

Construction Advanced Survey Tools

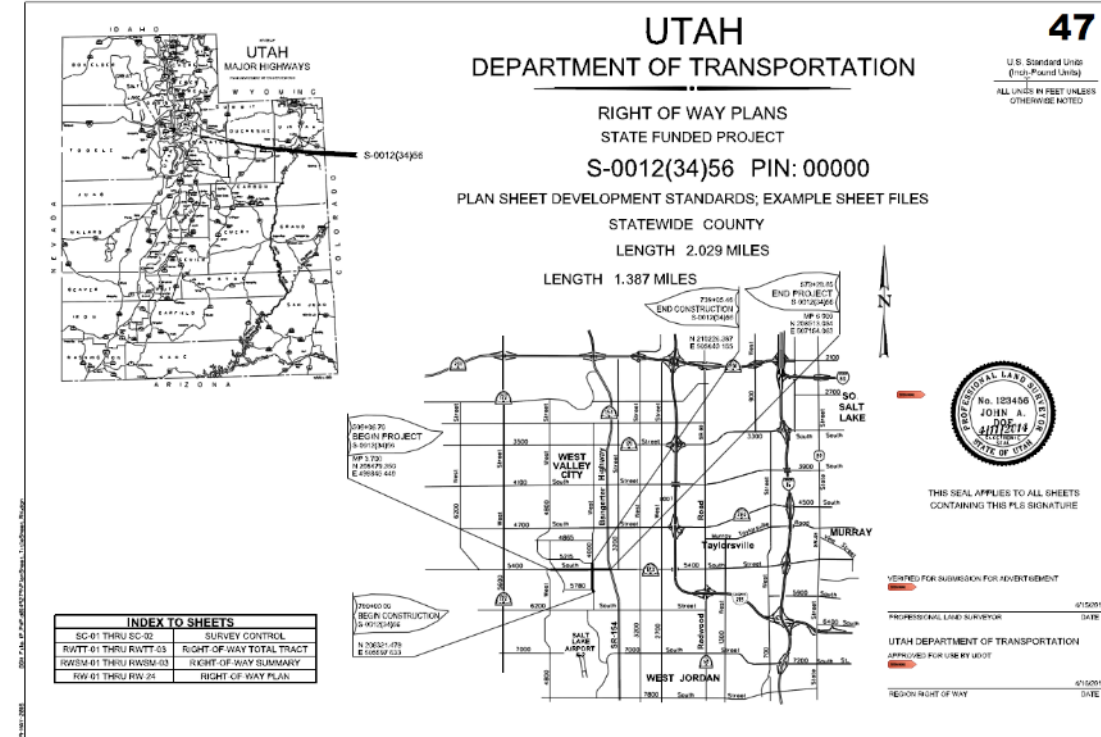
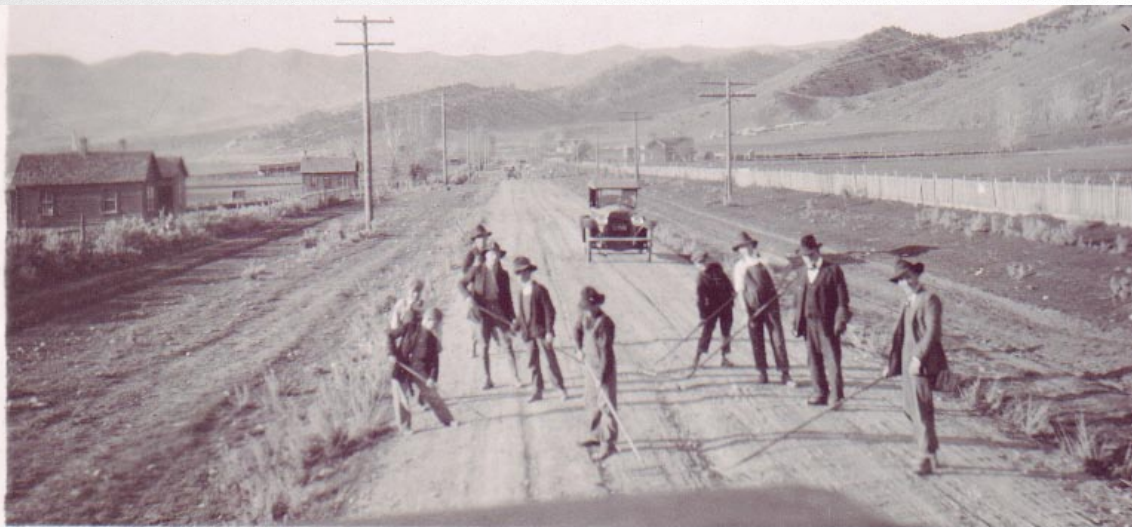


