

Mapping on a Budget

Using Drones & Digital Data

Jeff Campbell





Mapping with Minimal Investment

- UAS Mapping suited to Incremental Approach
- Large Up front investment not necessary.
- Determine if you have
 - Passion, Aptitude, Patience
- Start small, scale as necessary
 - Consumer Grade Multirotor UAV
 - UAV Image Capture App
 - Trial – Pix4D (or Drone Deploy)
- Product content, develop knowledge
- Generate income, then scale up

Agenda

1. Introduction
2. UAV Mapping Explained
3. Mapping Products
4. Technology
5. Training Methods



Vertical Aspect

- Specializing in Unmanned Aerial Vehicle (UAV) Mapping
 - Consultation
 - Training (Face-to face and Remote)
 - Services
- Offer related hardware / software
 - Robota Eclipse Fixed Wing – Texas Dealer
 - Pix4D Pro Mapping / Virtual Surveyor Software
 - V-Map Ground Control Targets
- FAA Certified, Insured



Our Background

- Jeff Campbell
 - Retired Navy Rotary Wing Pilot
 - Lockheed Martin Program Manager
 - Involved in UAS since 2012
- Mark Paulson
 - Registered Professional Surveyor
 - Private Pilot
 - Sales / training of UAS since 2013

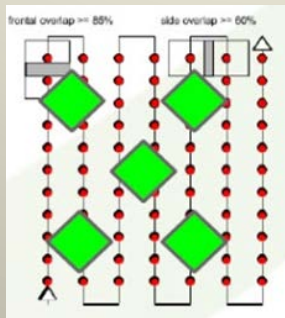
UAS Mapping Explained

Simplified Mapping Workflow

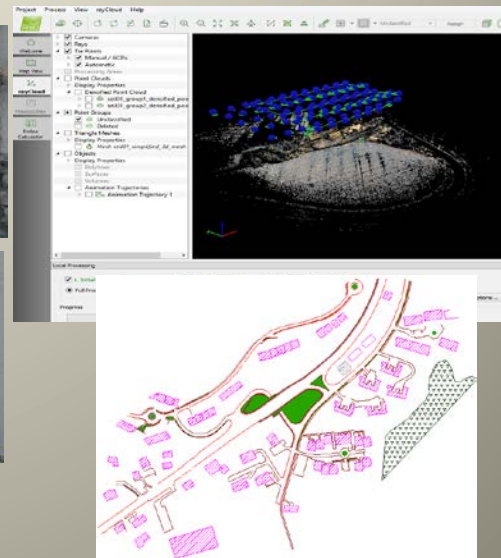
Plan & Load
the mission



Fly – Capture
images



Process,
Provide Output





UAS vs. Conventional Surveying

- Higher Speed of Capture
- Smaller Crew size
- More Data Points
- Less Cost
- Higher Efficiency
- Safer
- Less Impact on Operations
- Comparable accuracy (w/Ground Control)

