



# Remote Sensing and GIS for Public Works

May 16<sup>th</sup>, 2024

# SPEAKER BACKGROUND



**BILL SWOPE, CP**

Technical Leader, Survey/Geospatial  
Richardson, TX

- 16 years of experience in photogrammetry and remote sensing
- Certified Photogrammetrist, No. R1604CP (2016), American Society for Photogrammetry and Remote Sensing (ASPRS)
- Former Chair, Technical Division Directors Council, ASPRS
- Former Director, Professional Practice Division, ASPRS
- Former President & Past President Gulf South Region, ASPRS
- TxDOT pre-certified Aerial Mapping (15.3.1)
- FDOT pre-qualified Photogrammetric Mapping Workgroup (8.3)
- Member, NCTCOG North Texas Unmanned Aircraft Systems (UAS) Safety and Integration Task Force
- Advisor for North Central Texas Aerial Robotics Initiative (10 North TX ISDs)
- 2019 Geospatial Professional of Year, Texas Society of Professional Surveyors (TSPS)
- 2024 Outstanding Service Award, ASPRS Gulf South Region

# ABOUT HALFF

## Purposed for People

Halff is an engineering and land surveying firm designed, engineered, planned, constructed – and purposed – for people. Since 1950, we’ve been creating smart solutions that improve lives and communities by turning ideas into reality.



Halff was founded on a core tenet: Focus on people, treat them well, and success will follow. We treat our clients like family, and they regard us as trusted advocates and advisors.

Our industry-leading professionals collaborate to meet tough challenges in creative ways while keeping projects on schedule and on budget—all for one purpose: our clients’ success.