Model Based Design

History



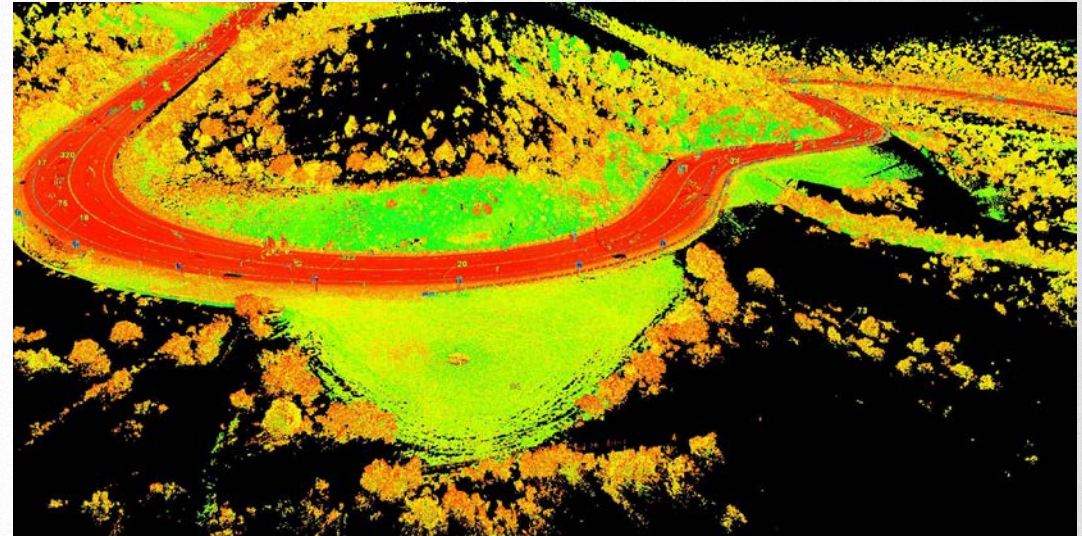
CHANGE



Model Based Design and Construction

Construction SR-20

- First Project for 3D Model as Legal Document
- Attribute based Model
- Phasing/Changes Over Time
- Used by Construction & Inspection



- Compared against original design
- Hybrid Data
 - GPS, UAS, LiDAR, Design
 - As-Built Model

