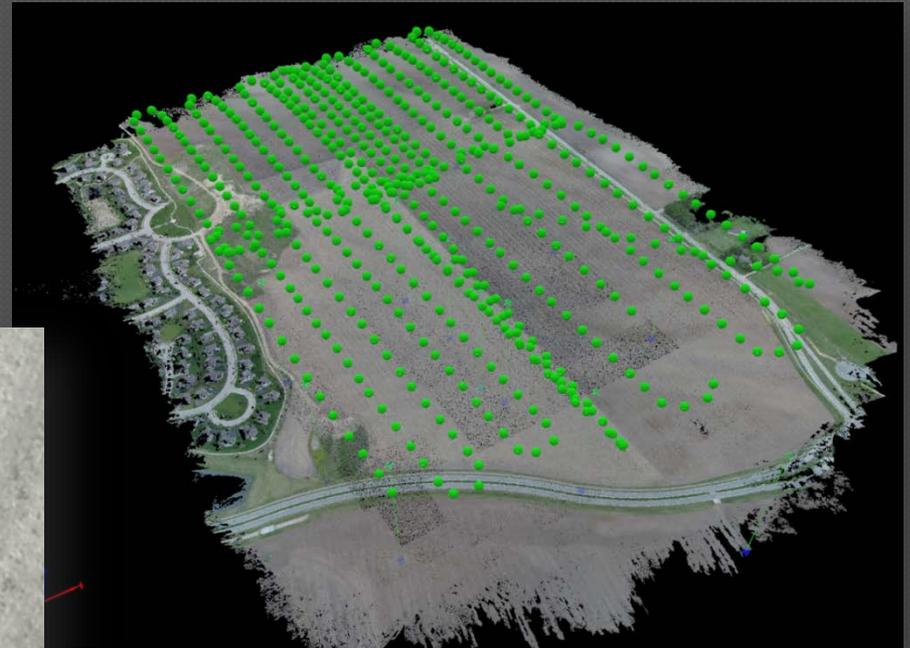


# Waukesha County 2016 Storm Water Workshop

## Unmanned Aerial Systems for Construction Site Inspection



**R.A. Smith National**

*Beyond Surveying  
and Engineering*

# Who We Are

- **Multi-discipline engineering, survey, technical and creative services firm.**
- **Serve clients across the nation.**
- **Experts in measuring the built environment.**

▪ **Appleton, WI** ▪ **Brookfield, WI** ▪ **Irvine, CA** ▪ **Pittsburgh, PA**

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# sUAS – Unmanned Aerial Systems

## ○ sUAS

- small Unmanned Aerial Systems



## ○ Types

- Fixed Wing
- Rotary



# sUAS – Unmanned Aerial Systems

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## ○ Impact

- Topographic / Volumetric Surveys
- Inspection Tool

## ○ Different sensors

- Photogrammetric Cameras
- Laser Scanners
- Thermal Imaging

## ○ Obstacles

- FAA



# sUAS – Unmanned Aerial Systems

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## ○ FAA Rules & Regulations

- They control all air space – PERIOD.