5  
STATES

Arkansas, Florida,  
Louisiana, Oklahoma  
and Texas



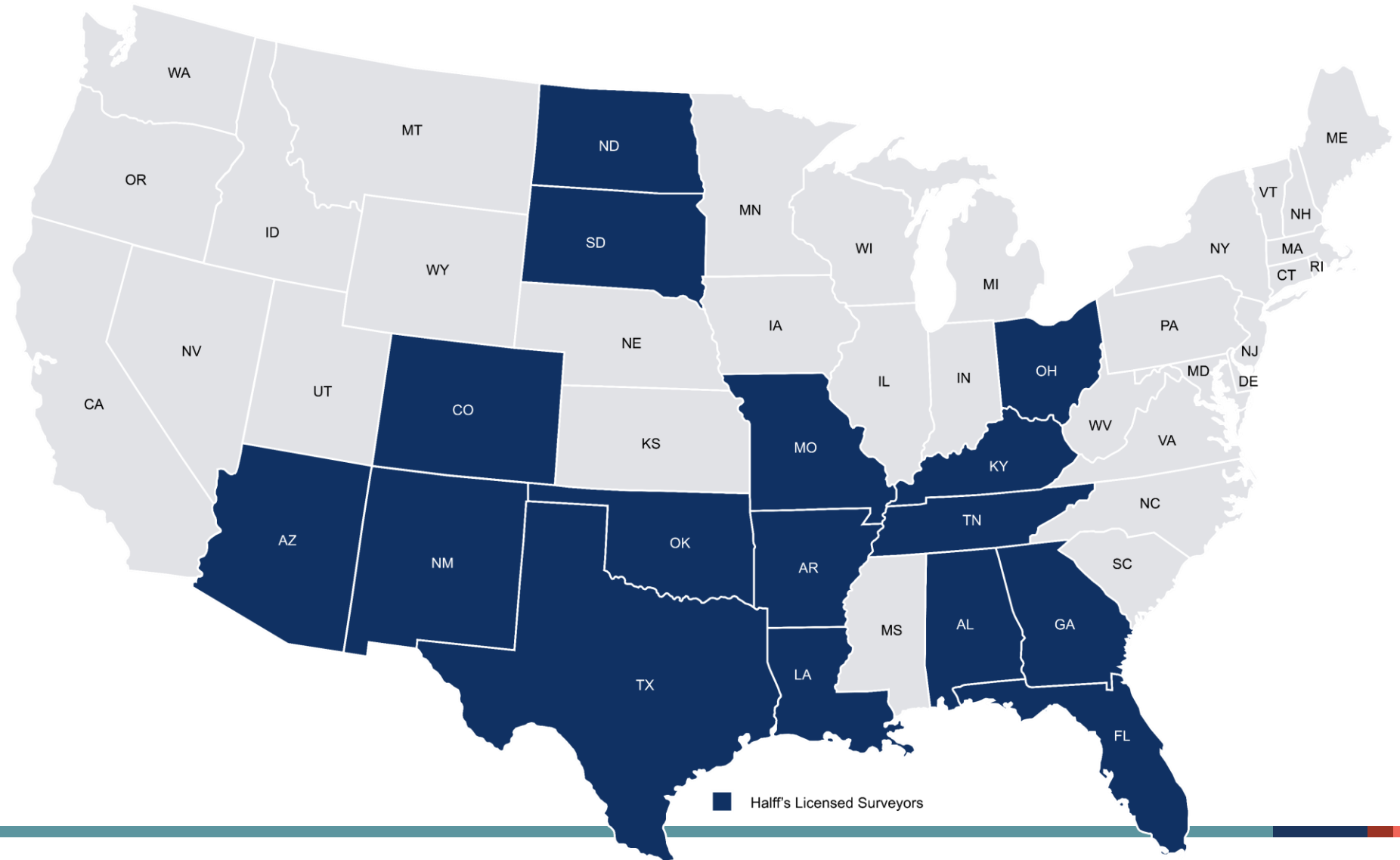
33  
OFFICES



1,500  
EMPLOYEES

# LAND SURVEYING & GEOSPATIAL SERVICES

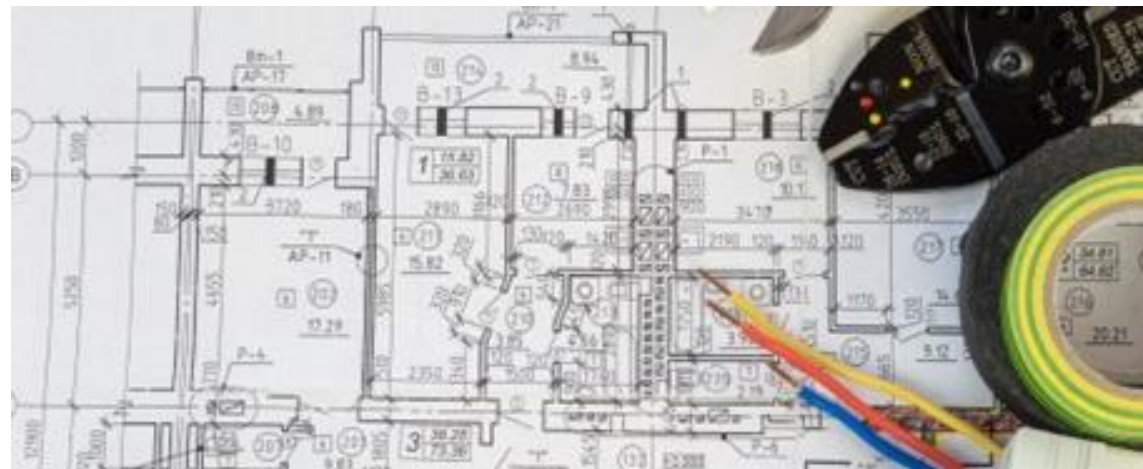
- 16 Survey Teams (170 staff)
- 28 Licensed Surveyors, 16 States
- 1 Licensed State Land Surveyor (LSLS)
- 1 Certified Photogrammetrist
- 1 Certified Lidar Technologist
- 70+ Survey/GSP Technicians
- 40 Field Crews



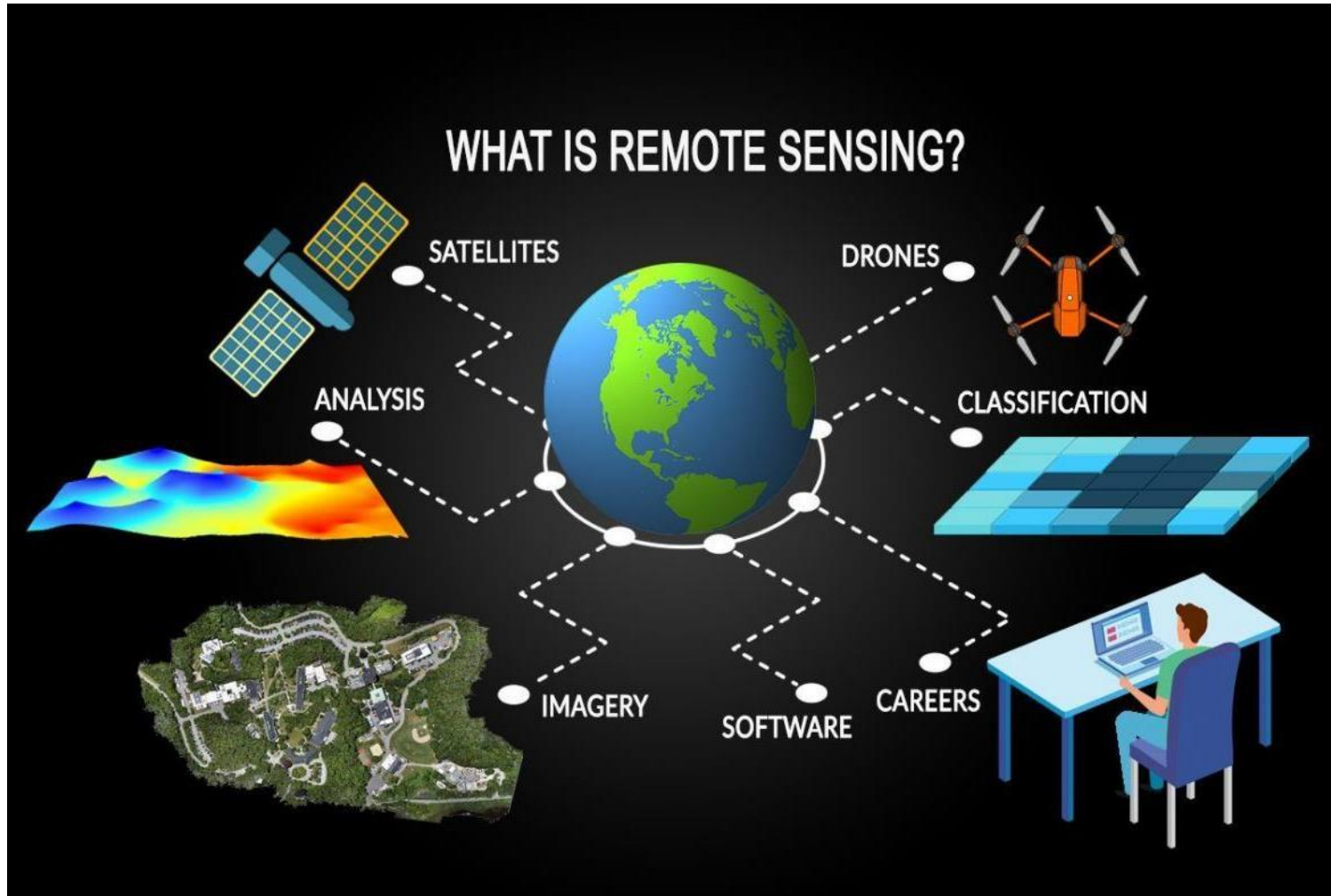


# AGENDA

- What is Remote Sensing?