Use Cases / Outputs

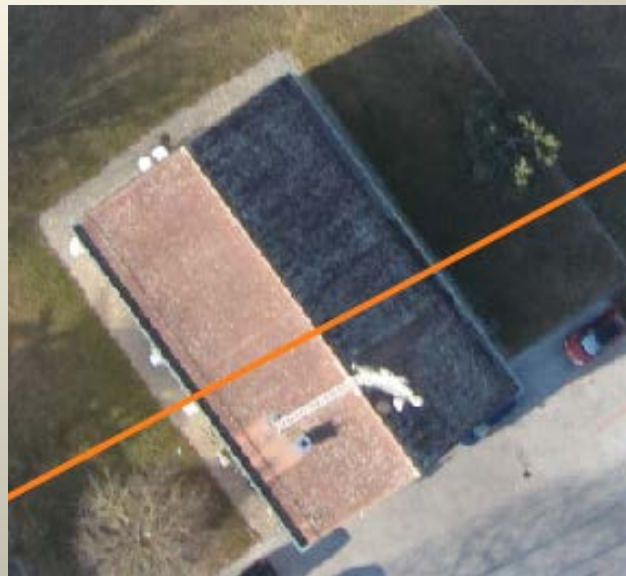
Orthomosaic



Stitching vs. Orthorectification