## ○ Commercial Operations

- Section 333 Exemption
- Blanket COA
- Register Aircraft
- Licensed Pilot

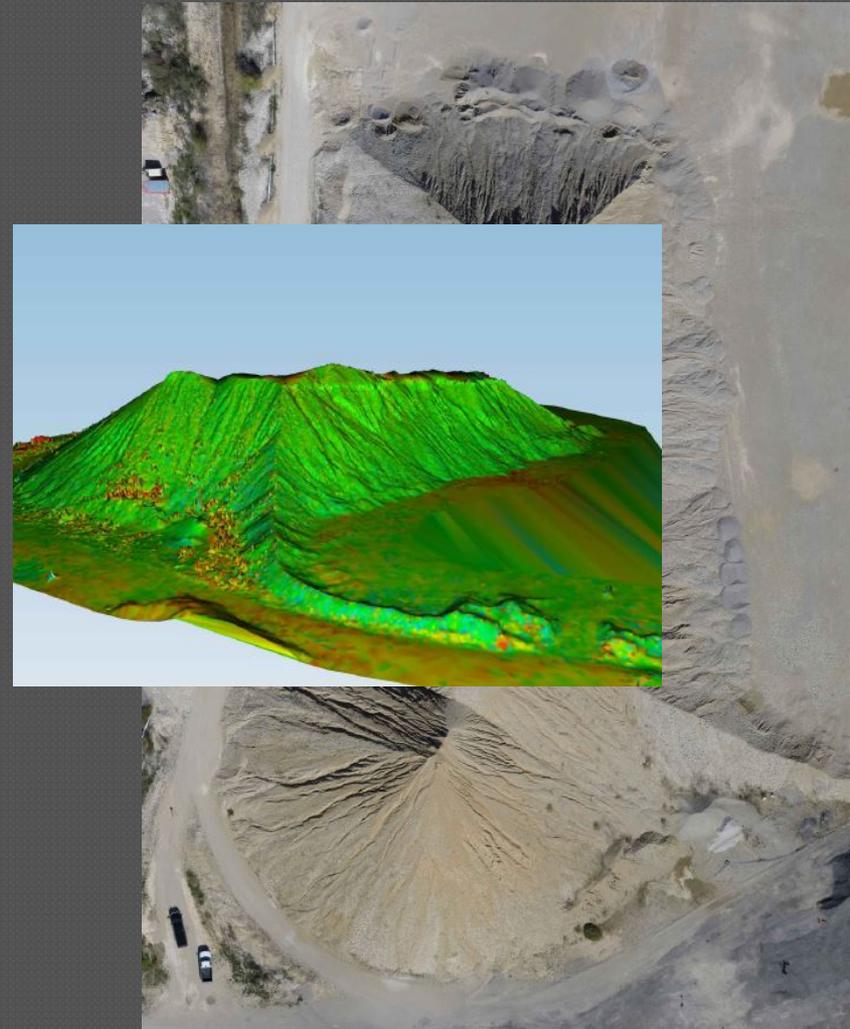


# sUAS – Unmanned Aerial Systems

## ○ Volumetrics - Stockpiles

- Static LiDAR as benchmark
- Promising results

	Small pile		Large pile	
	CU YDS	%	CU YDS	%
3d Laser scanner	9,012		147,301	
UAS	9,099	0.97%	147,149	-0.10%

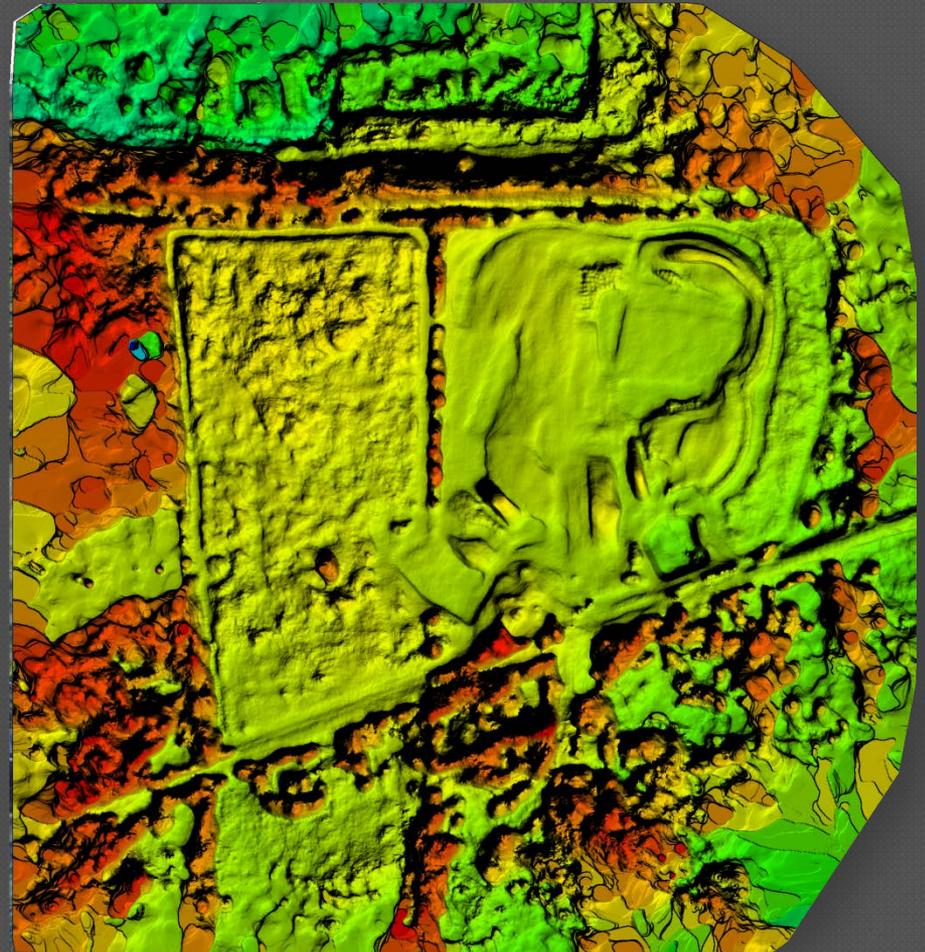
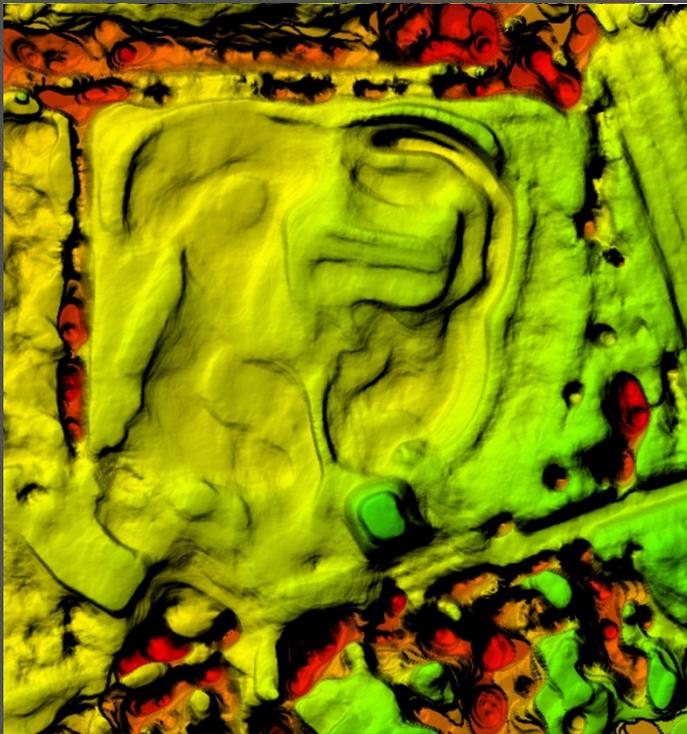




