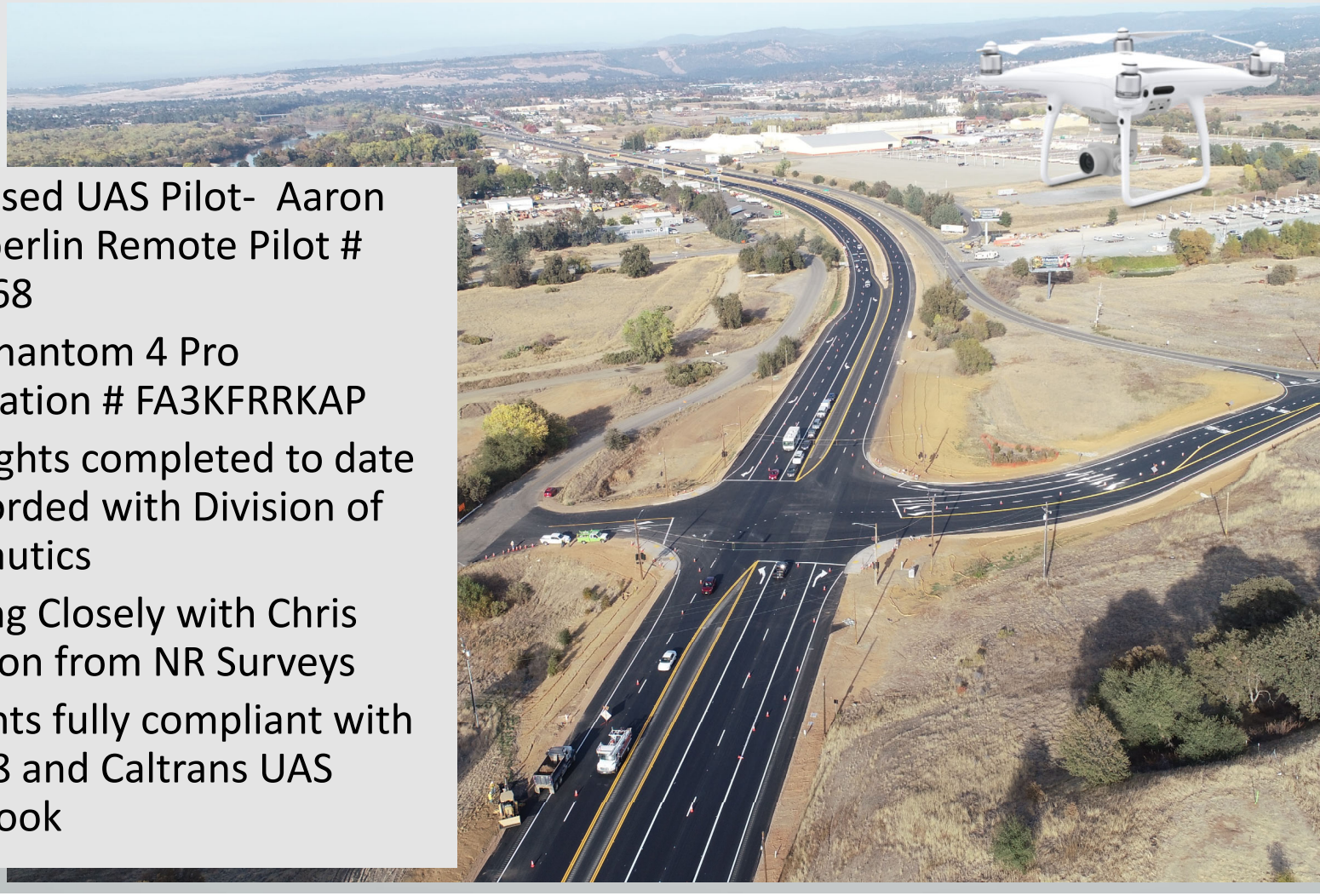
North Region Construction UAS

Aaron Chamberlin
Resident Engineer

DIVISION OF CONSTRUCTION
CALIFORNIA DEPARTMENT OF TRANSPORTATION

Current NRC UAS program



- 1 Licensed UAS Pilot- Aaron Chamberlin Remote Pilot # 4157568
- 1 DJI Phantom 4 Pro Registration # FA3KFRRKAP
- 165 Flights completed to date all recorded with Division of Aeronautics
- Working Closely with Chris Thornton from NR Surveys
- All flights fully compliant with DD-118 and Caltrans UAS Handbook