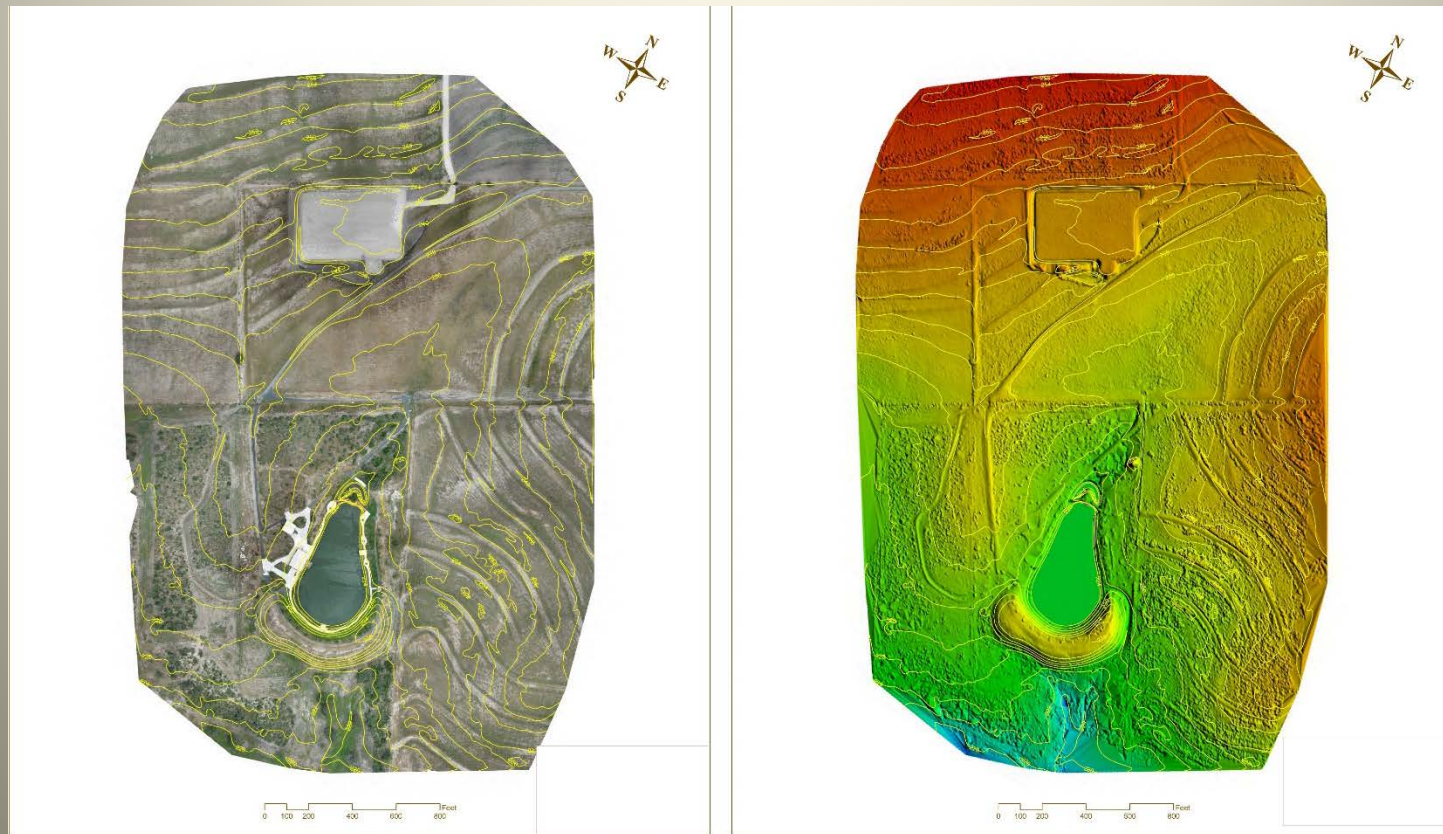


- Pictures not aligned
- Unsuitable for measurements

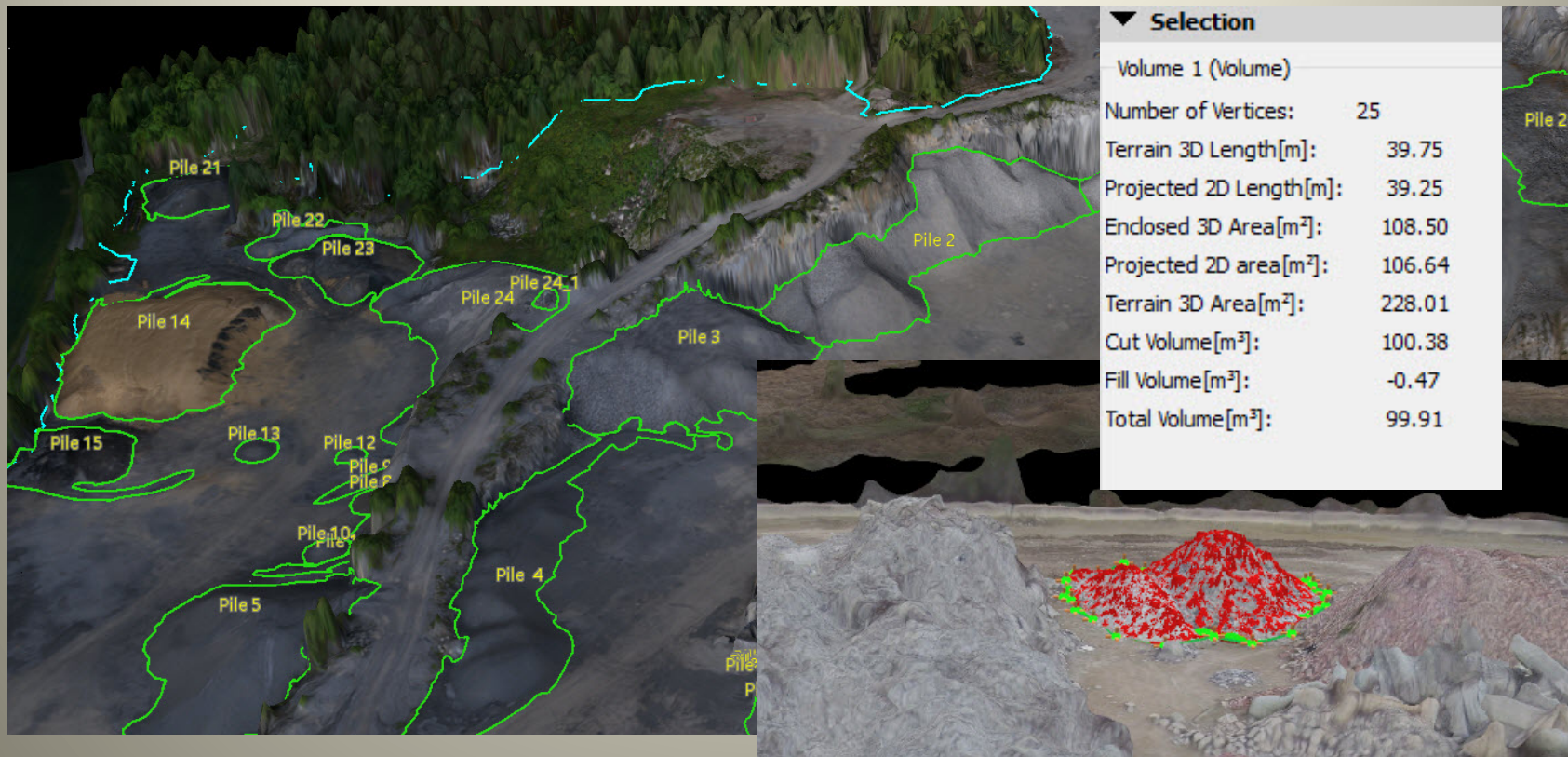