Model Based Design and Construction

SR-20

- Detailed Fill and Slope Analysis



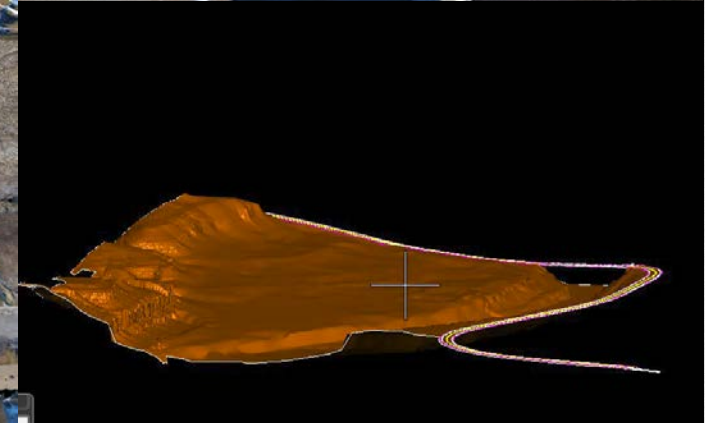
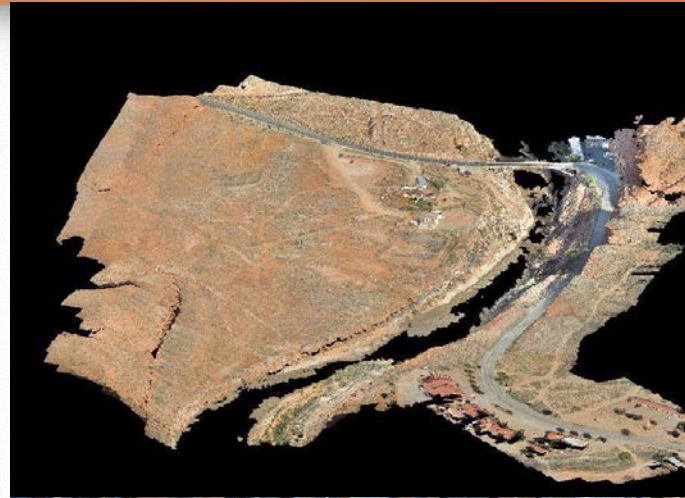
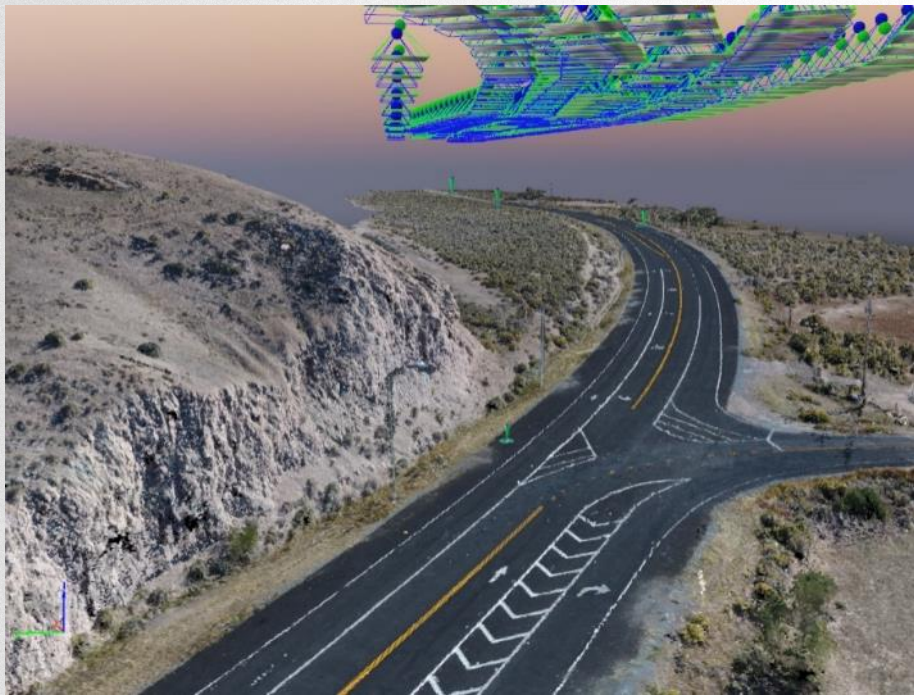
SR-20 Project Outcomes

- Overall savings for this project was \$82,672 (2.58%)
- Workforce was 45% more productive
- Completed 25 days ahead of schedule



Land Surveying

- Highly Detailed Mapping Model
- Safety
- Speed of Collection
- High Resolution Aerial Imagery with Point Cloud