Current NRC UAS program

- DD-118 “USE OF UNMANNED AIRCRAFT SYSTEM” and Caltrans UAS handbook are fully implemented.
- 22 Flights have been utilizing new Smartsheet flight logging per Division of Aeronautics guidelines
- Visual Observer used for every flight per DD-118 and Caltrans UAS Handbook

UAS OPERATIONS

- **UAS OPERATIONS HANDBOOK REQUIREMENTS3.1.4 Remote Pilot**
- The Remote Pilot shall hold a Federal Aviation Administration (FAA) Remote Pilot Certificate and is the only member of the UAS Flight Crew who may operate the flight controls of the unmanned aircraft during a UAS operation. The Remote Pilot has final authority and responsibility over the UAS flight.
- **3.1.3 UAS Flight Crew**
- A UAS Flight Crew is the team responsible to perform a UAS operation. The UAS Flight Crew must include at a minimum, a Remote Pilot and a Visual Observer. Support Personnel may be assigned, as needed, to ensure the safe and effective operation of the UAS.
- **3.1.4 Remote Pilot**
- The Remote Pilot shall hold a Federal Aviation Administration (FAA) Remote Pilot Certificate and is the only member of the UAS Flight Crew who may operate the flight controls of the unmanned aircraft during a UAS operation. The Remote Pilot has final authority and responsibility over the UAS flight. \
- **3.2.2 Visual Observer**
- The Visual Observer is responsible for aiding the Remote Pilot in maintaining situational awareness. The primary communication during flight is between the Remote Pilot and the Visual Observer. Responsibilities of the Visual Observer are to:
- • Be familiar with the UAS Operation
- • Assist the Remote Pilot in identifying any potential hazards or changing conditions
- • Scan the airspace for aircraft or collision hazards and maintain awareness of the position of the aircraft and the surrounding airspace
- • Listen and observe any abnormal sounds or flight characteristics exhibited by the UAS
- • Maintain two-way communication with the Remote Pilot at all times during the UAS operation
- • Assist in carrying out emergency plans and procedures in the event of an emergency

