DataSight

Nevada Air Waste Management Association
July 10, 2019
Jim Oliver, PG, LHG

What makes us different

Not aviation enthusiasts or silicon valley entrepreneurs

Surveyors, GIS experts, CAD experts, geologists, hydrologists, biologists and engineers with over 200 years of combined expertise

Multi-sensor workflows that utilize:

UAV LiDAR
Terrestrial LiDAR
Mobile LiDAR
Thermal
Multispectral
Imagery

Fuse geospatial point clouds for comprehensive data products

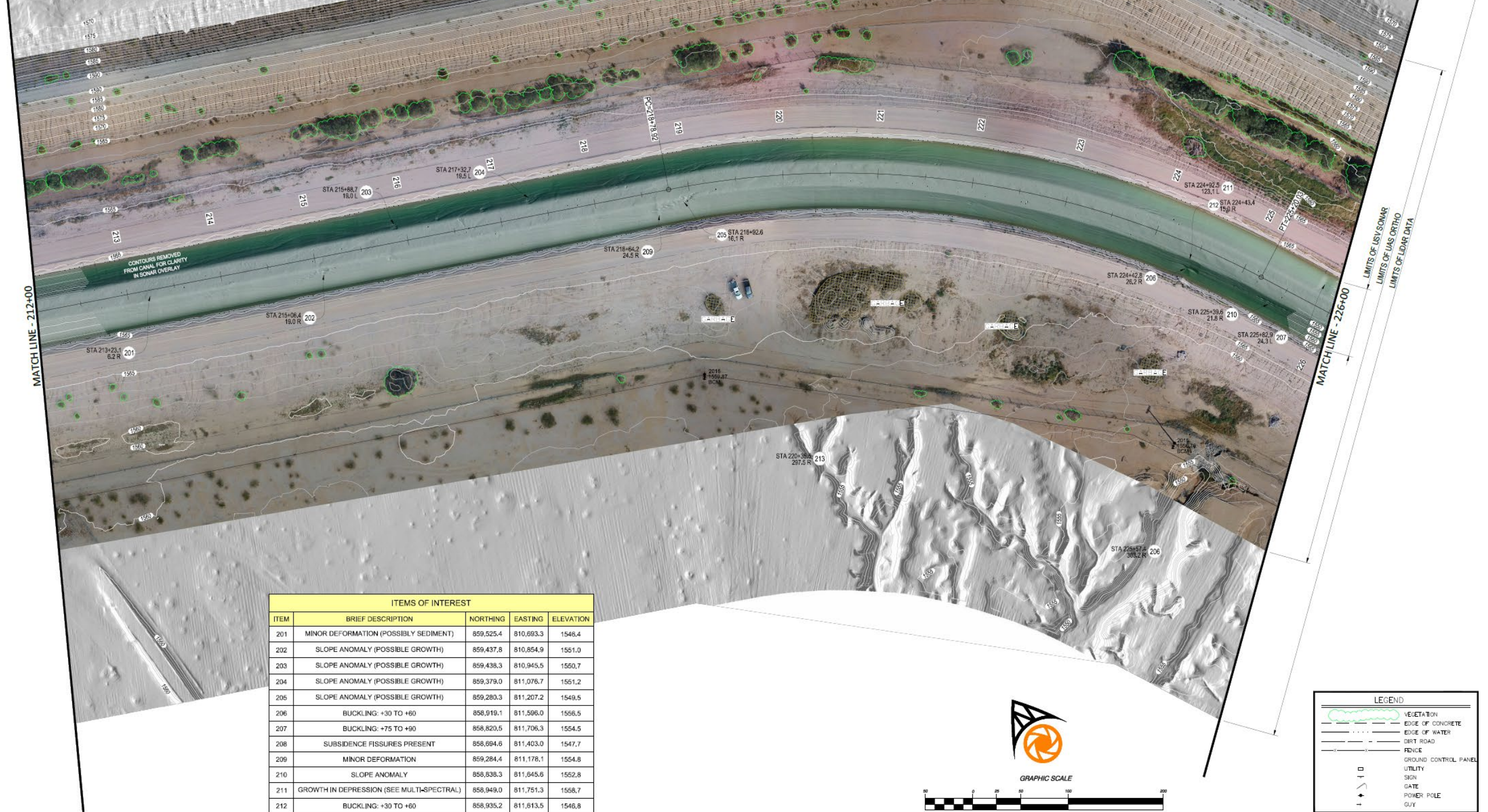
Multiple UAS/USV Craft

Unmanned Aerial Systems in Environmental Workflows

1. Water
2. Waste
3. Earth
4. Air

- The purpose of flying a drone is to collect data
- The drone does not collect data
- The sensor on the drone carries collects data
- Sensor selection is more important than the drone selection
- How you fly is more important than what you fly
- Data processing is hard
- Know everything about point clouds