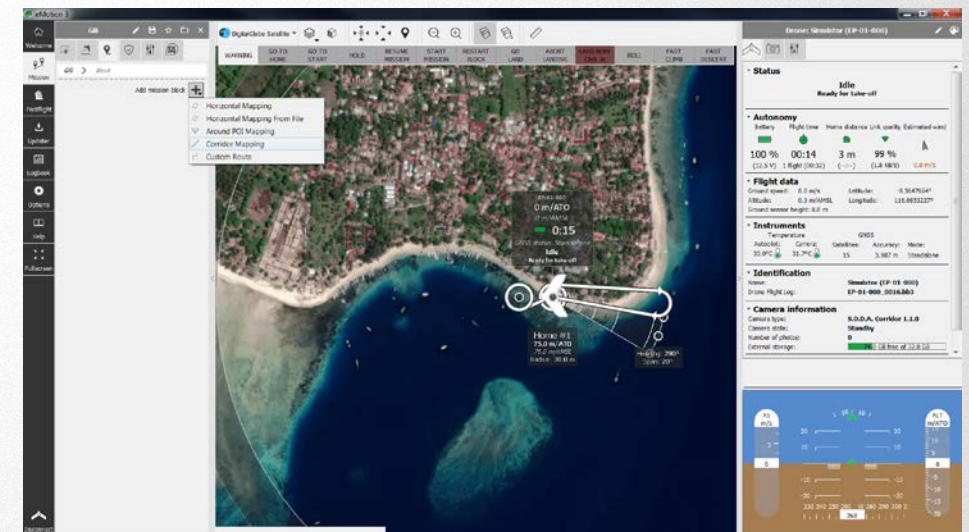


- Sensefly Albris
- Sensefly Ebee
- Wingtra VTOL Fixed Wing
- DJI Phantom 4
- DJI Inspire 2
- 3DR Solo