- Removes perspective distortions
- Accurate scale and position

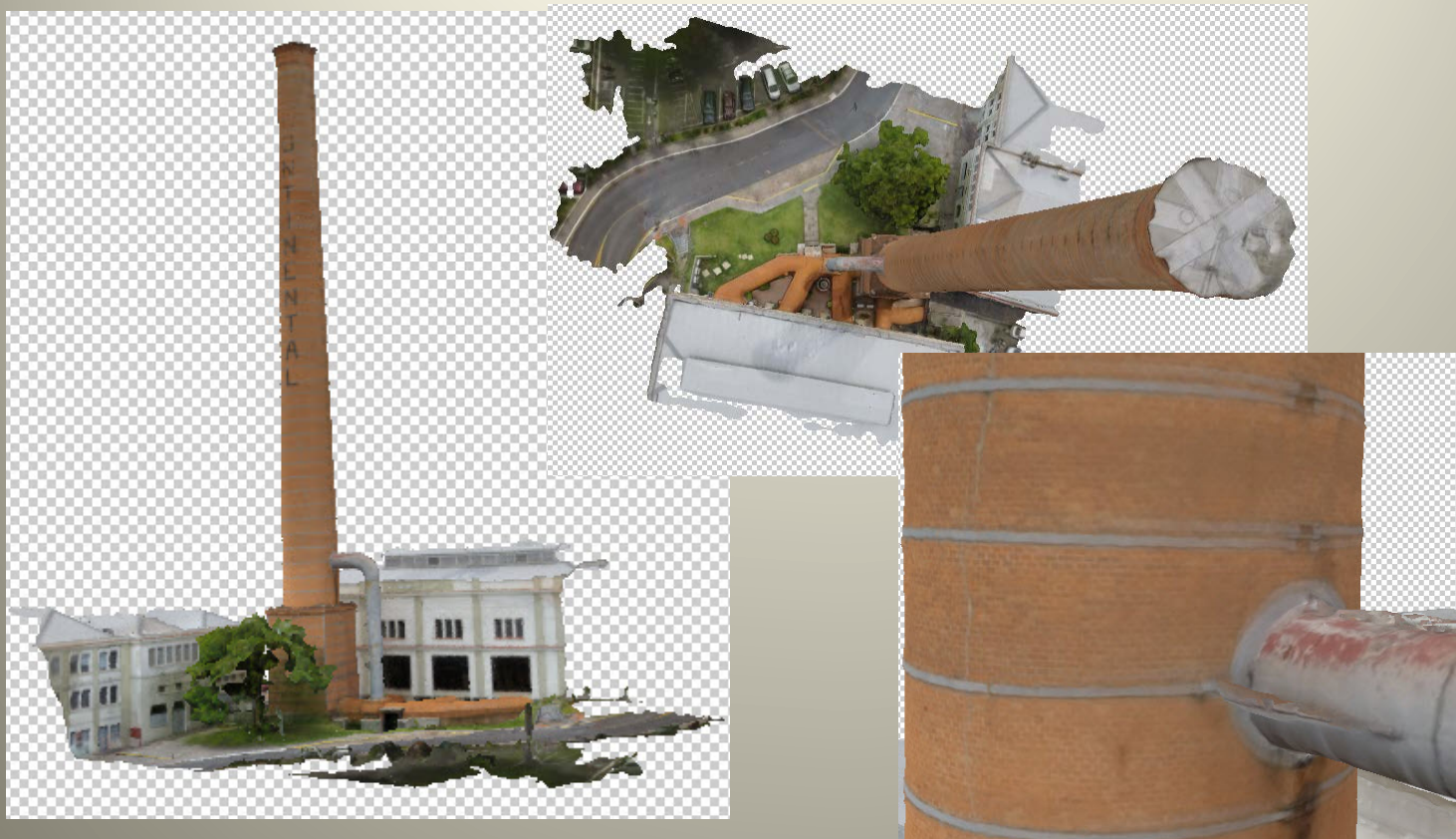