WATER



ITEMS OF INTEREST

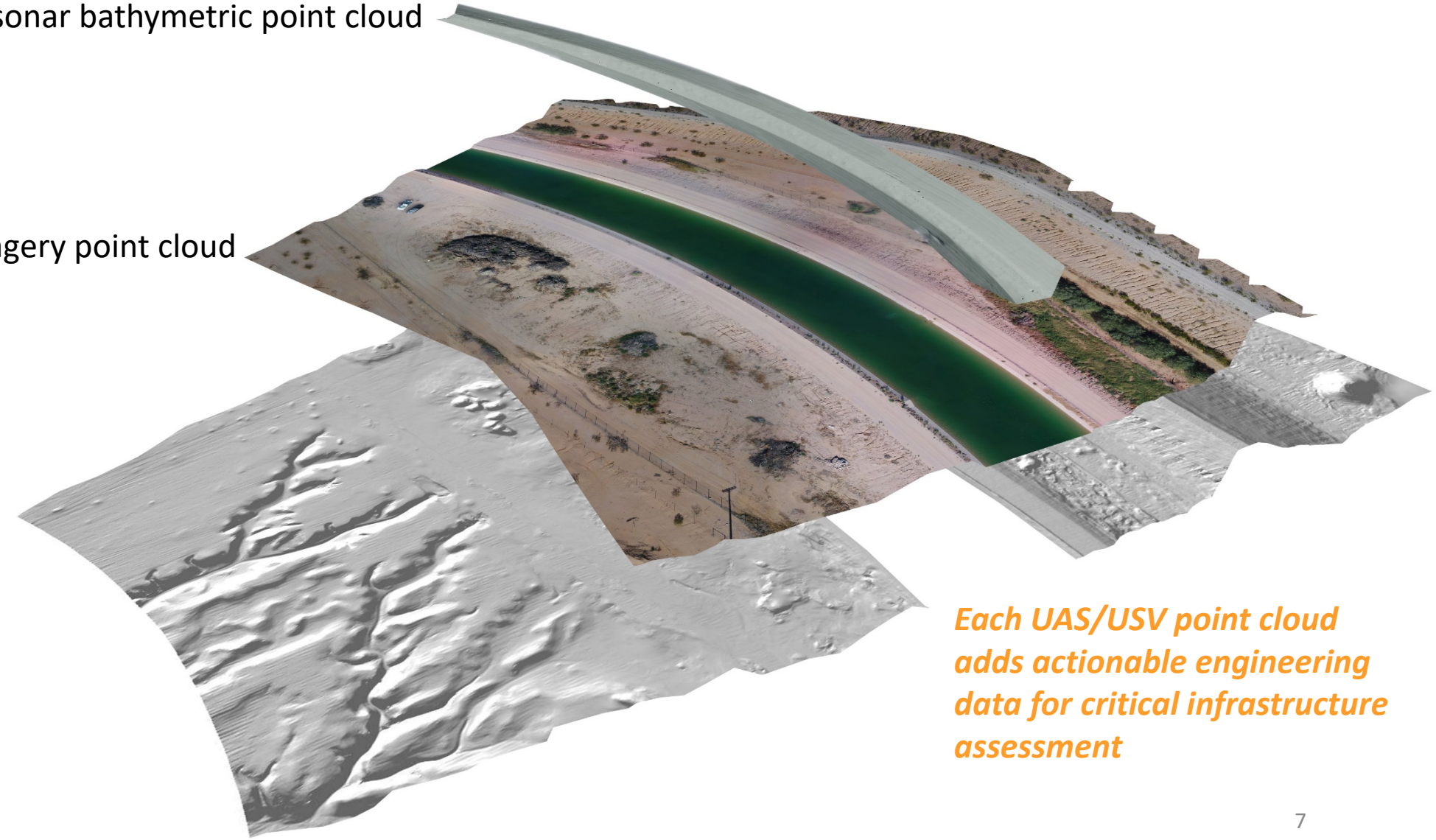
ITEM	BRIEF DESCRIPTION	NORTHING	EASTING	ELEVATION
201	MINOR DEFORMATION (POSSIBLY SEDIMENT)	859,525.4	810,693.3	1546.4
202	SLOPE ANOMALY (POSSIBLE GROWTH)	859,437.8	810,854.9	1551.0
203	SLOPE ANOMALY (POSSIBLE GROWTH)	859,438.3	810,945.5	1550.7
204	SLOPE ANOMALY (POSSIBLE GROWTH)	859,379.0	811,076.7	1551.2
205	SLOPE ANOMALY (POSSIBLE GROWTH)	859,280.3	811,207.2	1549.5
206	BUCKLING: +30 TO +60	858,919.1	811,596.0	1556.5
207	BUCKLING: +75 TO +90	858,820.5	811,706.3	1554.5
208	SUBSIDENCE FISSURES PRESENT	858,694.6	811,403.0	1547.7
209	MINOR DEFORMATION	859,284.4	811,178.1	1554.8
210	SLOPE ANOMALY	858,838.3	811,645.6	1552.8
211	GROWTH IN DEPRESSION (SEE MULTI-SPECTRAL)	858,949.0	811,751.3	1558.7
212	BUCKLING: +30 TO +60	858,935.2	811,613.5	1546.8
213	SUBSIDENCE FISSURES PRESENT	858,977.3	811,172.2	1547.7