- Remote Sensing Technology and Equipment
- GIS Applications in Public Works
- Data Mining
- Data Fusion
- Indoor Mapping



# REMOTE SENSING



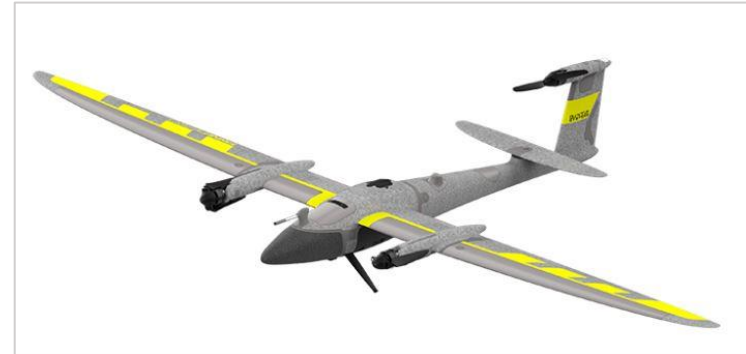
- Remote sensing involves detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation from a distance, *typically using satellites or aircraft.*
- Ground based; mobile lidar, terrestrial lidar, hand-held
- Waterborne; echo-sounder, multi-beam
- Concentrate on remote sensing in ***Professional Services***