# sUAS – Unmanned Aerial Systems

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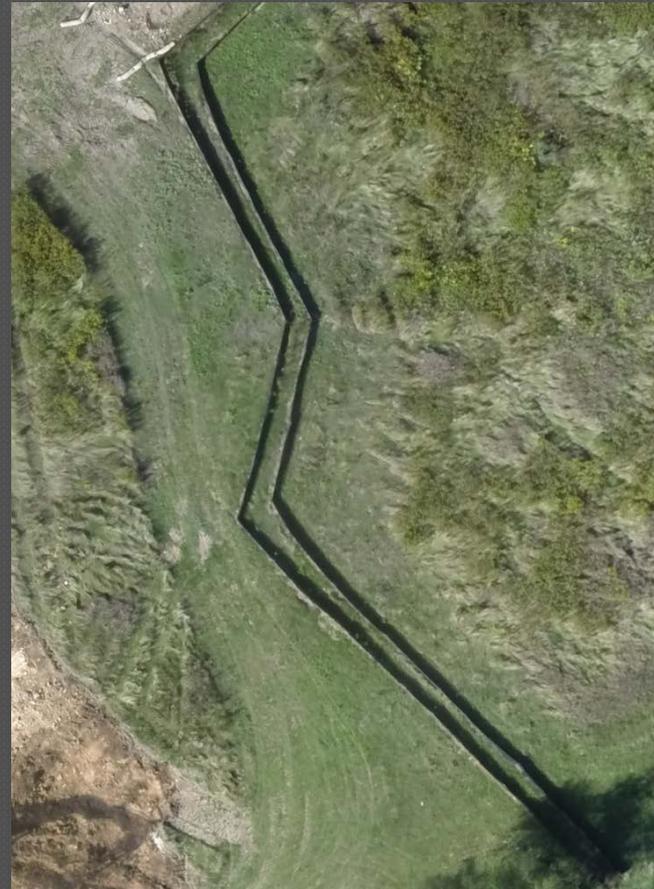
- **Monitor Earthwork Draws**