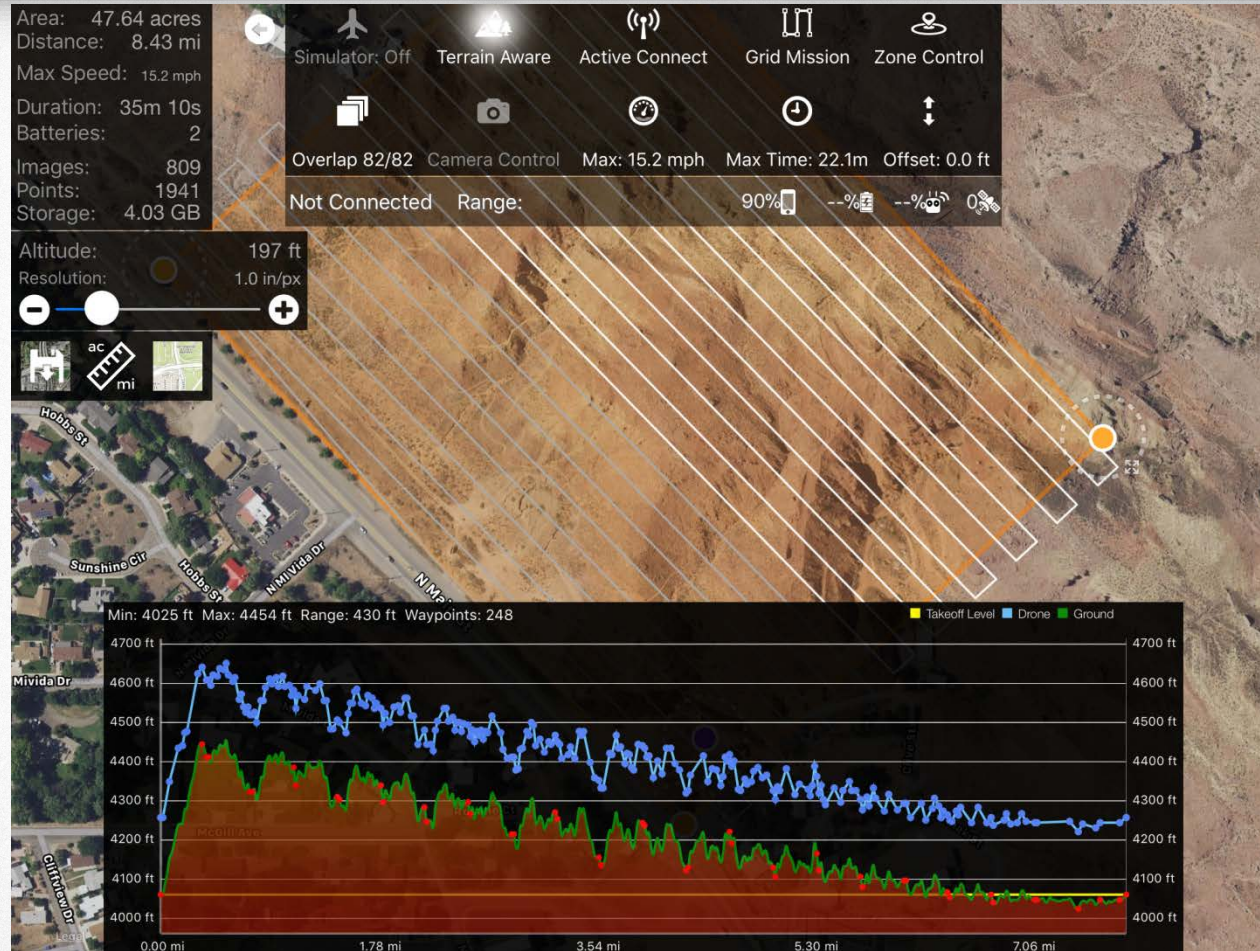
Software - Flight Planning

- Pix4D Capture
- Map Pilot
- Emotion X
- Wingtra Hub



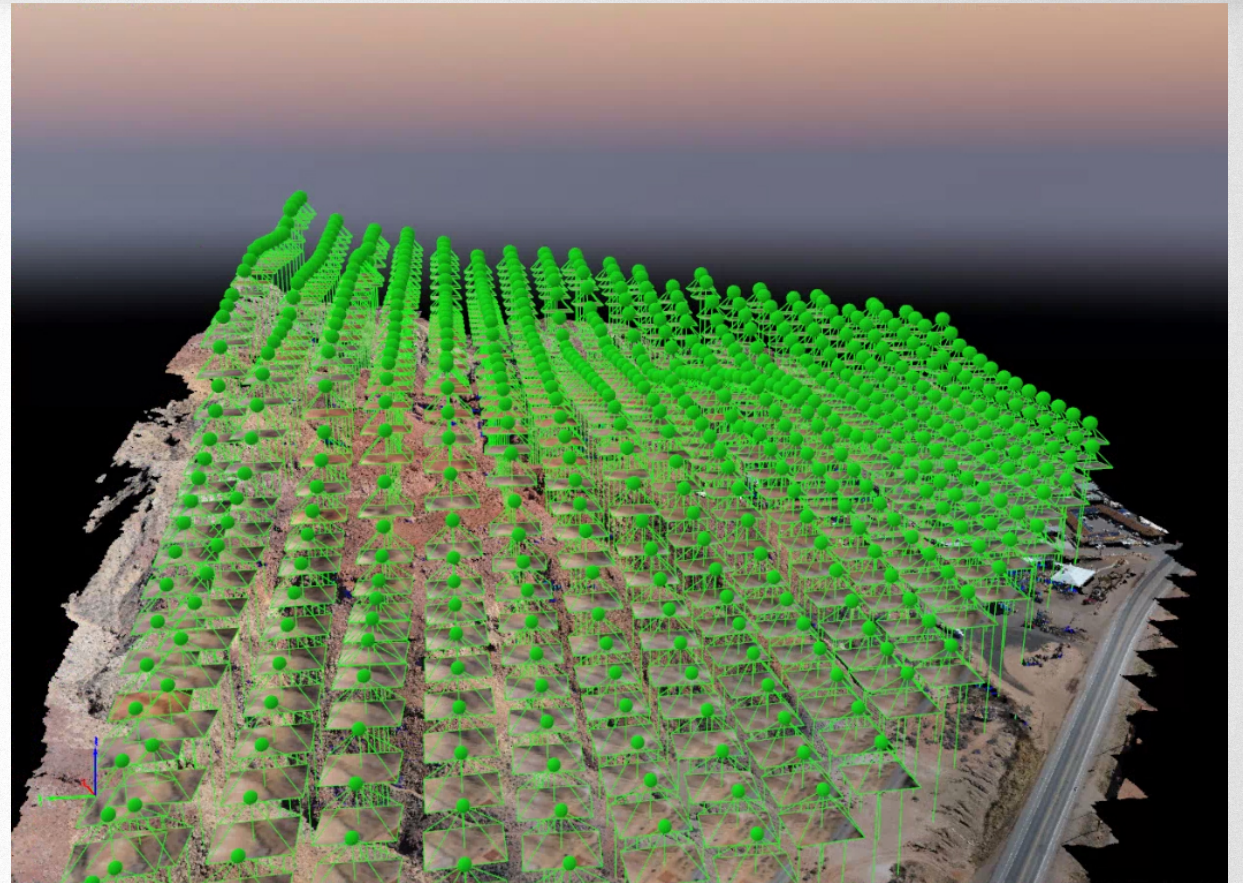
Software - Flight Planning

- Terrain Awareness



Software – Data Processing

- Pix4D
- Bentley Context Capture Center
- TopoDOT
- Virtual Surveyor



Quality Control/Quality Assurance

Verification Report

- Required on all Pre-Construction Surveys
 - Softscape Surfaces
 - Hardscape Surfaces
- Hybrid Model

