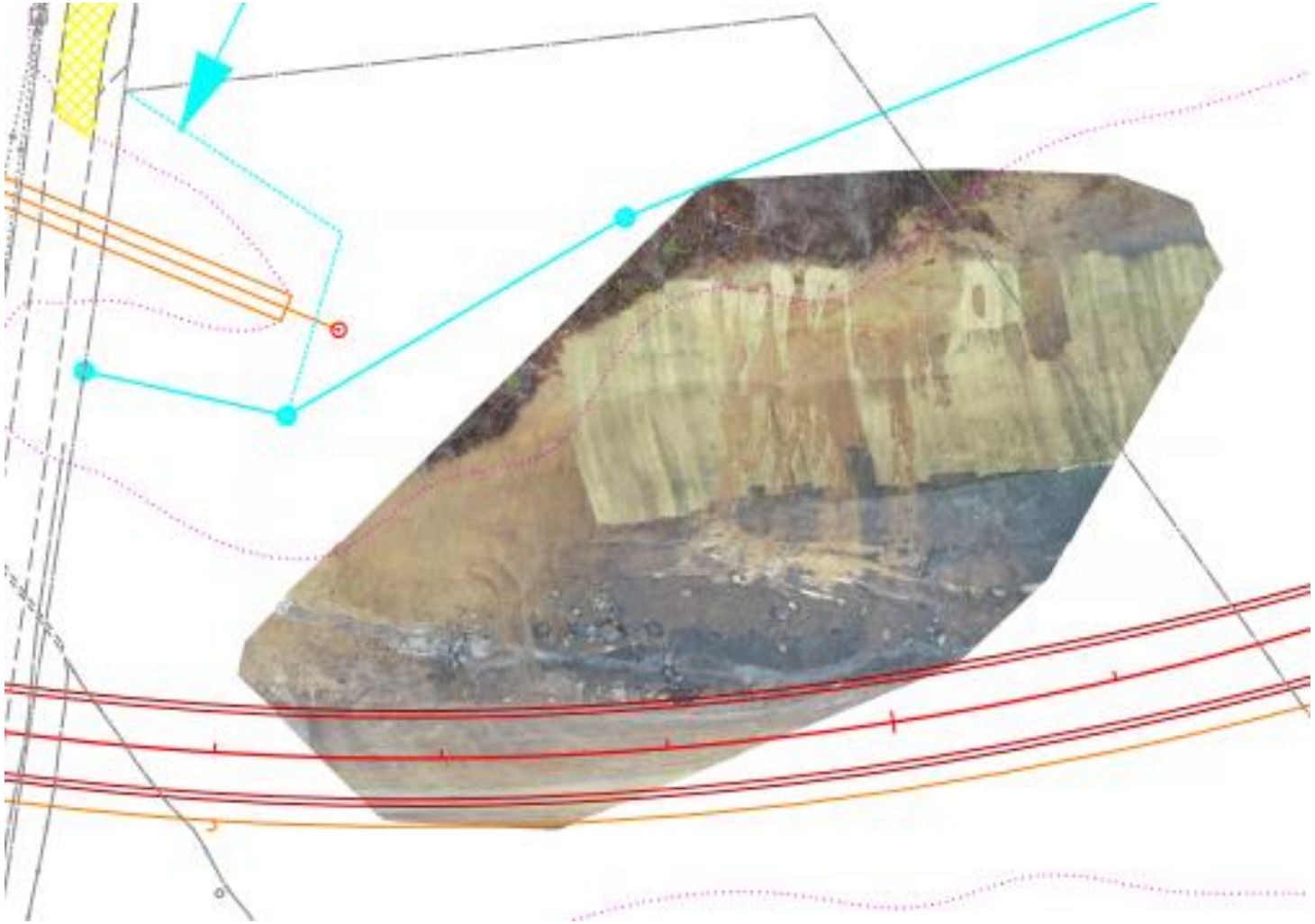
Sample



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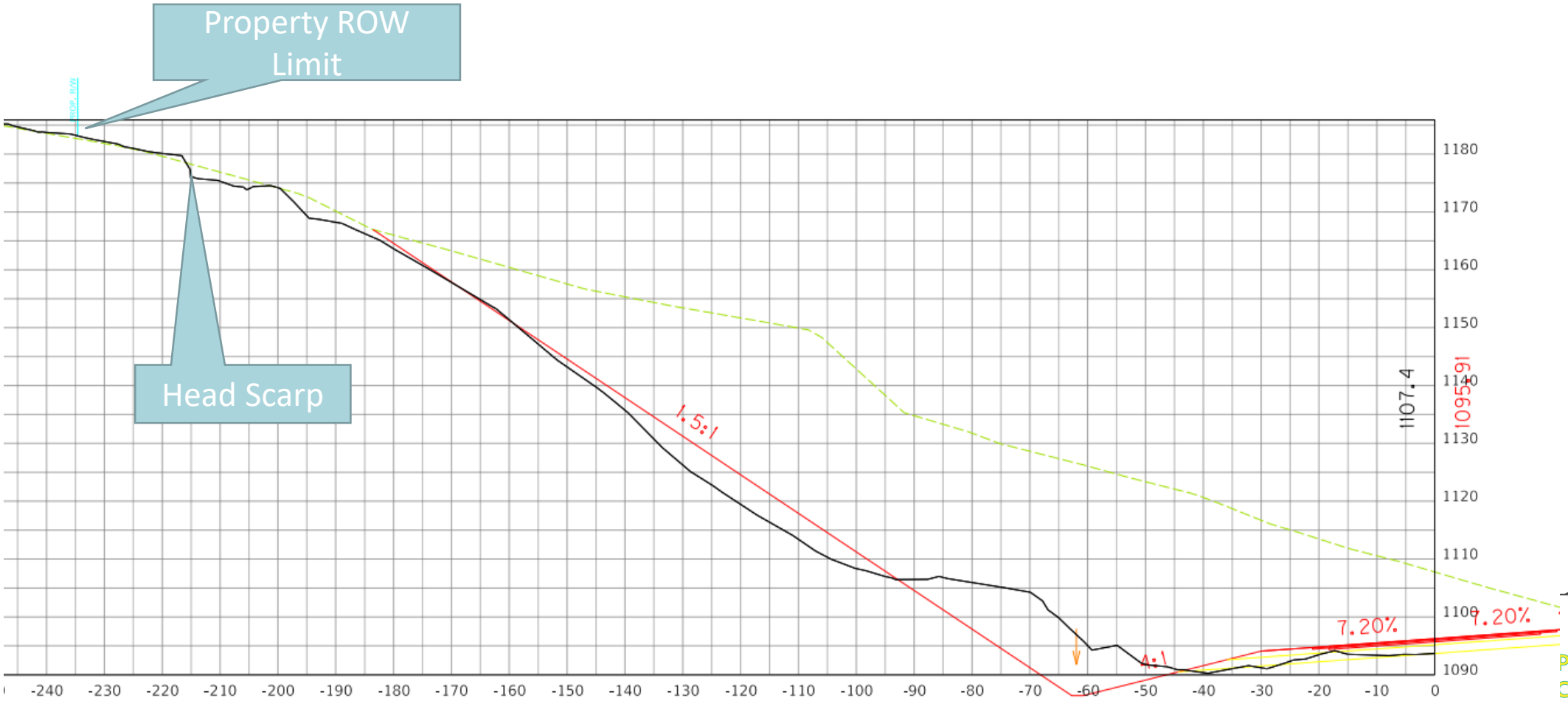