# sUAS – Unmanned Aerial Systems

## ○ Erosion Control Monitoring

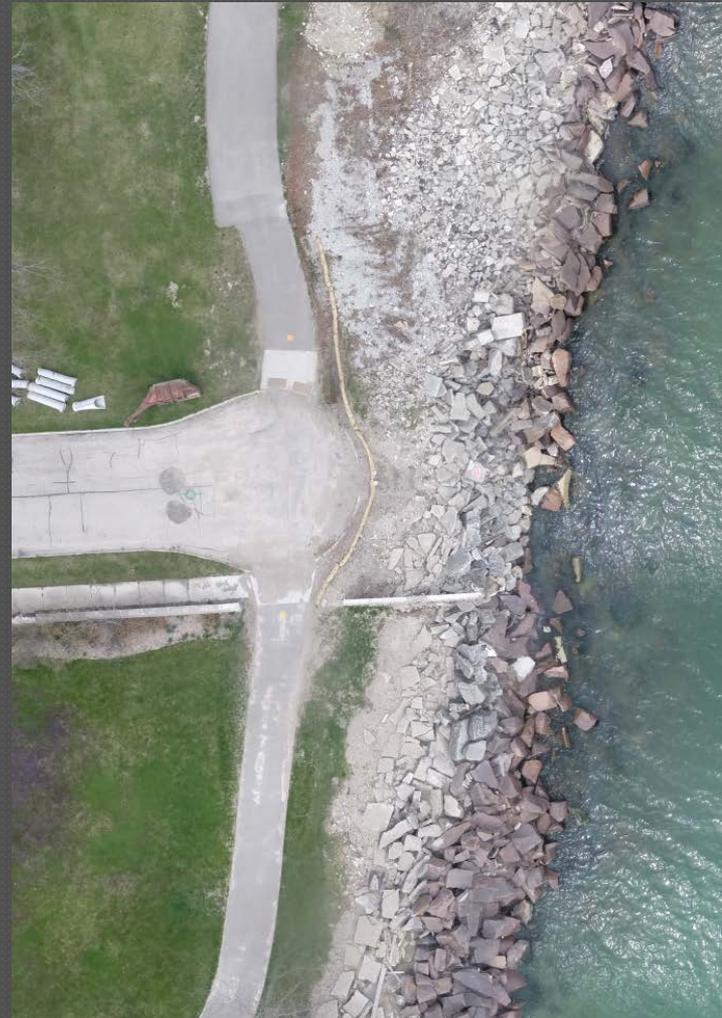
- Measure quantities of silt fence.
- Track sediment movement.



# sUAS – Unmanned Aerial Systems

## ○ Erosion Monitoring

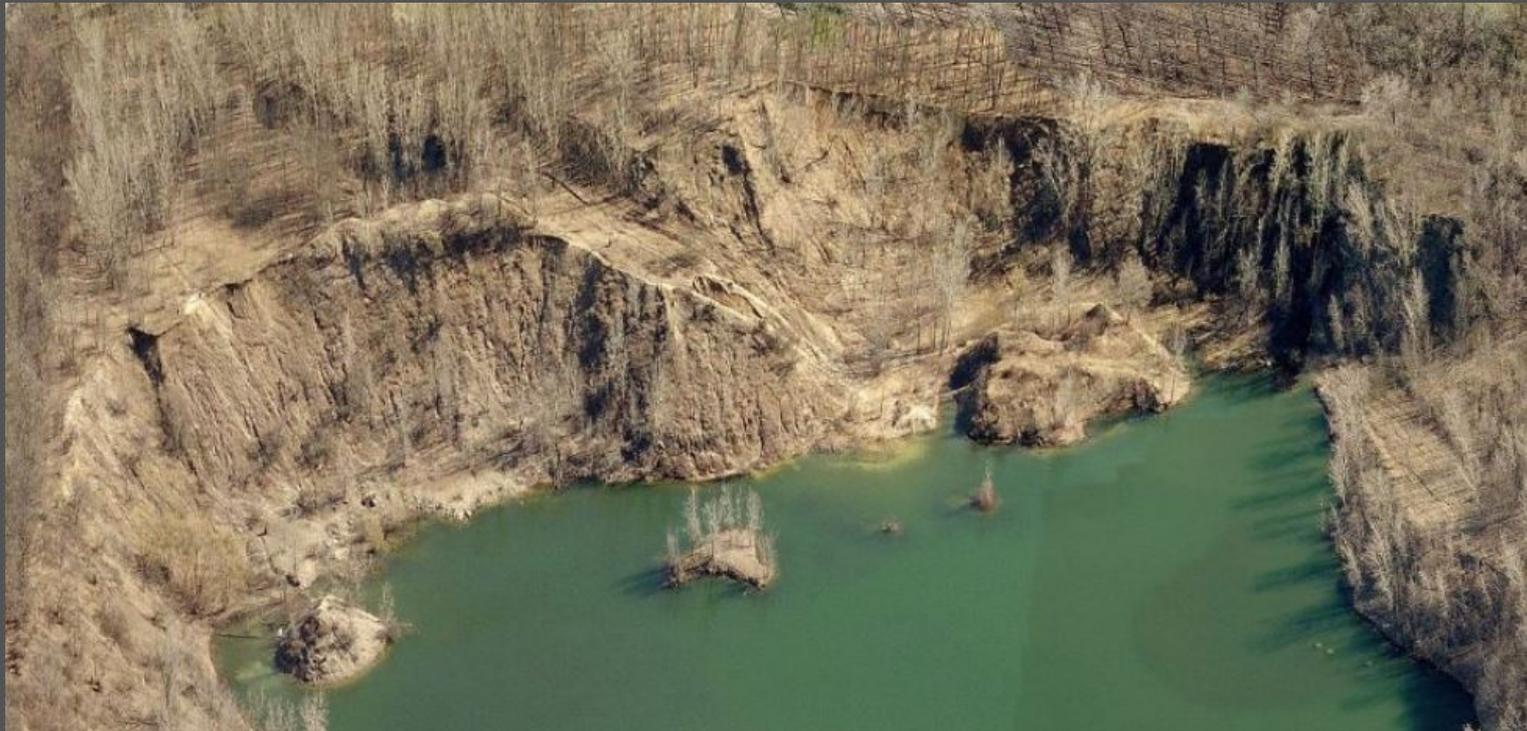
- Low altitude flight for highly detailed photogrammetric derived surface.