# REMOTE SENSING EQUIPMENT

## Aerial

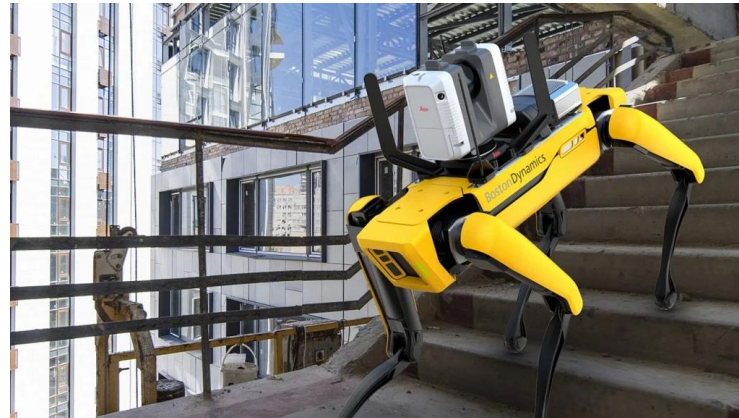
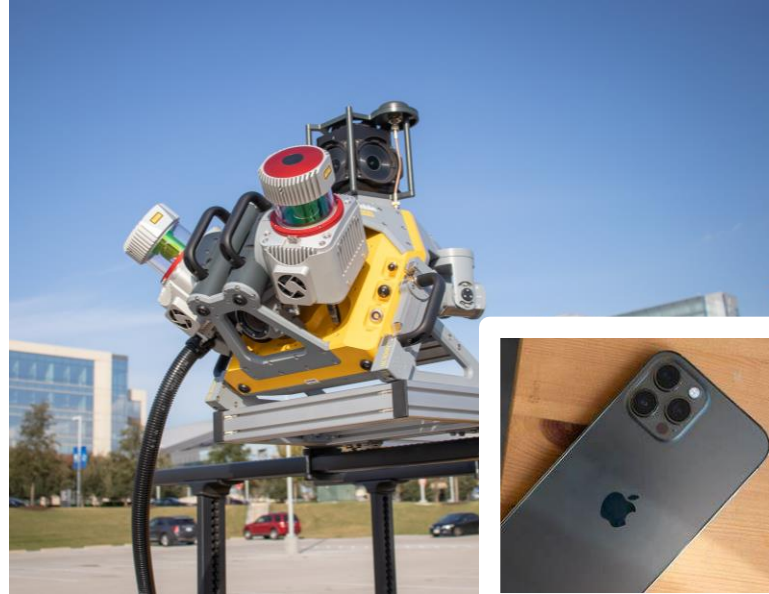
- Photogrammetry
- Lidar
- Manned acquisition
- sUAS



# REMOTE SENSING EQUIPMENT

## Ground Based

- Mobile lidar
- Terrestrial lidar
  - Static
  - Hand-held or wearable

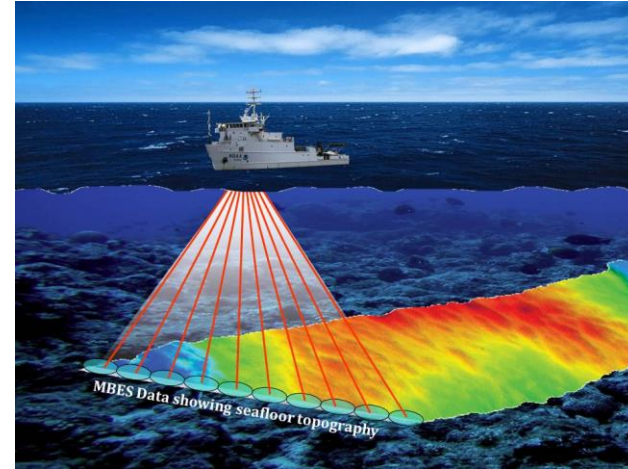




# REMOTE SENSING EQUIPMENT

## Waterborne

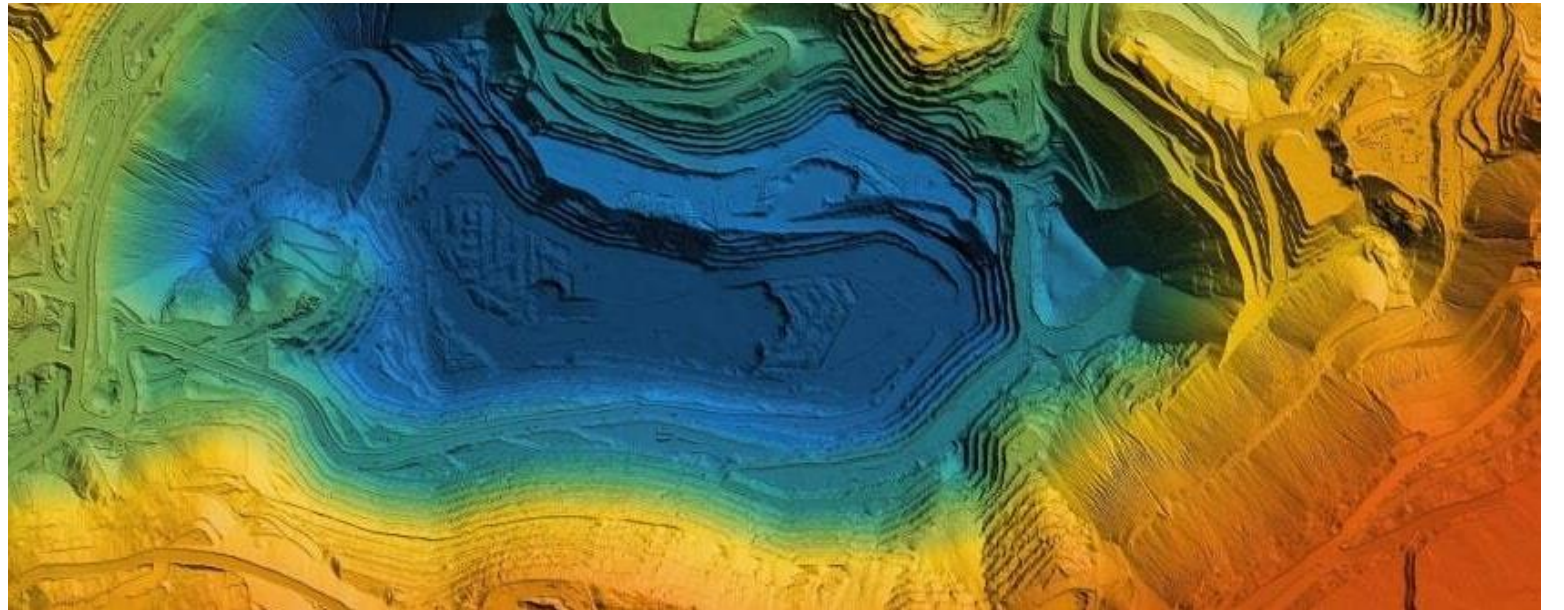
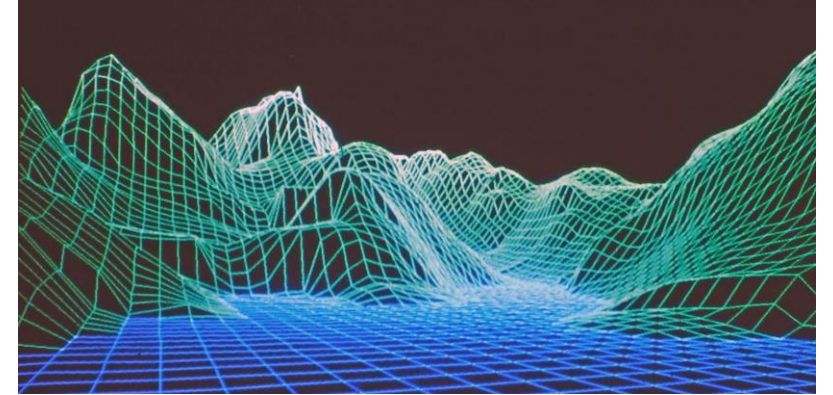
- Single Beam Echosounder (single sound pulse)
- Multi-Beam Echosounder
- Side-scan
- Topo-bathy