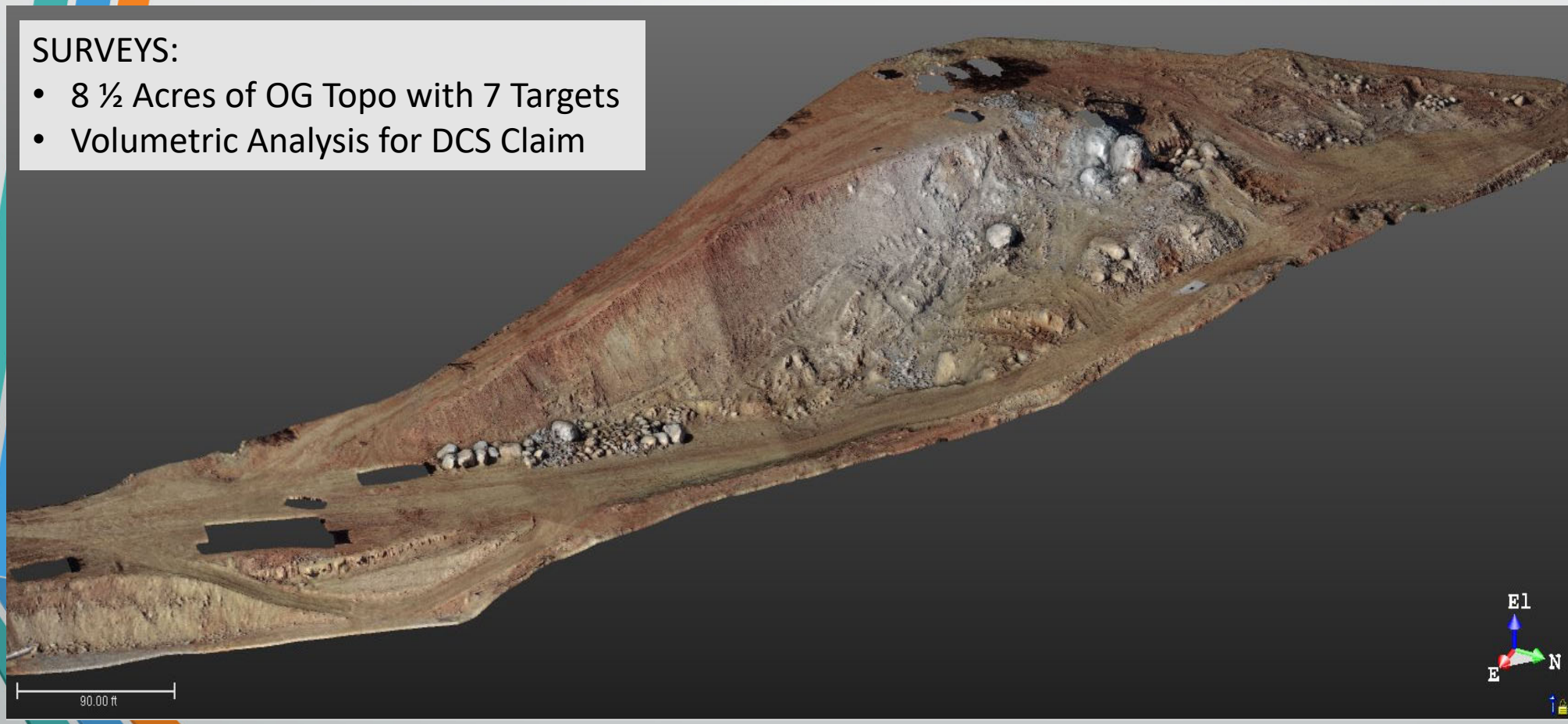
UAS Construction Applications

- Major Damage Assessment
- Public Information
- Bridge Inspections
- Geotechnical/Slope Investigations