# sUAS – Unmanned Aerial Systems

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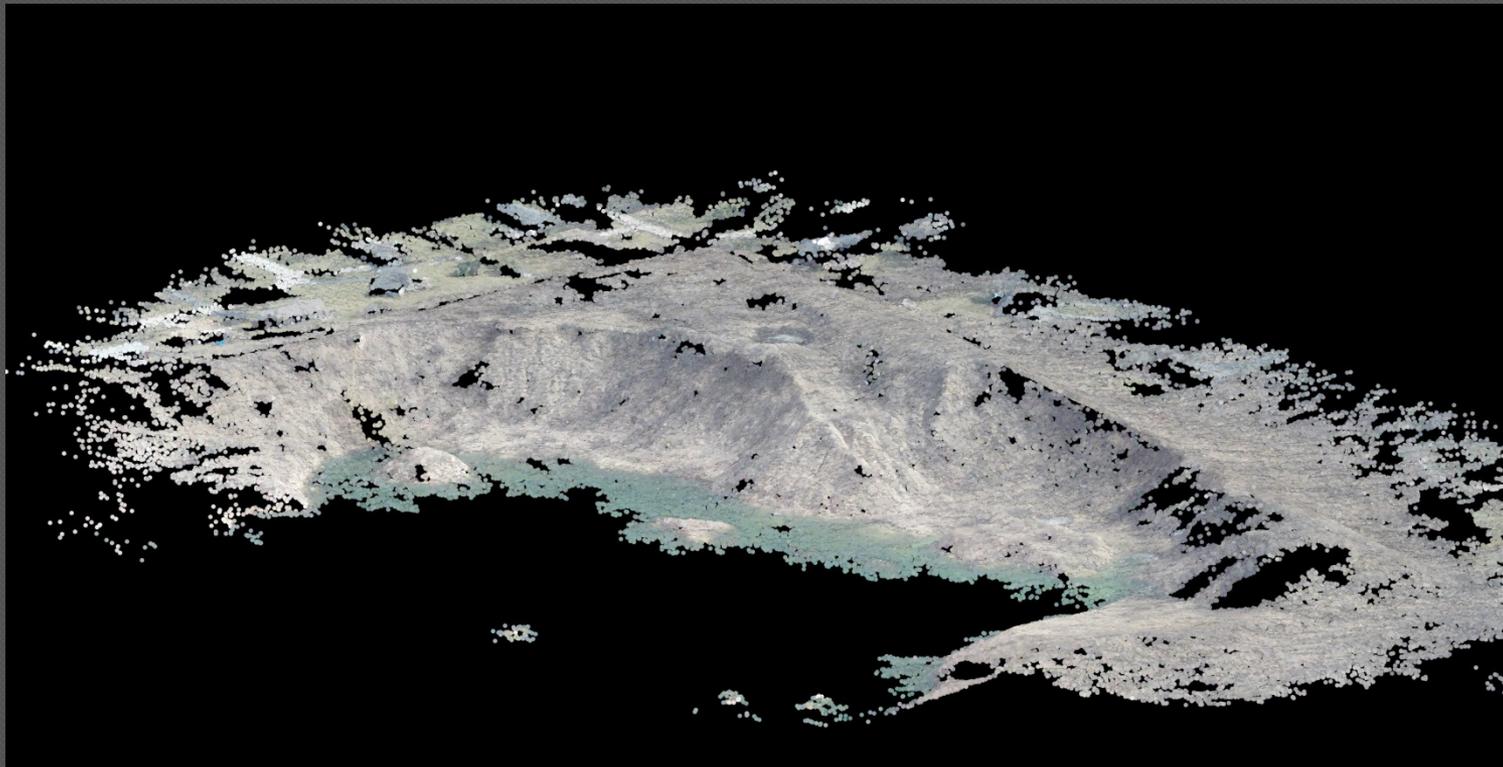
- **Inaccessible Topography**