Topographic



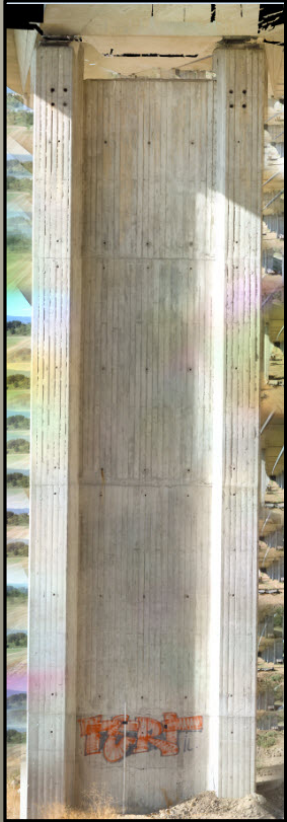
Stockpile Volume Calculations



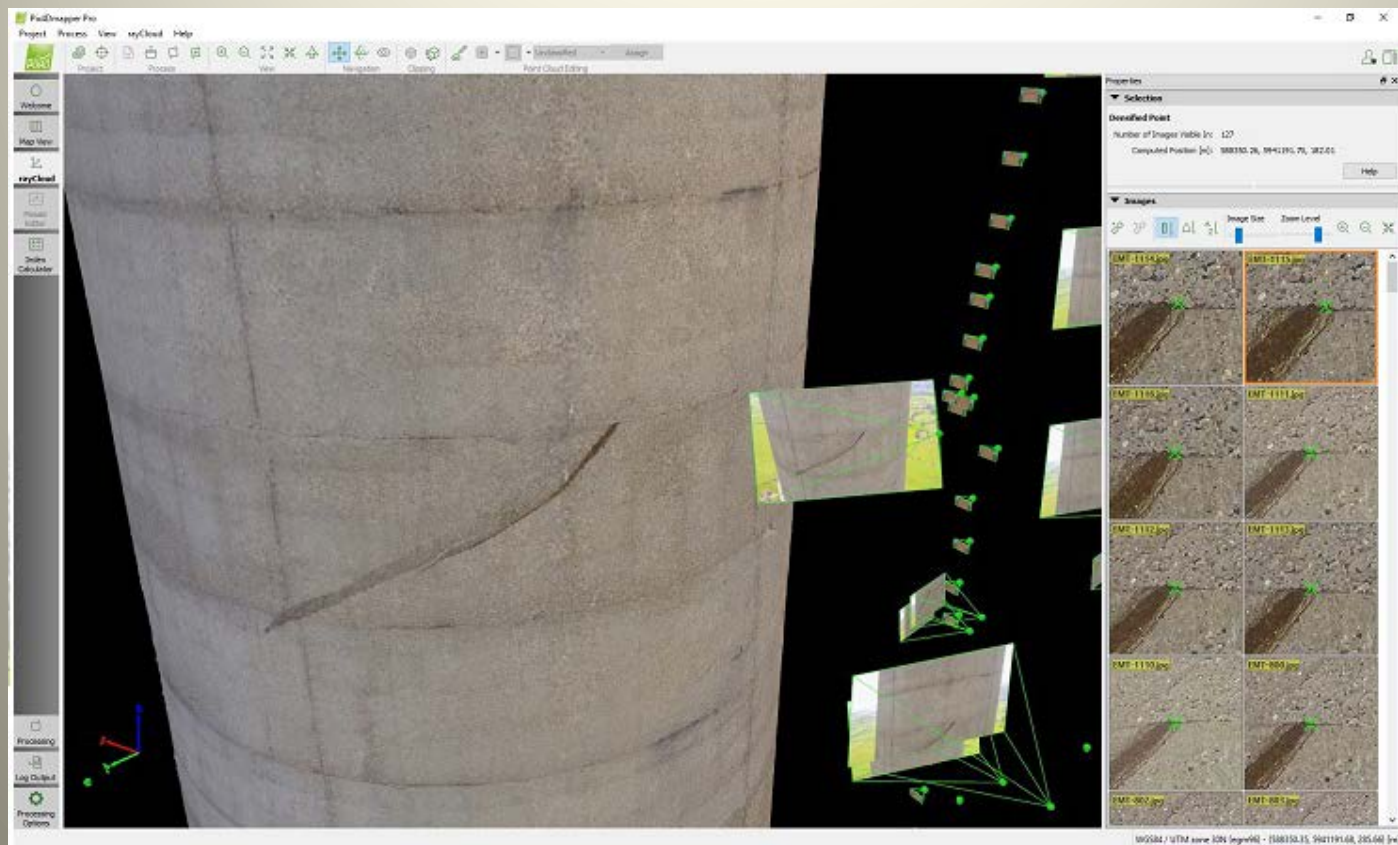