71	1151			3788.06	113741.25	572386.58	3788.06			0.00
72	1152			3787.84	113741.41	572375.89	3787.90			0.05
73	1154			3787.57	113720.26	572355.68	3787.70			0.13
74	1155			3787.33	113708.19	572340.29	3787.34			0.00
75	1156			3787.29	113700.01	572336.63	3787.26			-0.03
76	1164			3786.48	113648.18	572274.96	3786.47			-0.02
77	1165			3786.46	113648.62	572264.49	3786.44			-0.03
78	1166			3786.36	113632.89	572253.04	3786.29			-0.07
79	1167			3786.24	113621.83	572236.72	3786.23			-0.01
80	1174			3785.55	113559.50	572167.23	3785.65			0.10
81	1175			3785.56	113563.69	572154.37	3785.62			0.05
82	1176			3785.51	113552.82	572149.52	3785.48			-0.03
83	1177			3785.42	113539.87	572140.59	3785.37			-0.05
84	1179			3785.27	113519.68	572114.83	3785.27			0.01
85	1180			3785.20	113519.12	572105.90	3785.29			0.09
86	1181			3785.15	113525.44	572099.48	3785.24			0.09
87	Number Chk Pnts									81
88	Mean Error (us)									0.01
89	Standard Deviation (us)									0.04
90	RMSE (us) - RMSE _x , RMSE _y , RMSE _z									0.04
91	RMSE _r (us) - Combined Horizontal RMSE									
92	H Accuracy @ 95%									
93	V Accuracy @ 95%								0.08	

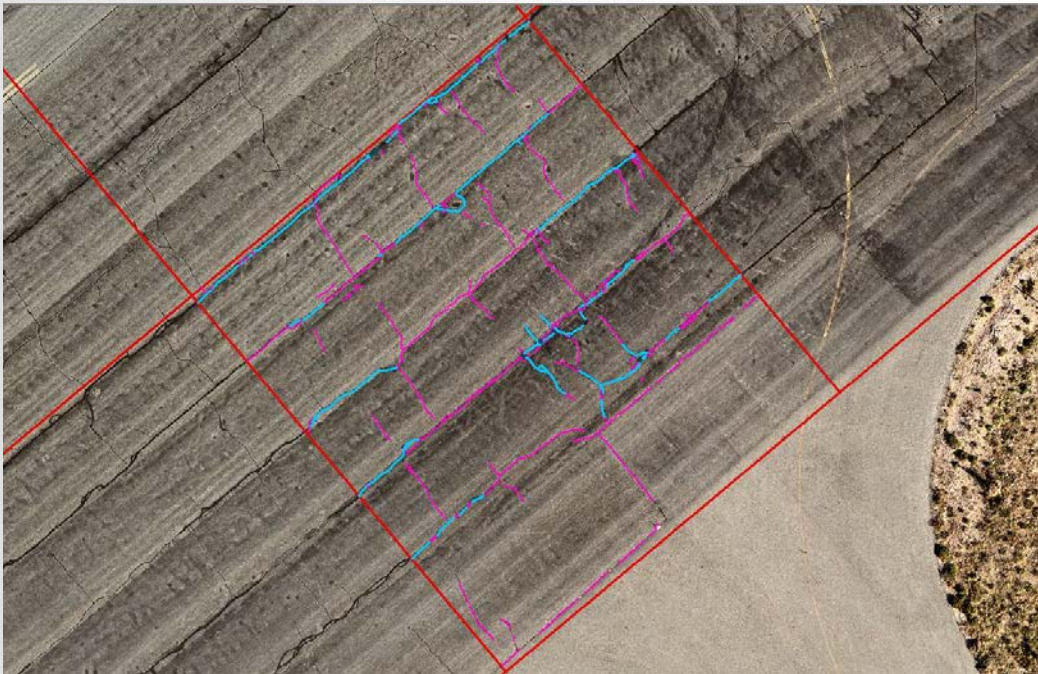
Hardware – Data Processing

- Dual Xeon Processors E52620 V4
- 16 Core - 32 Threads
- 128 GB RAM
- 1TB SSD Hard Drive
- Quadro K4000 Video Card