# sUAS – Unmanned Aerial Systems

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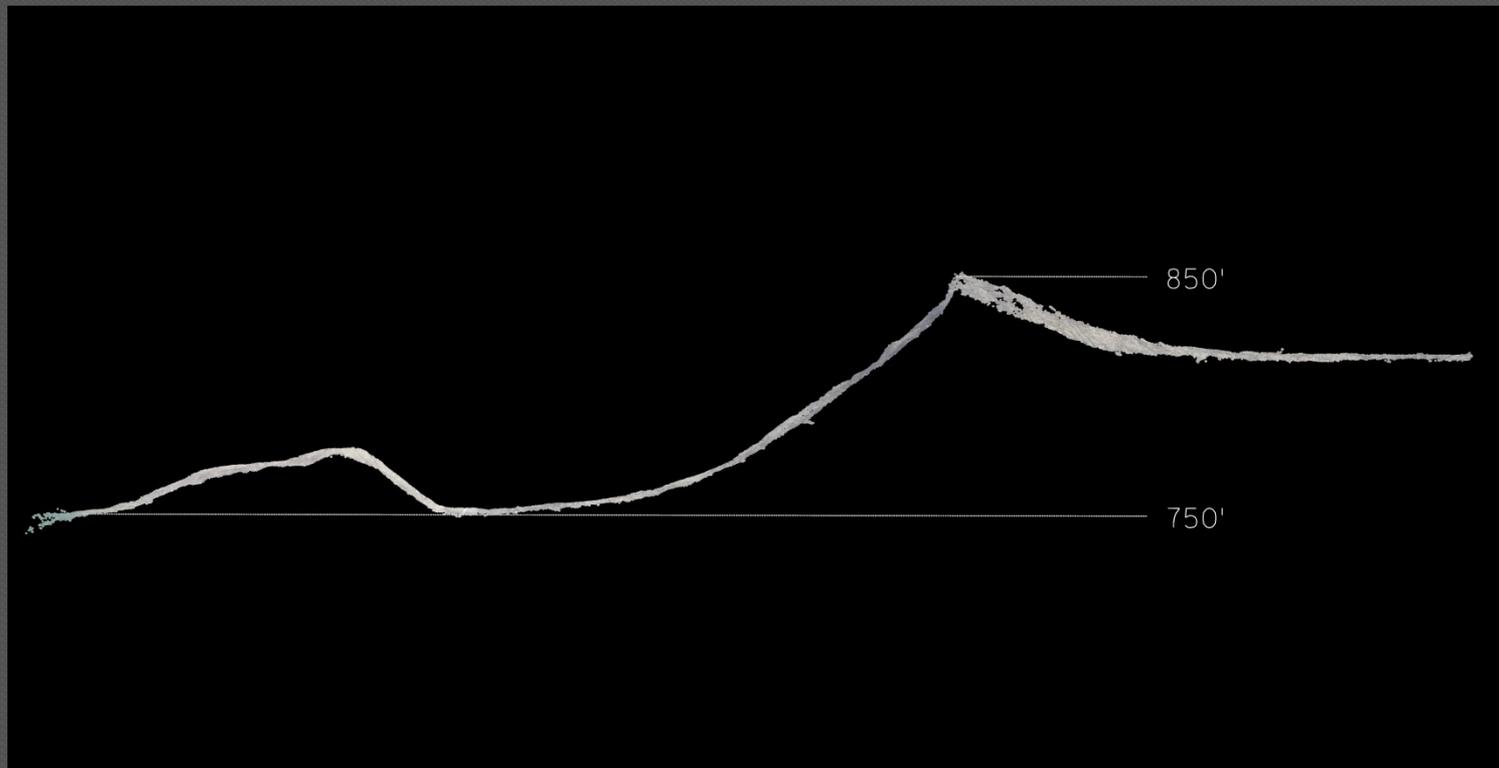
- **Inaccessible Topography**