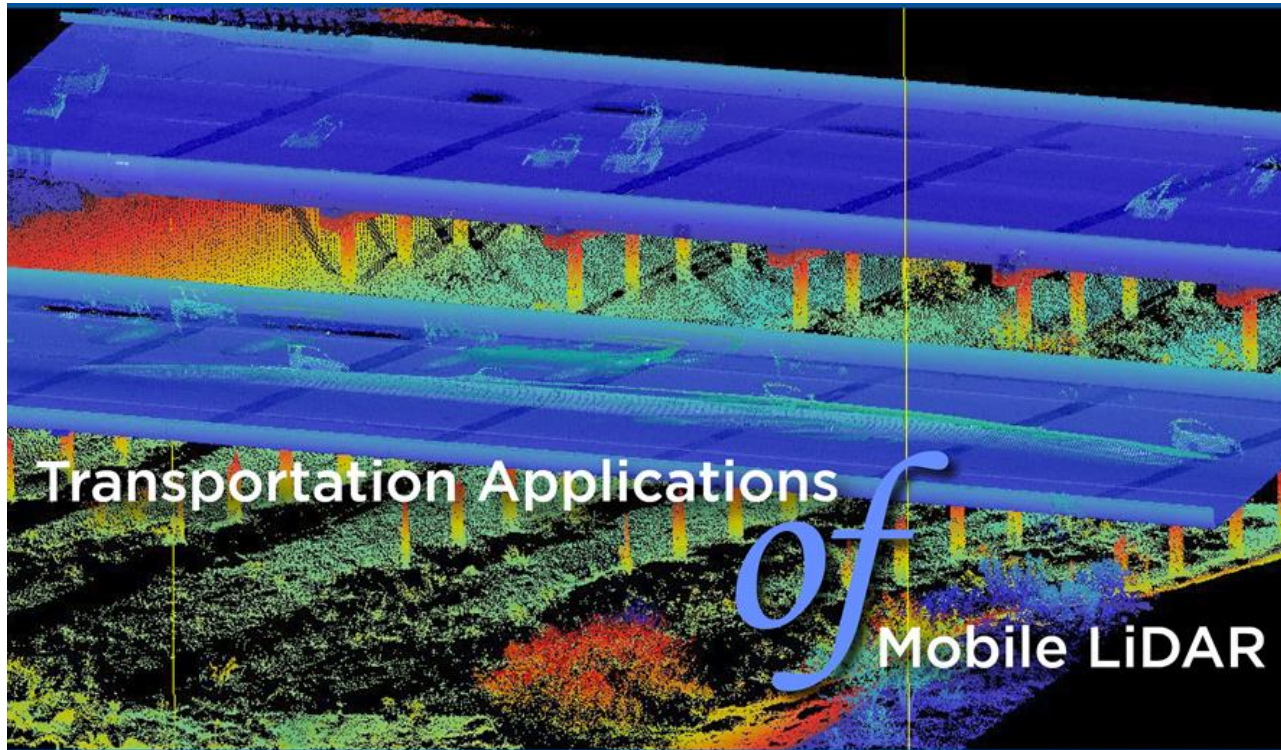
# GIS APPLICATIONS IN PUBLIC WORKS

- Surveying and Mapping; Topo, planimetric, floodplain, etc.
- Asset Inventory and Condition Assessment
- Land Cover Classification, Impervious Cover Analysis
- Sign Inventory
- ADA Compliance
- Terrain Analysis
- Environmental Monitoring
- Disaster/Emergency Response
- Site Assessment
- Vegetation Monitoring
- Infrastructure Inspection
- Broadband/Fiber Inventory





# MOBILE LIDAR APPLICATIONS - TRB



The Transportation Research Board has put together a list of current and emerging applications for mobile LiDAR:

## Asset Management

- Billboard management
- Automated/semiautomated extraction of signs
- Modeling and inspection
- Inventory mapping

## Construction

- Machine control and construction automation
- As-built/repairs documentation
- Post-construction quality control
- Pavement smoothness/quality determination
- Quantities
- ADA compliance

## Maintenance

- Bridge inspections
- Power line clearance
- Drainage/flooding
- Vegetation management

## Operations

- Traffic congestion/parking utilization
- Land use/zoning
- Building Information Modeling (BIM)
- Bridge Information Modeling (BrIM)
- Emergency response
- Clearances

## Project Development

- Feature extraction for CAD models and baseline data
- Virtual, 3D design (alternatives and class detection)

## Project Planning

- Roadway analysis
- Topographic mapping
- Environmental studies
- General measurements

## Research

- Unstable slopes
- Landslide assessment
- Coastal erosion

## Safety

- Extraction of geometric properties and features for analysis
- Forensics/accident investigation
- Driver assistance/autonomous navigation