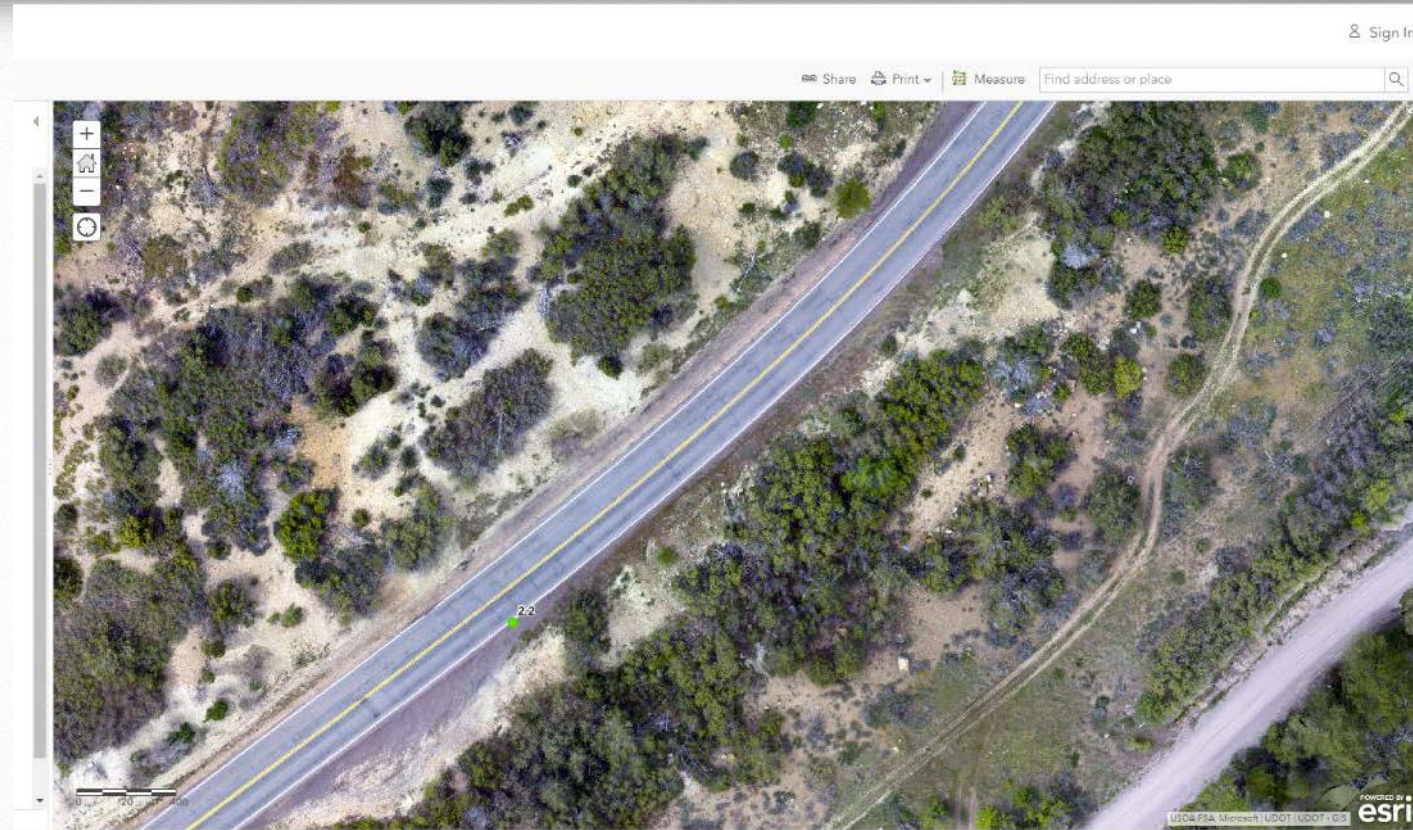
Automation

- Deep Learning
- Automated Crack Detection
- Future?



Data & Storage

- Plan for large data sets
- Keep all flight logs, files, and processed data.
- GIS database for all Ortho Imagery.
 - <https://uplan.maps.arcgis.com/home/webmap/viewer.html?webmap=dc81b7cbd5ce4f8fba086e05d723ffff>



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