# sUAS – Unmanned Aerial Systems

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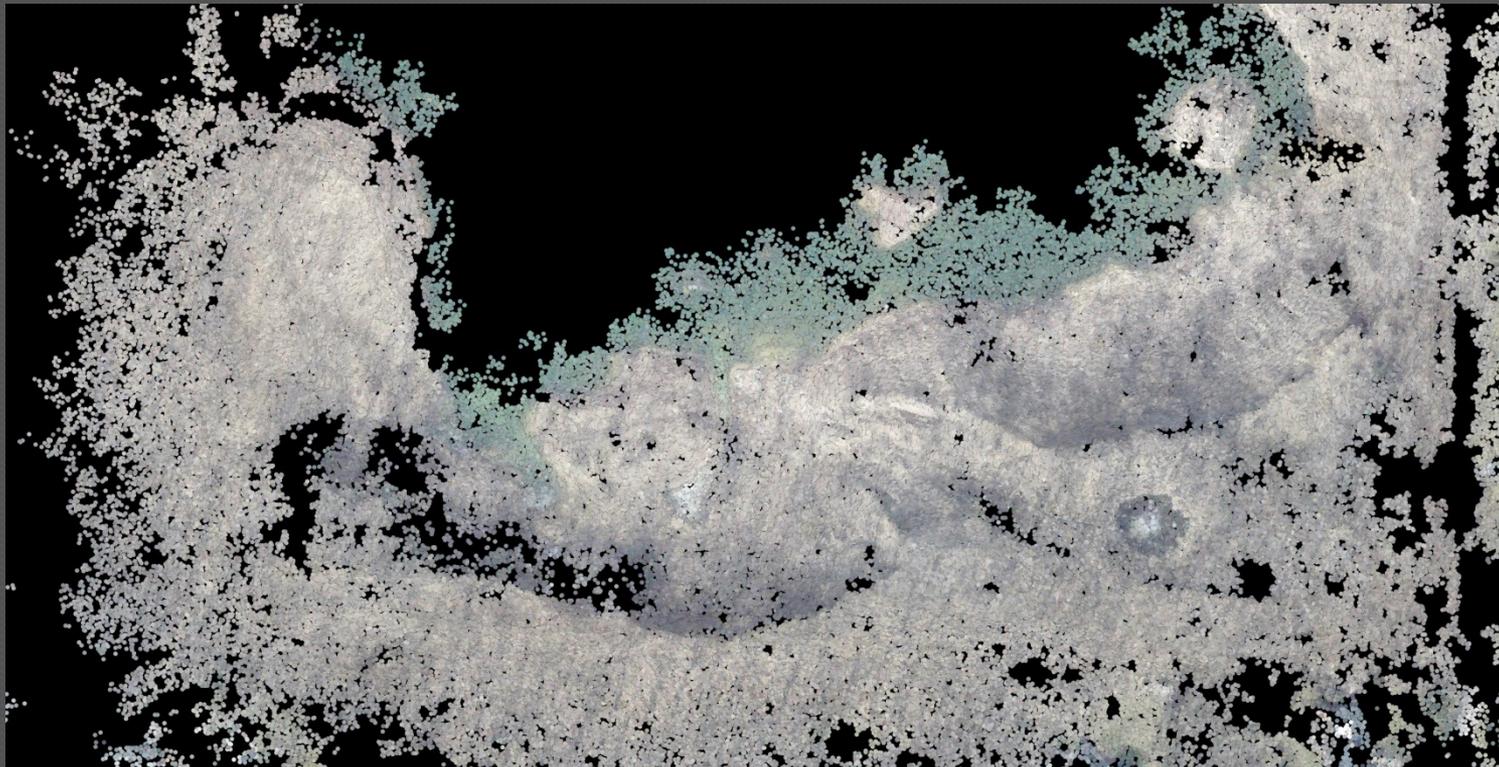
- **Inaccessible Topography**



# sUAS – Unmanned Aerial Systems

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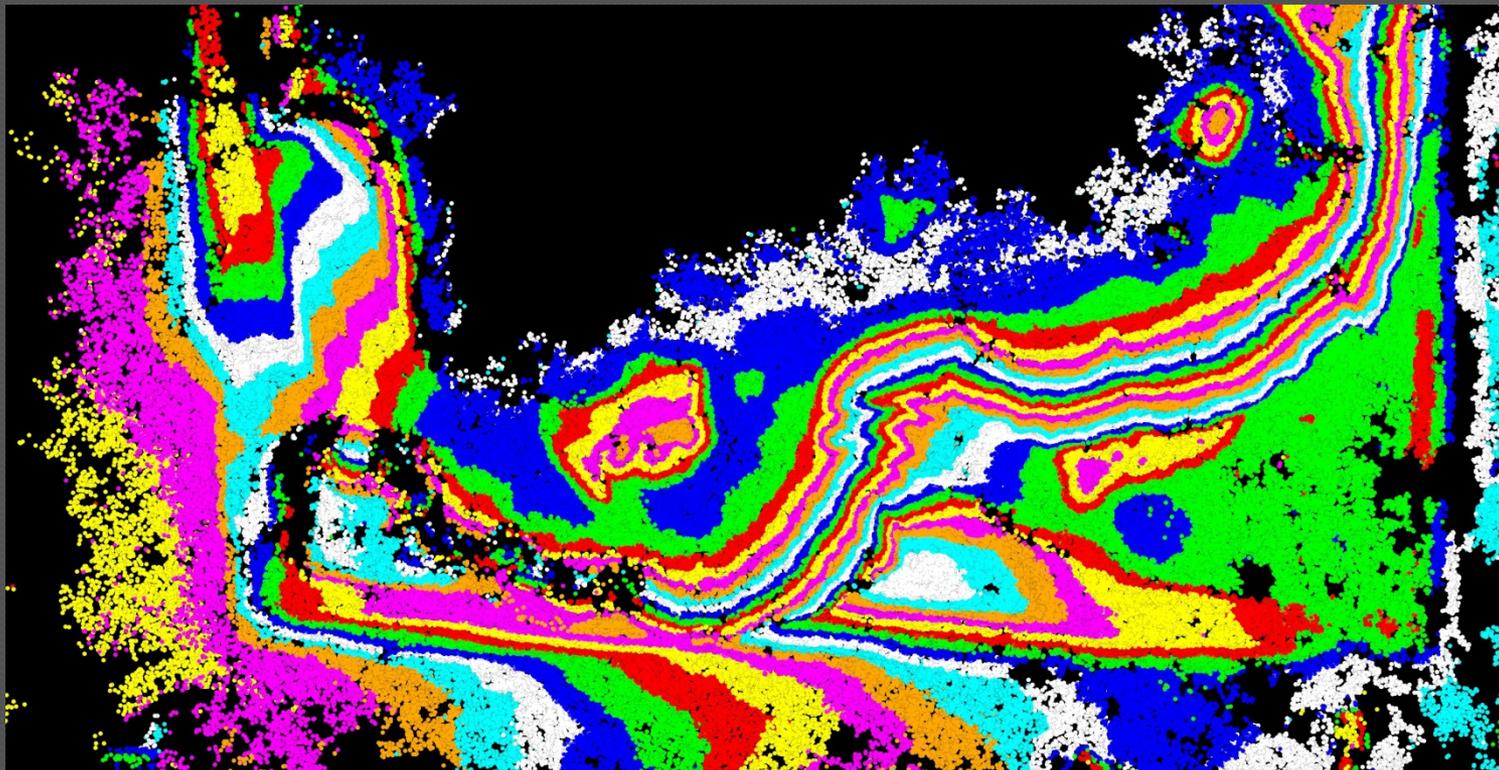
- **Inaccessible Topography**