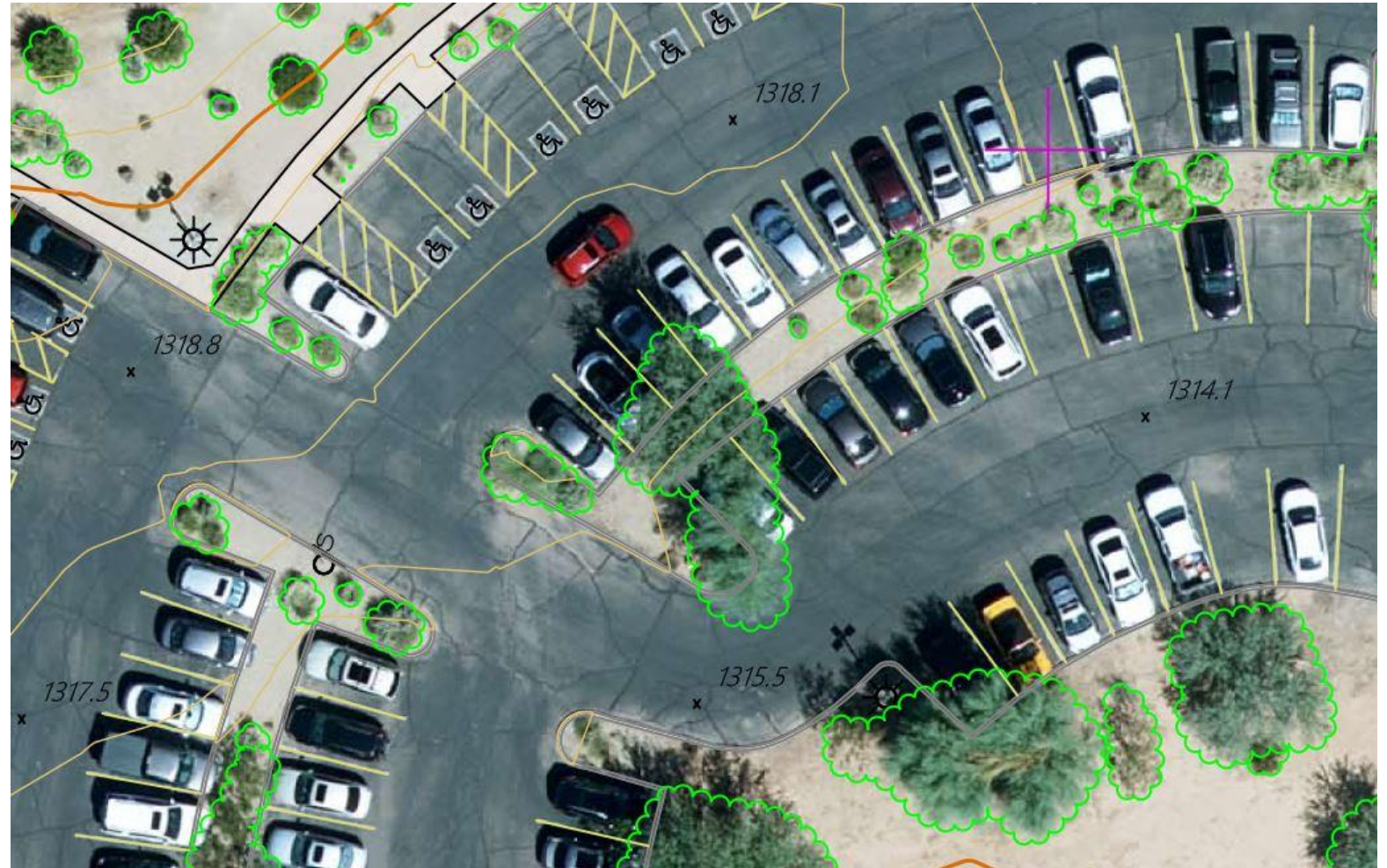
## Tourism

- Historical preservation
- Virtual tour of attractions

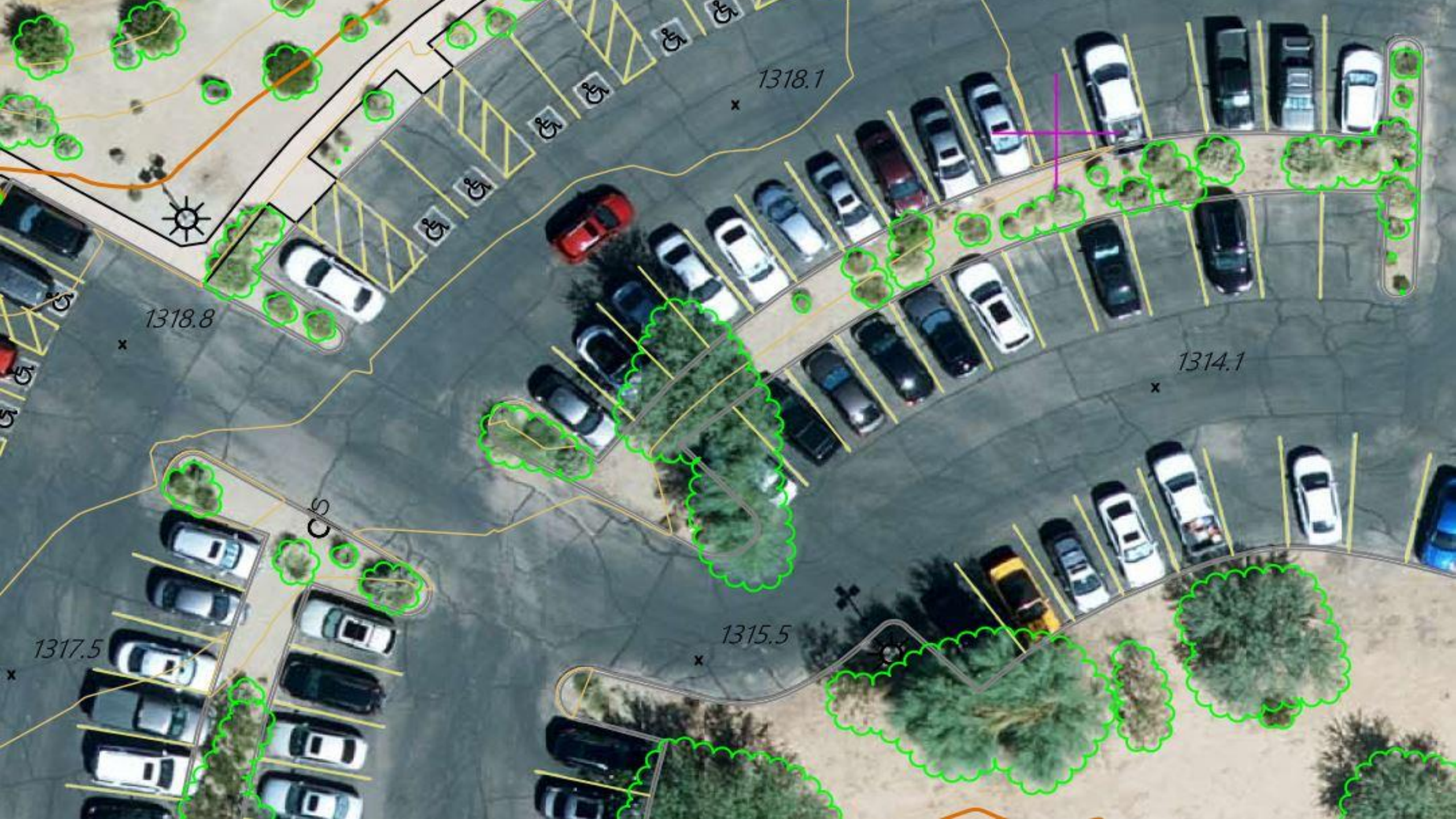


# DATA MINING

- Data mining is repurposing data collected for one project type and using it for another project type
- Topographic mapping project and ADA compliance, or sign inventory