- Earthwork Calculations
- Traffic Monitoring
- Construction Documentation
- Asset Management Data Collection (GIS)

Smartsville Realignment Project

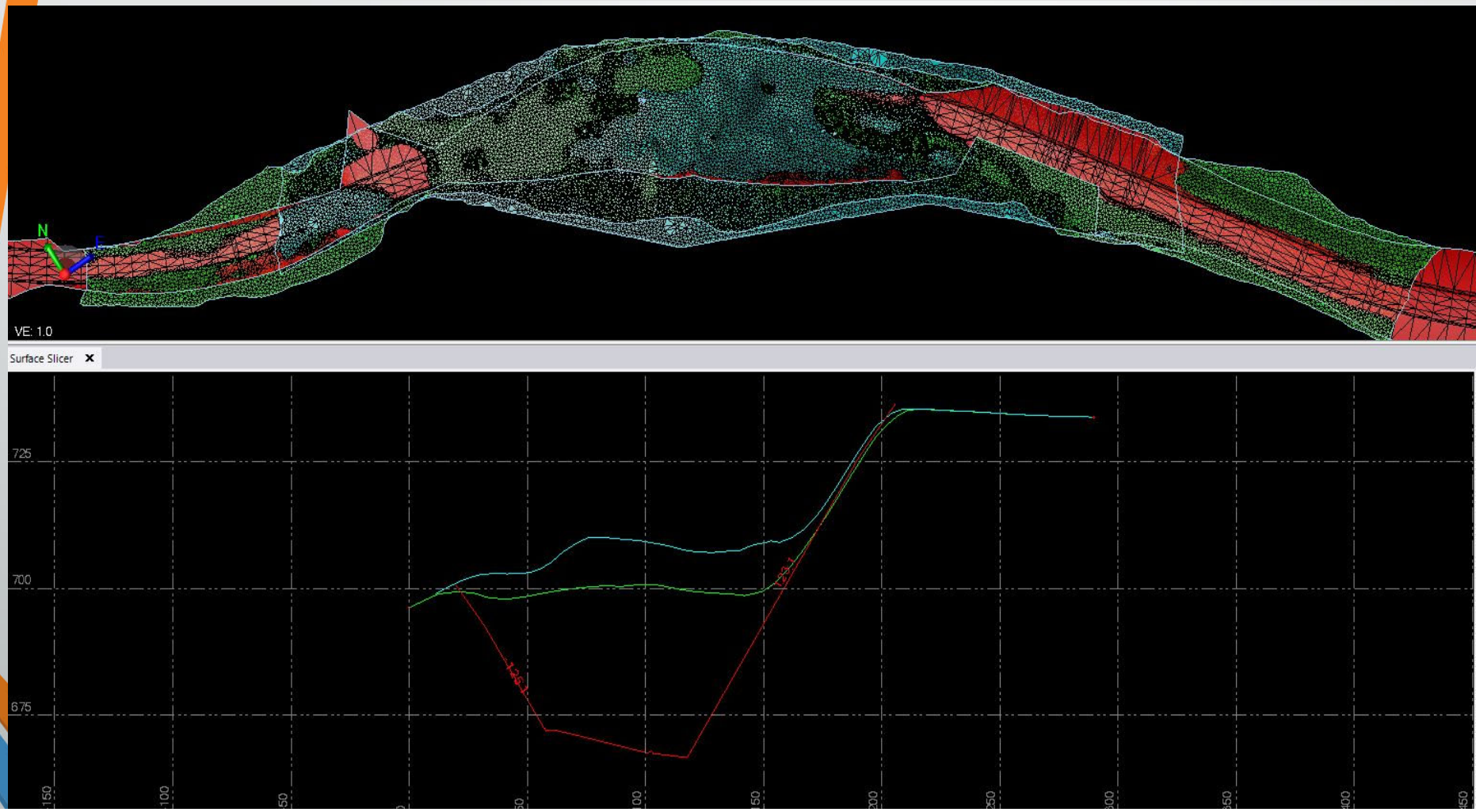
SURVEYS:

- 8 ½ Acres of OG Topo with 7 Targets
- Volumetric Analysis for DCS Claim

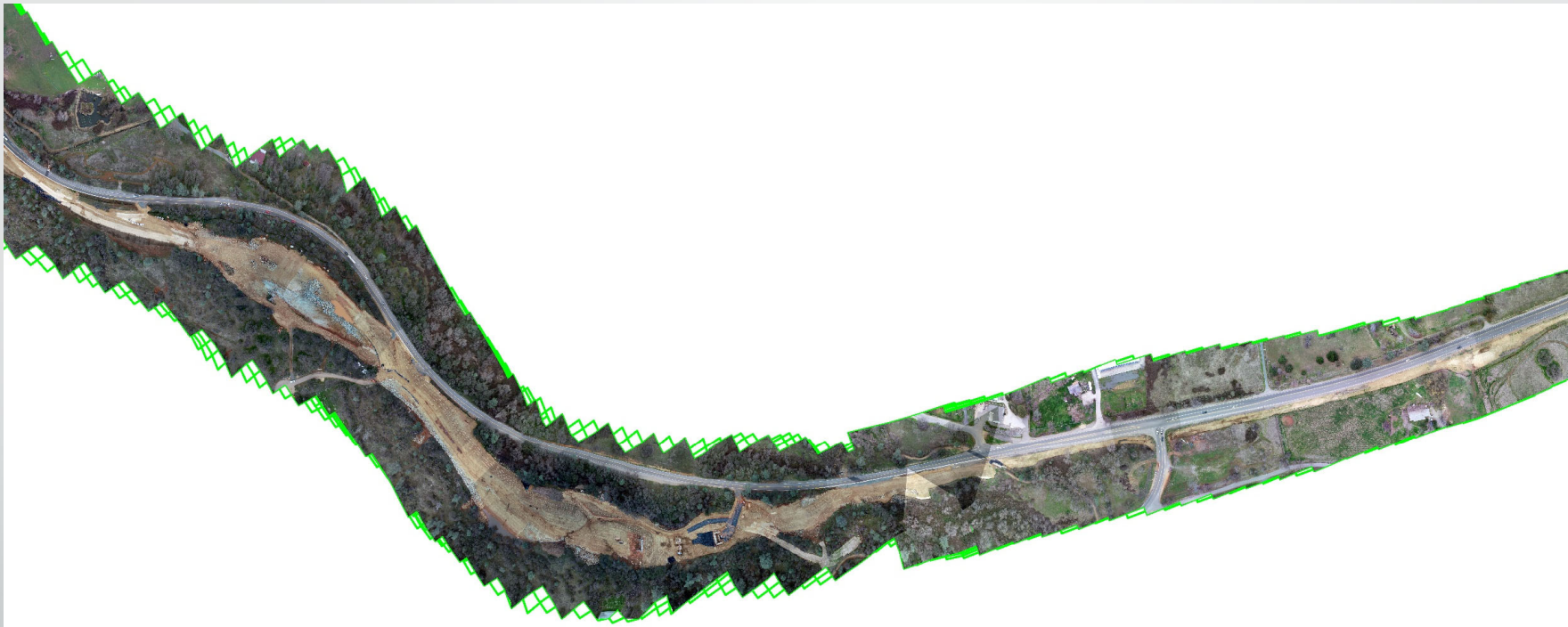


Smartsville Realignment Project

Volumetric Analysis for DSC Claim



03-2F5904 Smartsville Realignment
2D Orthographic image of 2.1 mile project



UAS documentation of Precast Girder Placement

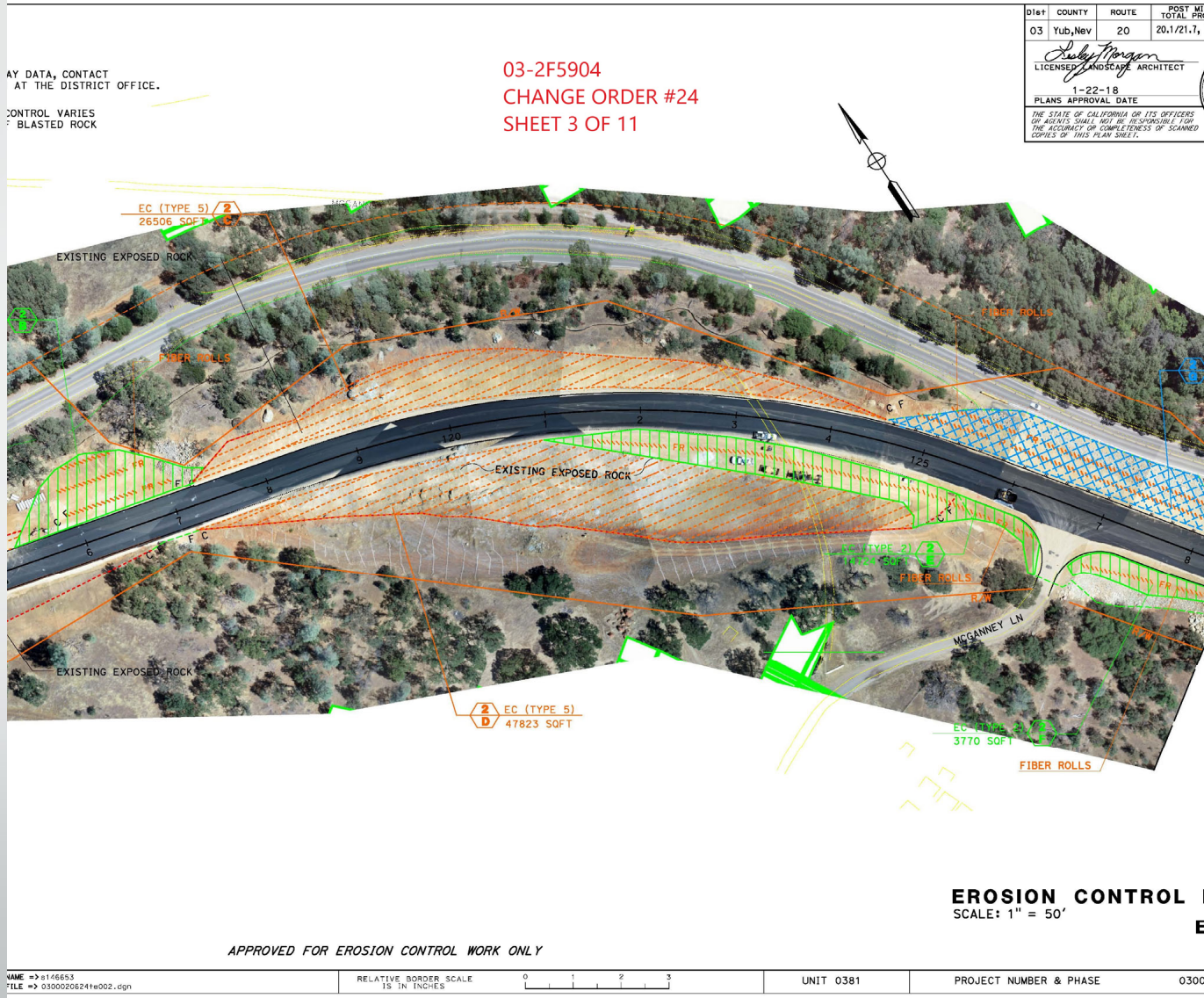
03-2F5904 Smartsville Realignment
Deck Pour Documentation

What else can these tools be used for?