# sUAS – Unmanned Aerial Systems

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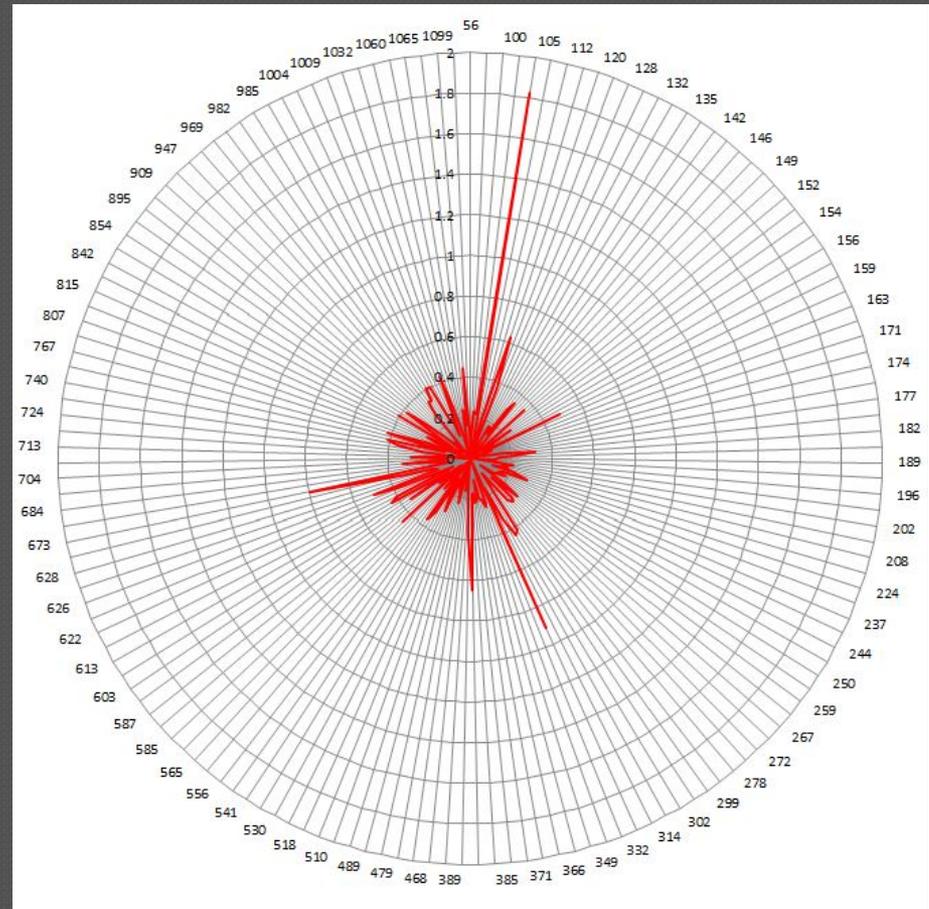
- **Inaccessible Topography**



# sUAS – Unmanned Aerial Systems

## ○ Example of Accuracies

- 159 conventional check shots
- RMSE of 0.29 feet



# Questions

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