3D Model



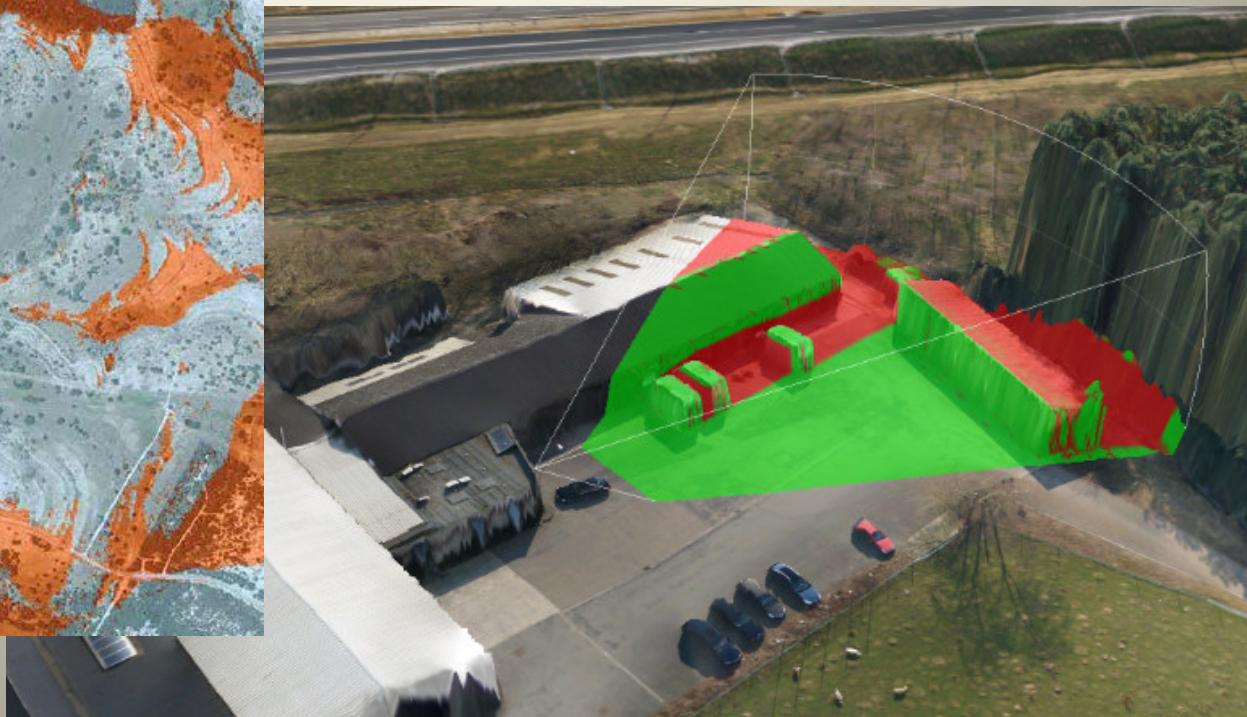
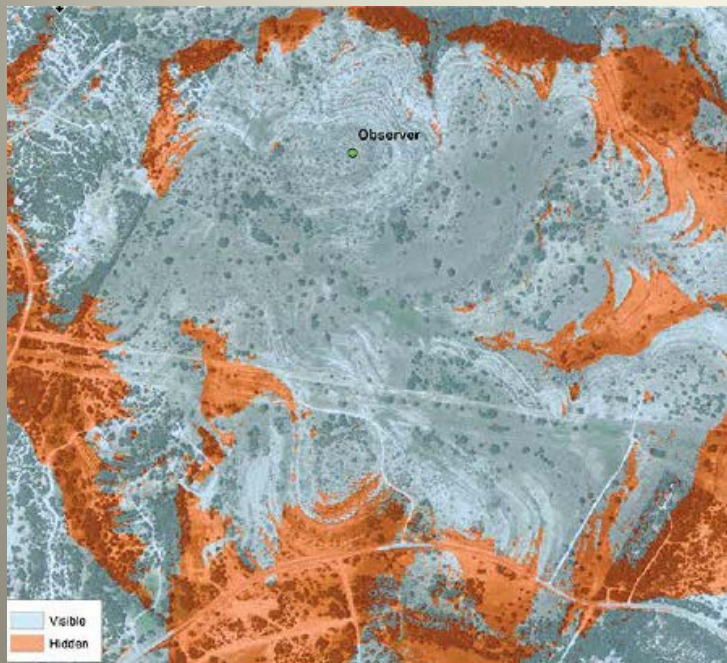
Inspections