- Progress pay estimates
- Linear measurements
- Area Measurements
- Volume Measurements
- Work Progress
- Claims documentation
- Extra work bill review
- Change Order Development

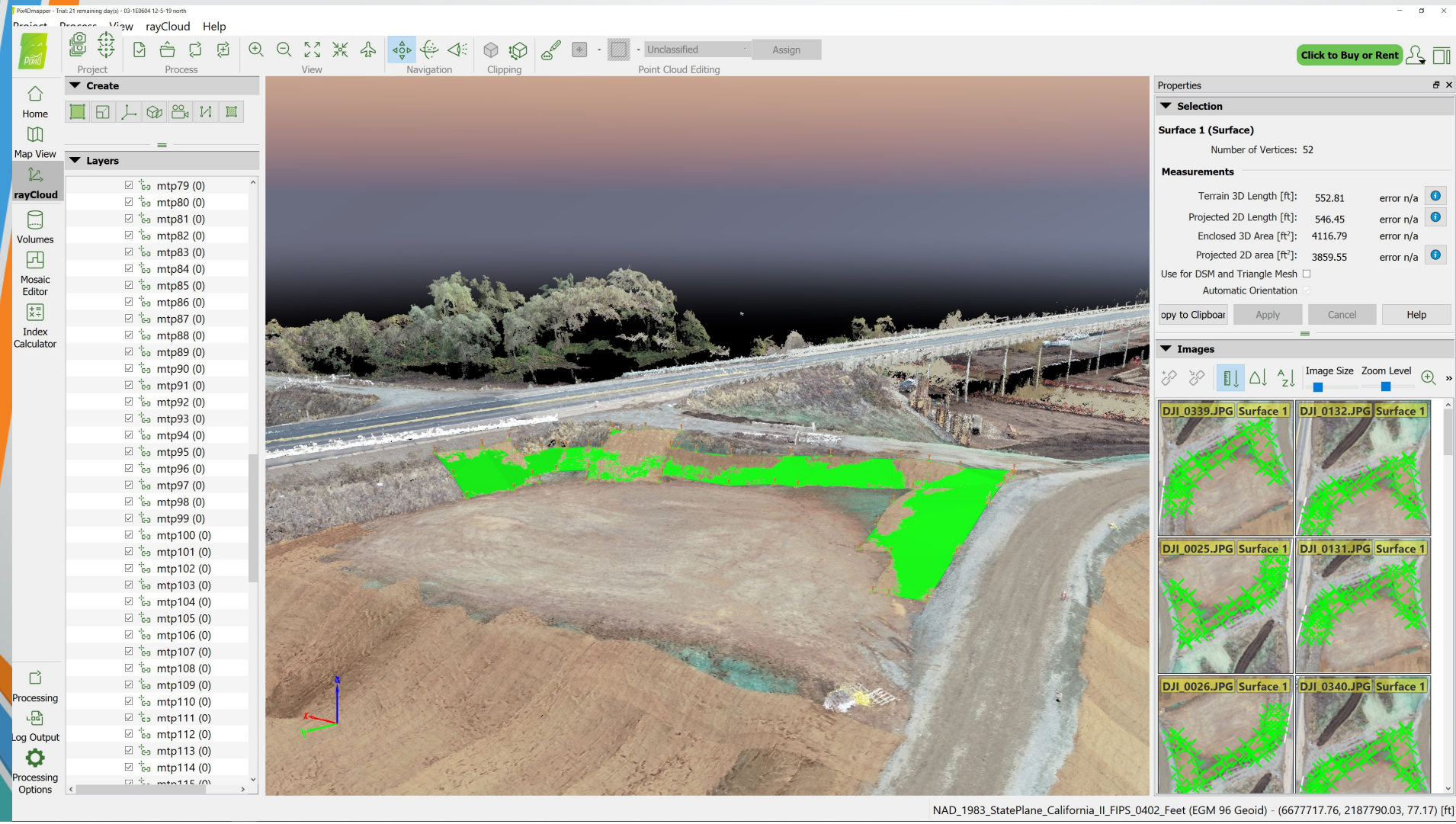
Change Order Development

- Orthographic Imaging
- Cost Savings
- Accurate
- Efficient

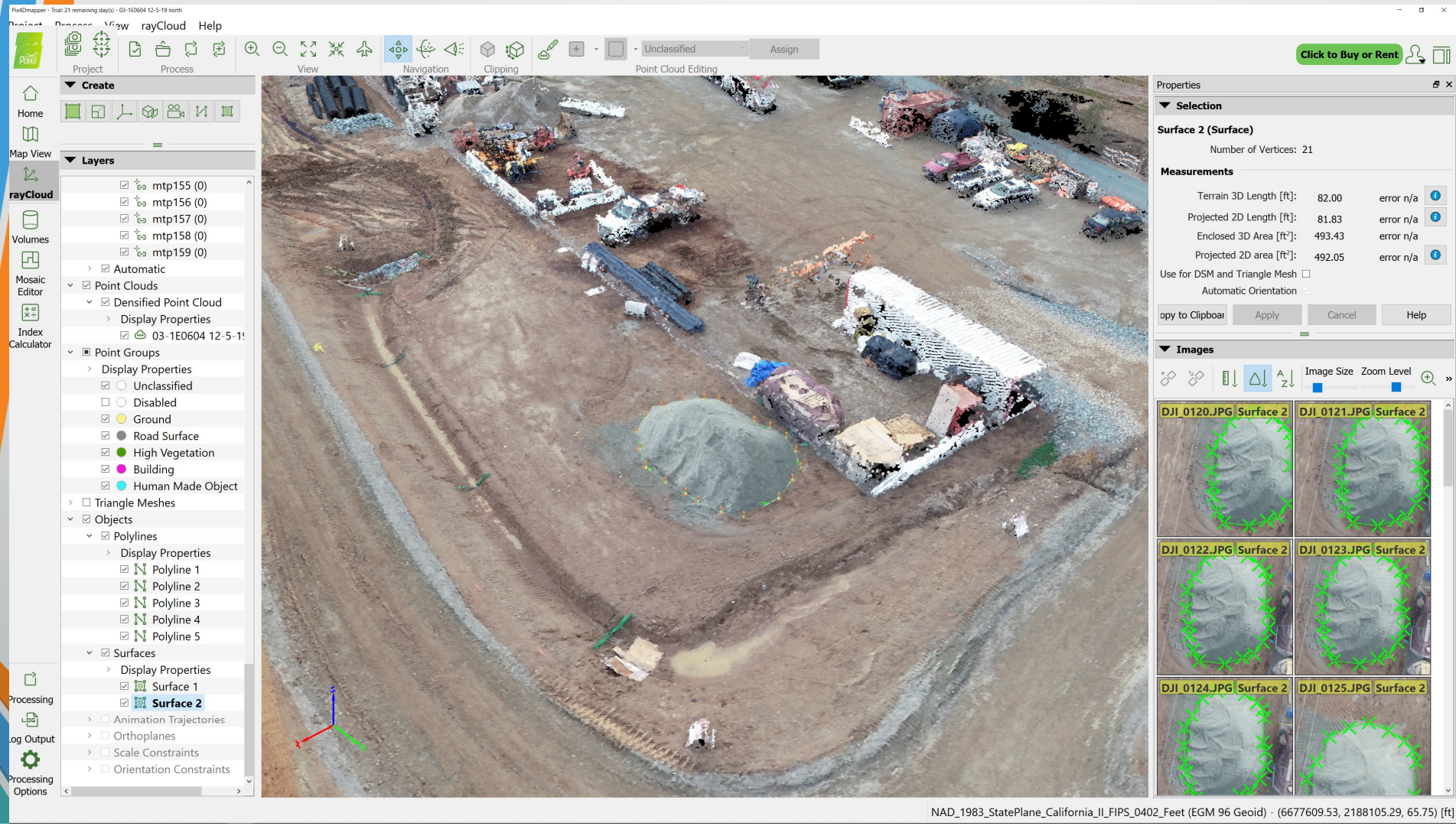


Linear Measurements

Area Measurements

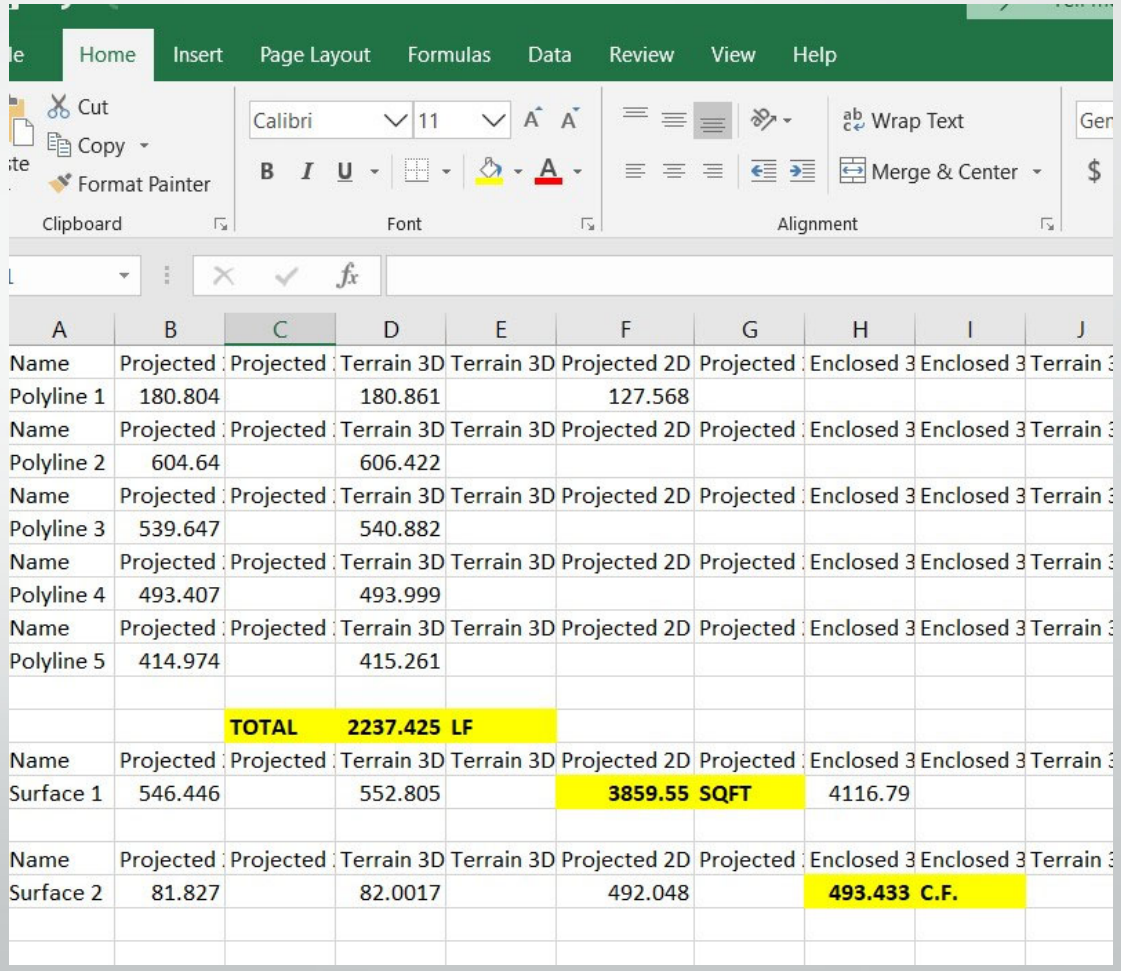


Volume Measurements



CAT 48 Pay Estimate Documentation

- Logs can be exported to Excel
- More accurate, repeatable results
- Raw Data Stored for backup



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	A	B	C	D	E	F	G	H	I	J
1	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
2	Polyline 1	180.804		180.861		127.568				
3	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
4	Polyline 2	604.64		606.422						
5	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
6	Polyline 3	539.647		540.882						
7	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
8	Polyline 4	493.407		493.999						
9	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
10	Polyline 5	414.974		415.261						
11										
12			TOTAL	2237.425	LF					
13	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
14	Surface 1	546.446		552.805		3859.55	SQFT	4116.79		
15										
16	Name	Projected	Projected	Terrain 3D	Terrain 3D	Projected 2D	Projected	Enclosed 3	Enclosed 3	Terrain
17	Surface 2	81.827		82.0017		492.048		493.433	C.F.	
18										
19										

UAS Direct Savings and Benefits

- $60K in Extra work bills rejected
- Measurements on average take 1/3 less time
- Change Order Development led to 74K in item savings.

UAS Costs

- DJI Phantom 4 Pro ~$2000.00.
- Ipad Used as Controller
- Expected lifespan 2-3 years
- Analysis Software- Cost vary
- FAA pilot License fee - $150.00