1318.1

1318.8

1314.1

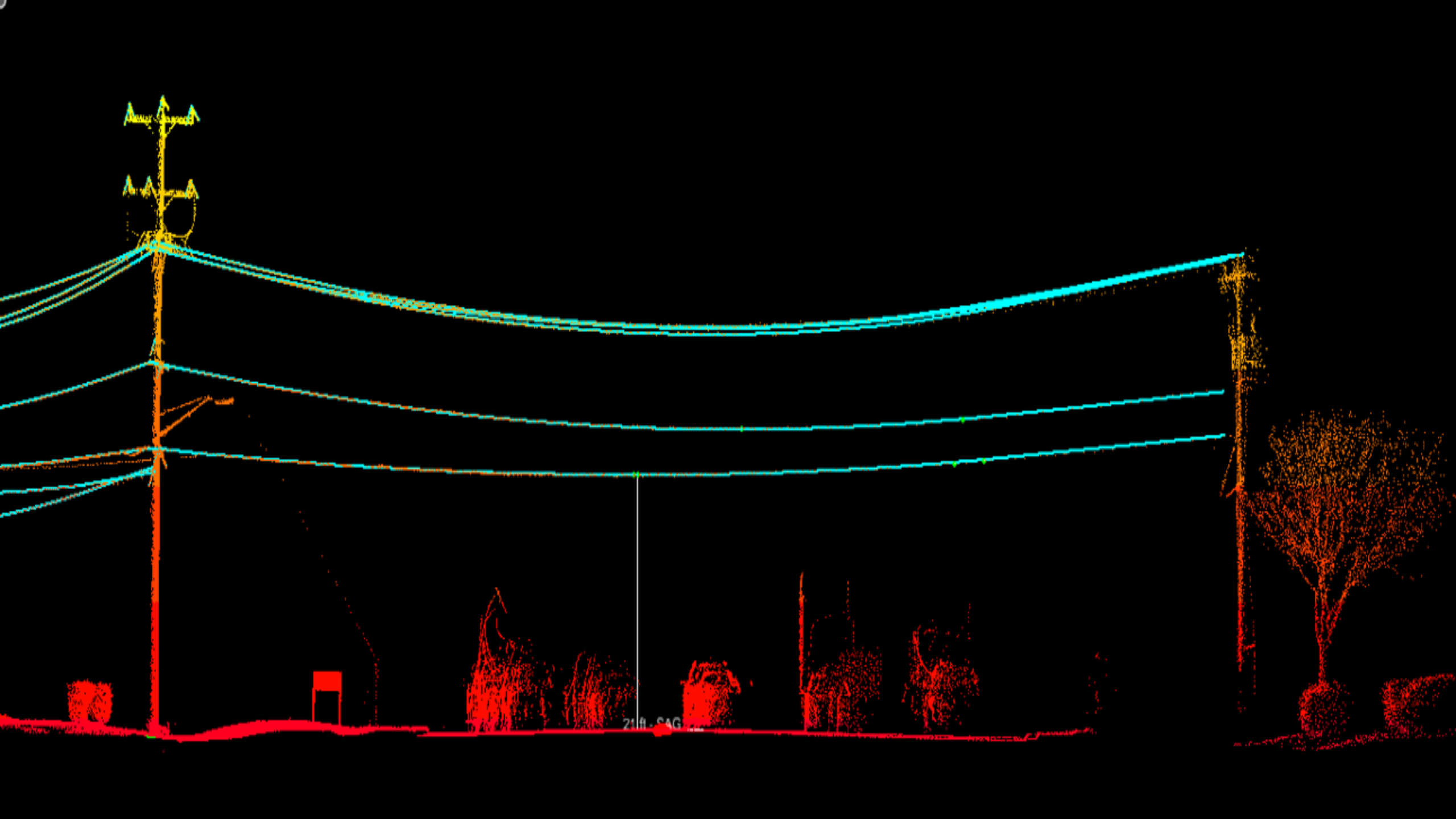
CS

1315.5

1317.5

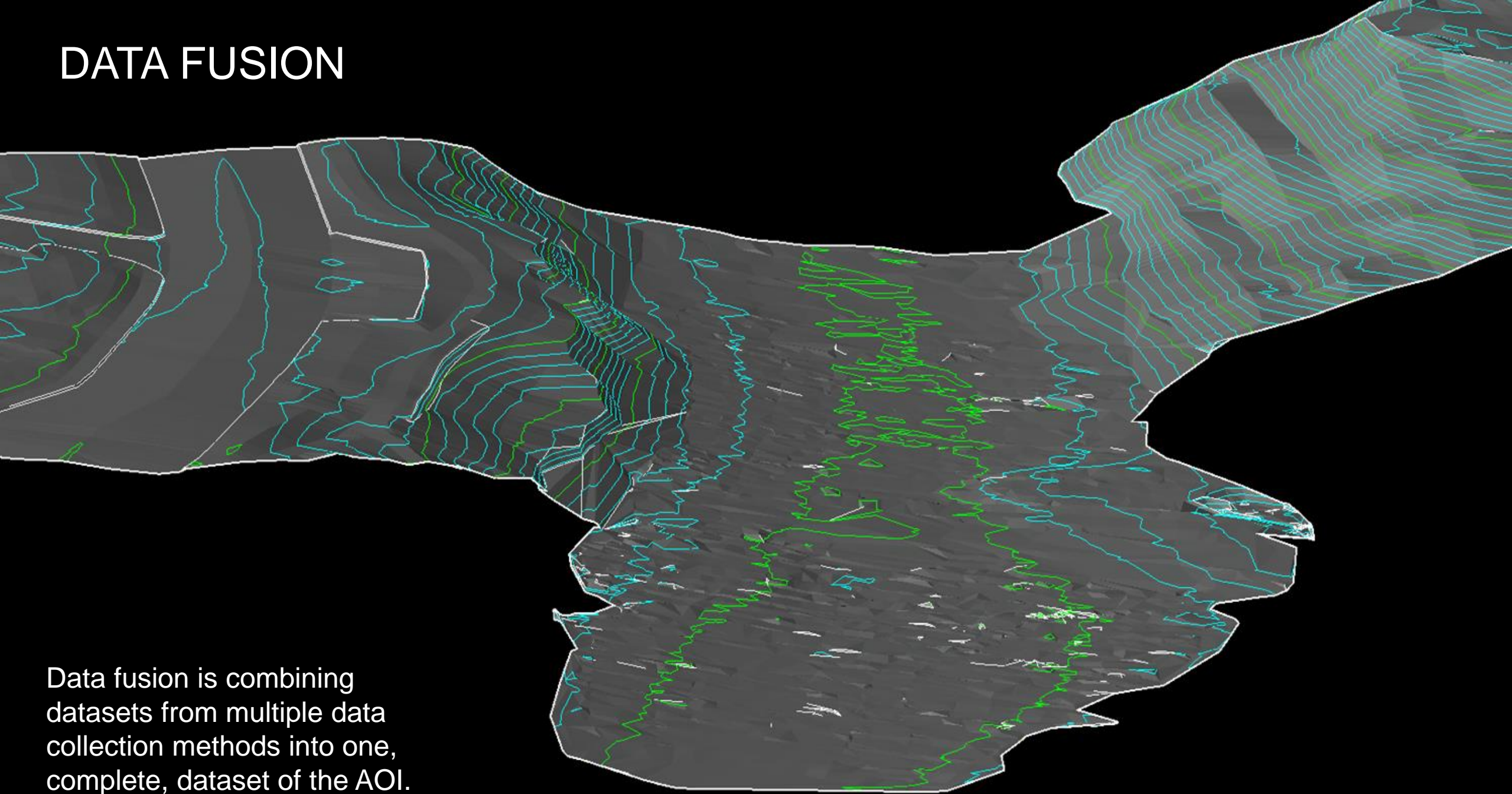








# DATA FUSION



Data fusion is combining datasets from multiple data collection methods into one, complete, dataset of the AOI.