Inspections



ViewShed / Sightline



UAS Mapping: Technologies

UAS Mapping Requirements

- UAV (fixed wing or multicopter)
- Image capture app
- Tablet, smartphone or laptop for field use
- Post-processing software
- Desktop or hi end laptop for processing
- Training (UAS, image capture, post-processing)
- FAA Part 107 certification for commercial ops

Typical Mapping Platforms



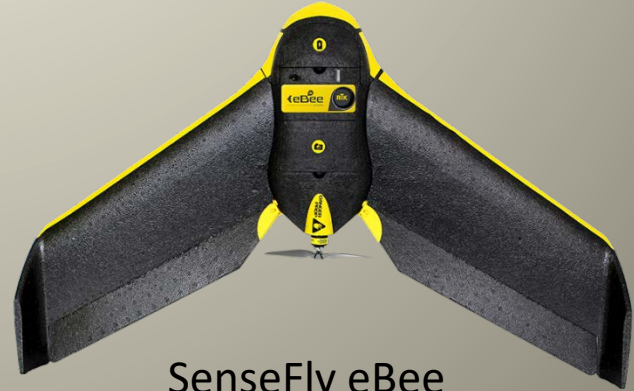
DJI Inspire 1



Robota Eclipse

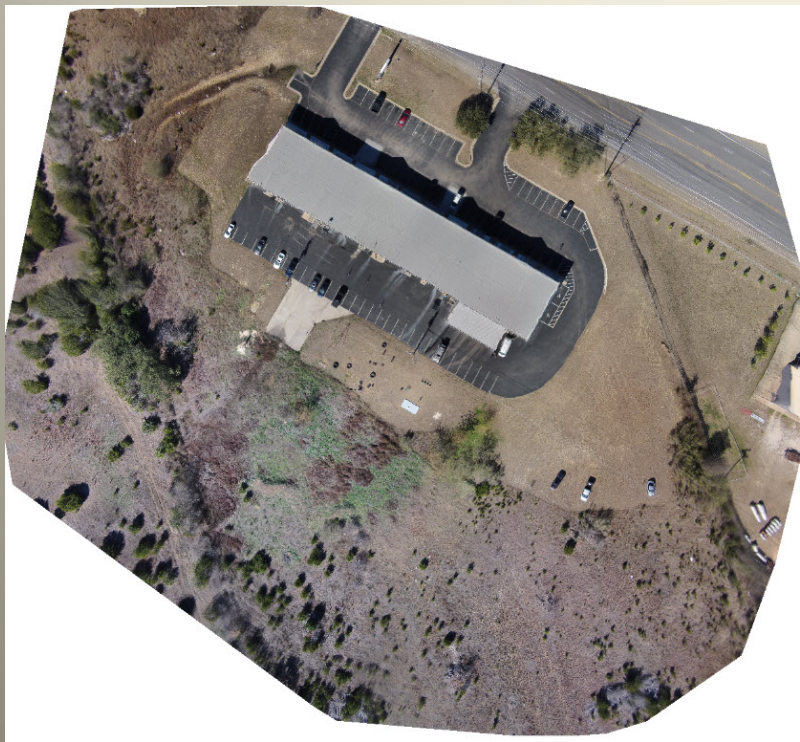


DJI Phantom 4 Pro



SenseFly eBee

Multitorotor vs. Fixed Wing



Multicopter vs. Fixed Wing

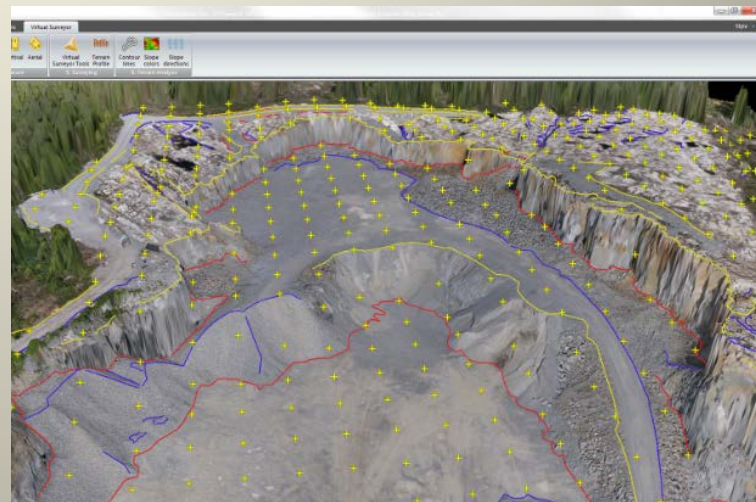
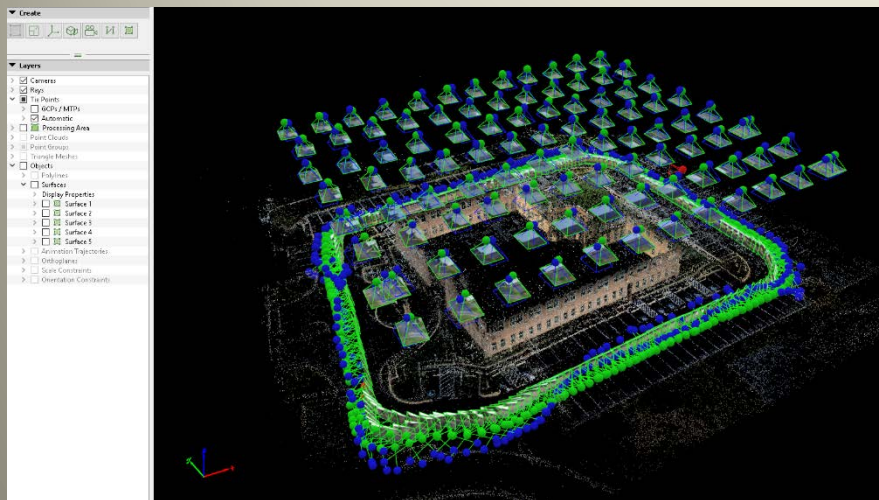
Attribute	Multicopter	Fixed Wing
Size of Project	Up to 100 ac (~30 ac /flt)	1200 ac + (~400 ac / flt)
Learning Curve	Easiest + smaller datasets	More complex (+ larger datasets)
Landing/takeoff area	Vertical (Very small)	Larger clear area for takeoff/landing
Altitude / detail	Lower alt / higher detail / less coverage	Higher alt / less detail / greater coverage
Flt times	~15-29 mins	~50 mins
Cost of entry	\$2000 - \$3000	\$12,500 - \$34,000

Flight Planning / Image Capture



Post-Processing Software

- Pix4D
- Virtual Surveyor



Online vs. Desktop Processing

Online