Sample



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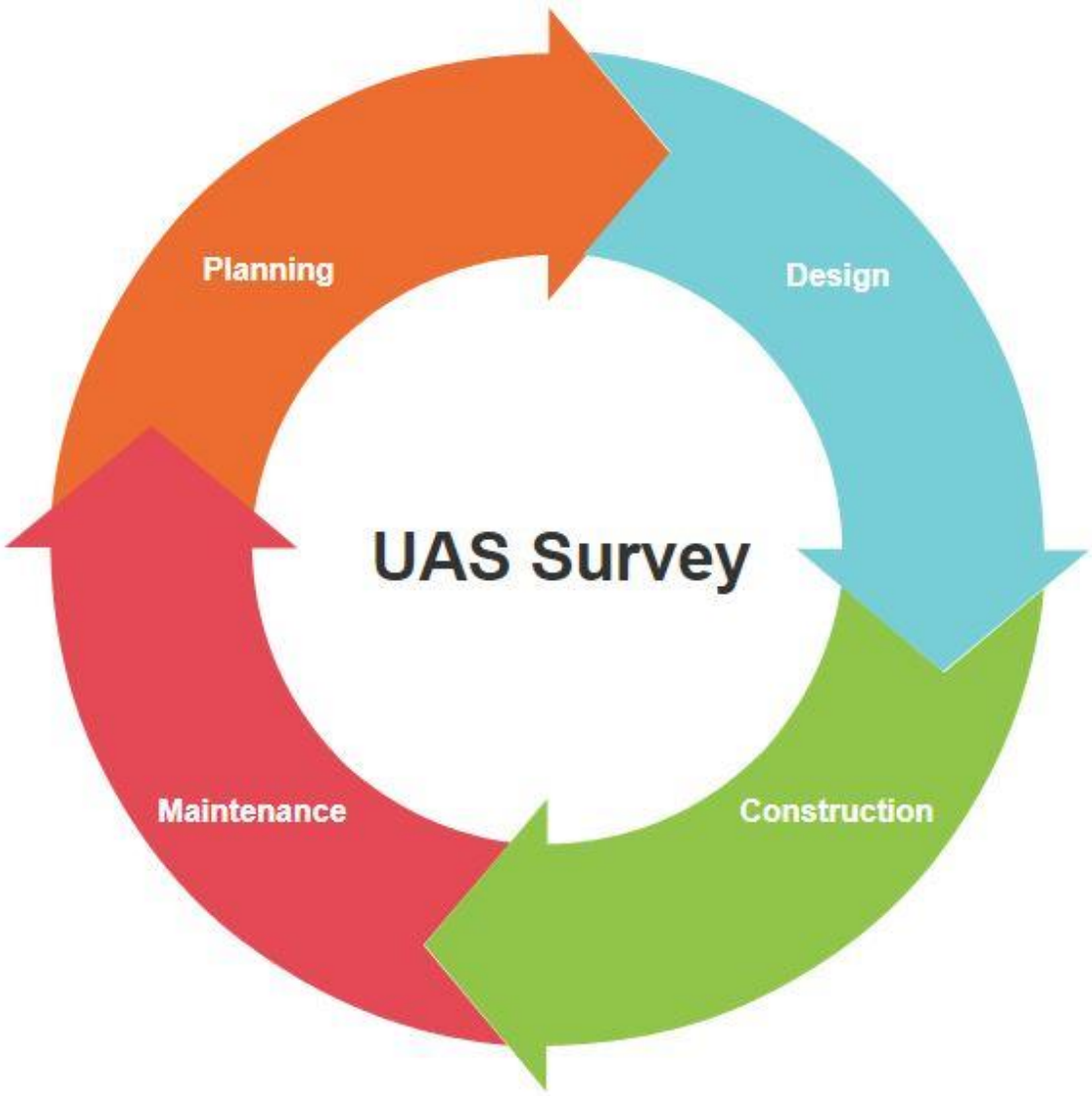
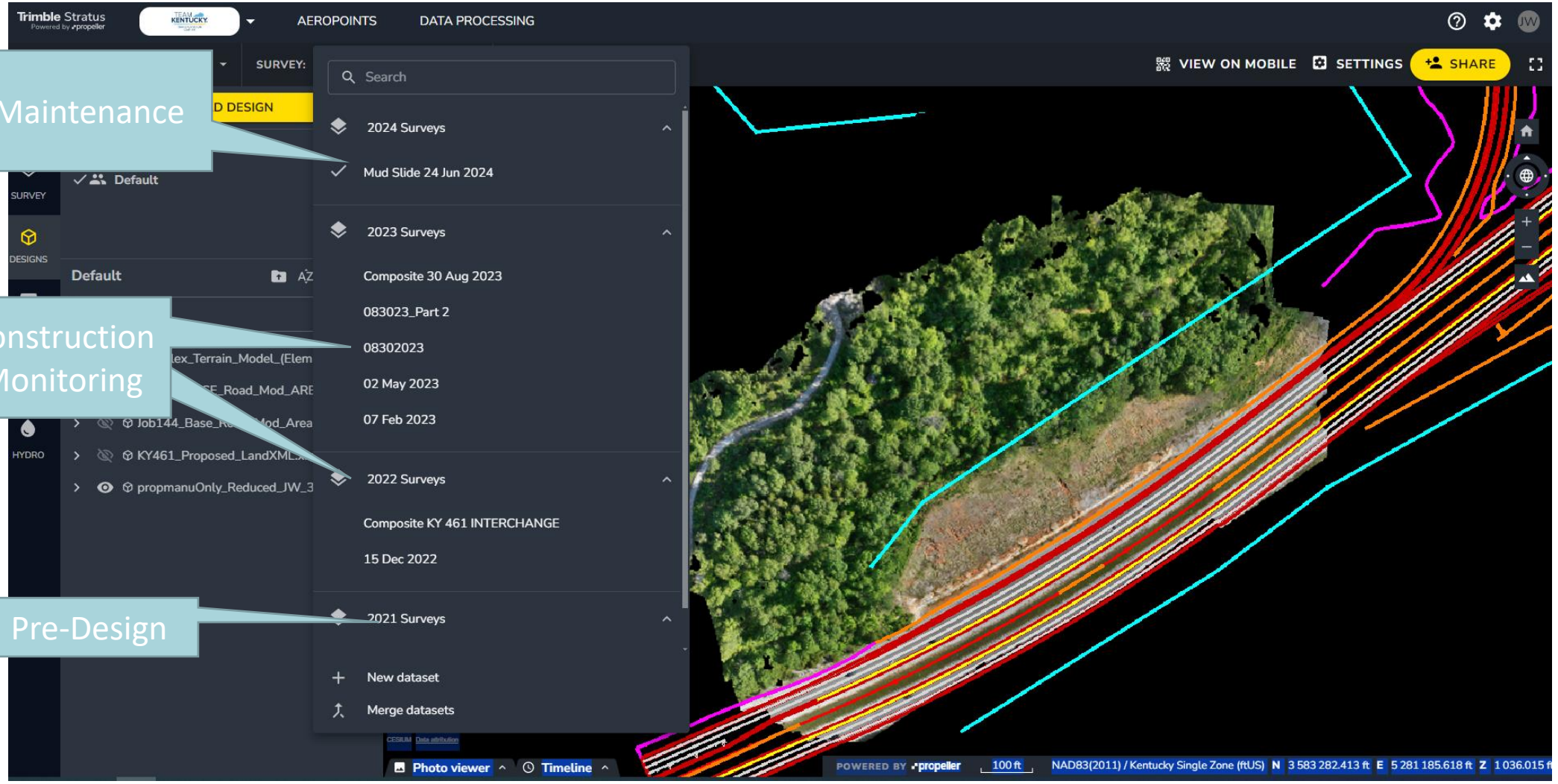
Life Cycle: Planning – Design – Construction – Maintenance

Life Cycle

- Project Is Stored On The Cloud
- Re-Flown As Needed
  - New Right Of Way
  - New Construction
  - Maintenance
  - Project Improvement



Life Cycle Example



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