# INDOOR MAPPING





# Geographic Emergency Response Application

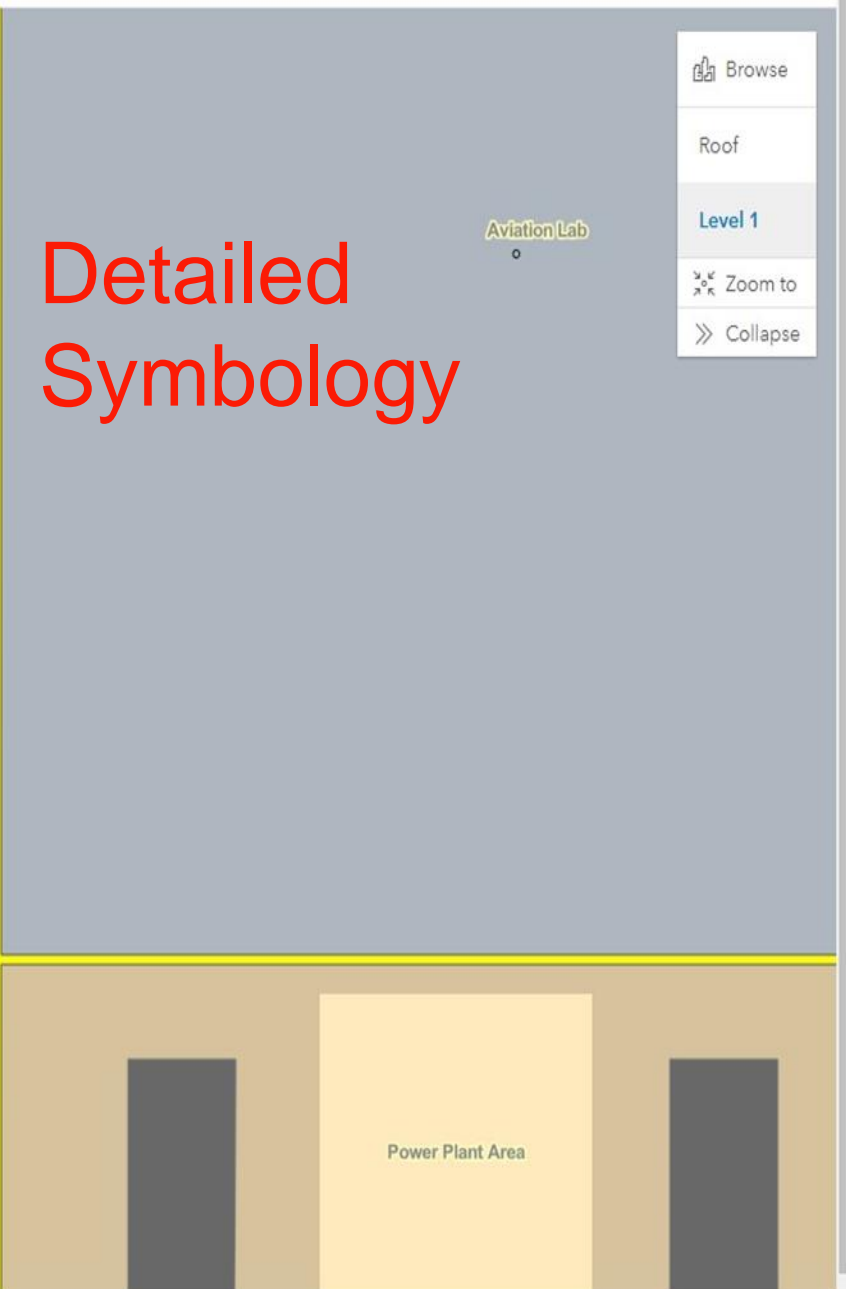




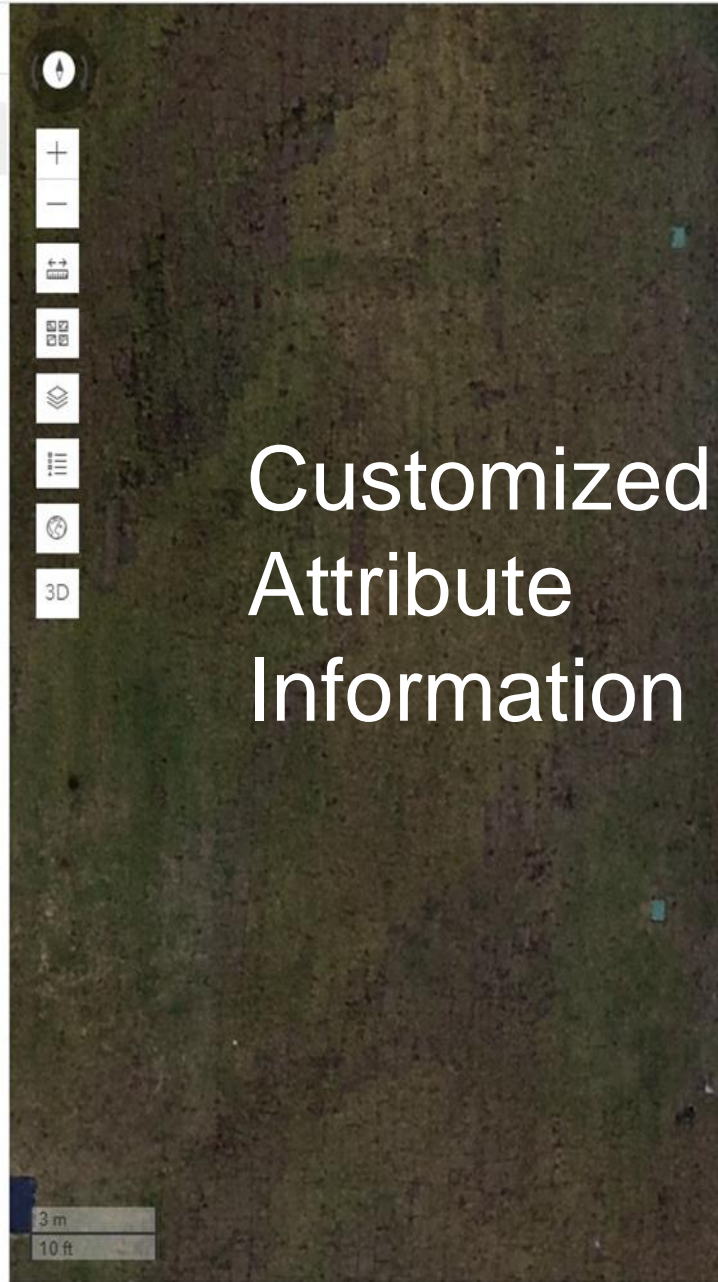
Safety

Side

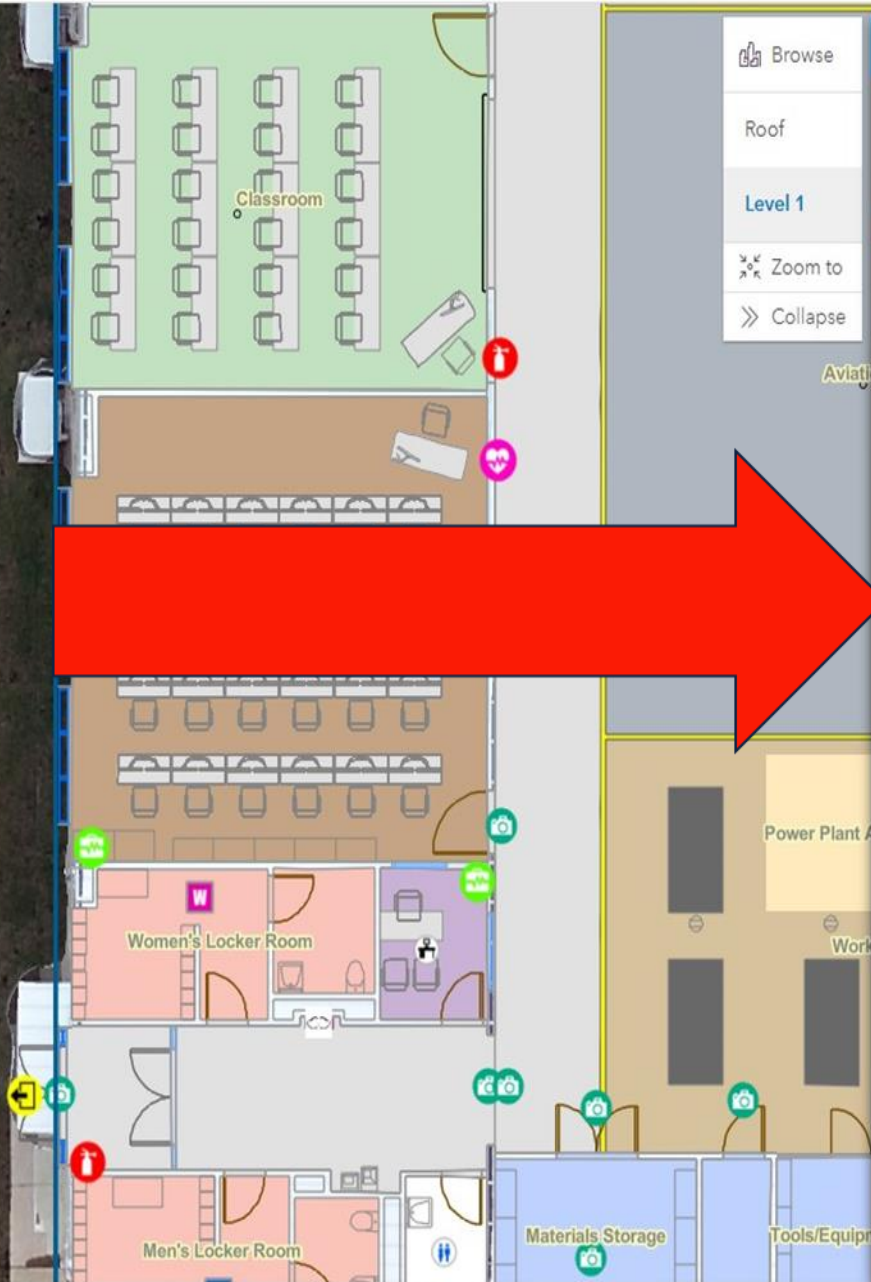
- AED
- Emergency Shower/Eye Wash Station
- Fire Extinguisher
- First Aid Kit
- Goggle Cabinet
- Left



- ← Images
- Aviation Lab
- Classroom 1
- Classroom 2
- Entry Point 1
- Entry Point 2
- Front Door
- Hallway
- IDF Room
- Materials Storage
- Materials Storage Door
- NICAD Battery Storage
- Work Area Left
- Work Area Right



# Customized Attribute Information



- Browse
- Roof
- Level 1
- Zoom to
- Collapse

### Classroom 2

Set Home Save Share

Attributes Related Items

< Back Next >

#### Classroom 2

Name Classroom 2

Click "View" to see image View



360 imagery  
of classrooms,  
hallways, and  
common areas.









# HALFF SURVEY/GEOSPATIAL

## QUESTIONS?

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**halff.com**

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