- Less up-front investment
- Black-box
- Ease of use
- More limited capabilities

Desktop

- Need decent PC
 - Dedicated is better
- More control
- Proof of accuracy

Accuracy

Without GCP



With GCP



Ensuring Accuracy

- Ground Control Points
- Professional Grade GPS
- Ground Control Kit





Approach Accuracy Incrementally

- Initial projects without GCP
- Hire surveyor to mark GCP
- Rent GPS equipment
- Buy equipment or RTK aircraft

Getting Started

Developing Knowledge

- **Self-Taught**

- **PROS**

- Less financial Outlay
 - Much available info – Online, workshops, forums

- **CONS**

- Much longer time investment
 - Requires significant research
 - Will be dead ends

- **Consultant / Classroom**

- **CONS**

- Cost involved
 - Finding the right people

- **PROS**

- Navigate straight through the maze
 - Up front cost produces ROI
 - Fewer wrong turns / repairs / re-purchases

Hybrid Approach

- Balance of Cost / Time
- Use consultant / classroom training only when needed

What Else is Involved?

- Launching Drone Services (Fri – 11:15)
 - FAA Regulations
 - Ethics / Privacy Considerations
 - Potential Business Opportunities
 - Steps to Launch Business
 - Implementation Strategies



QUESTIONS?

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