Canal Data Fusion Deconstruct

USV sonar bathymetric point cloud

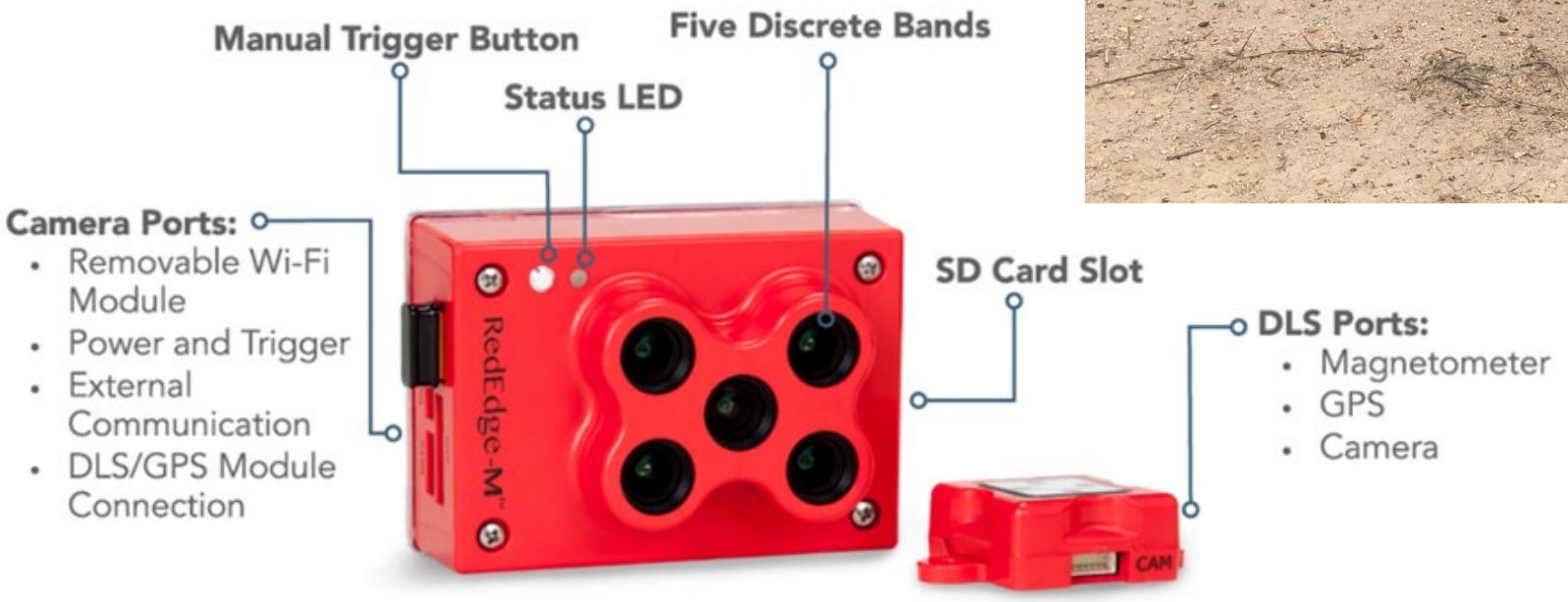
UAS Orthoimagery point cloud

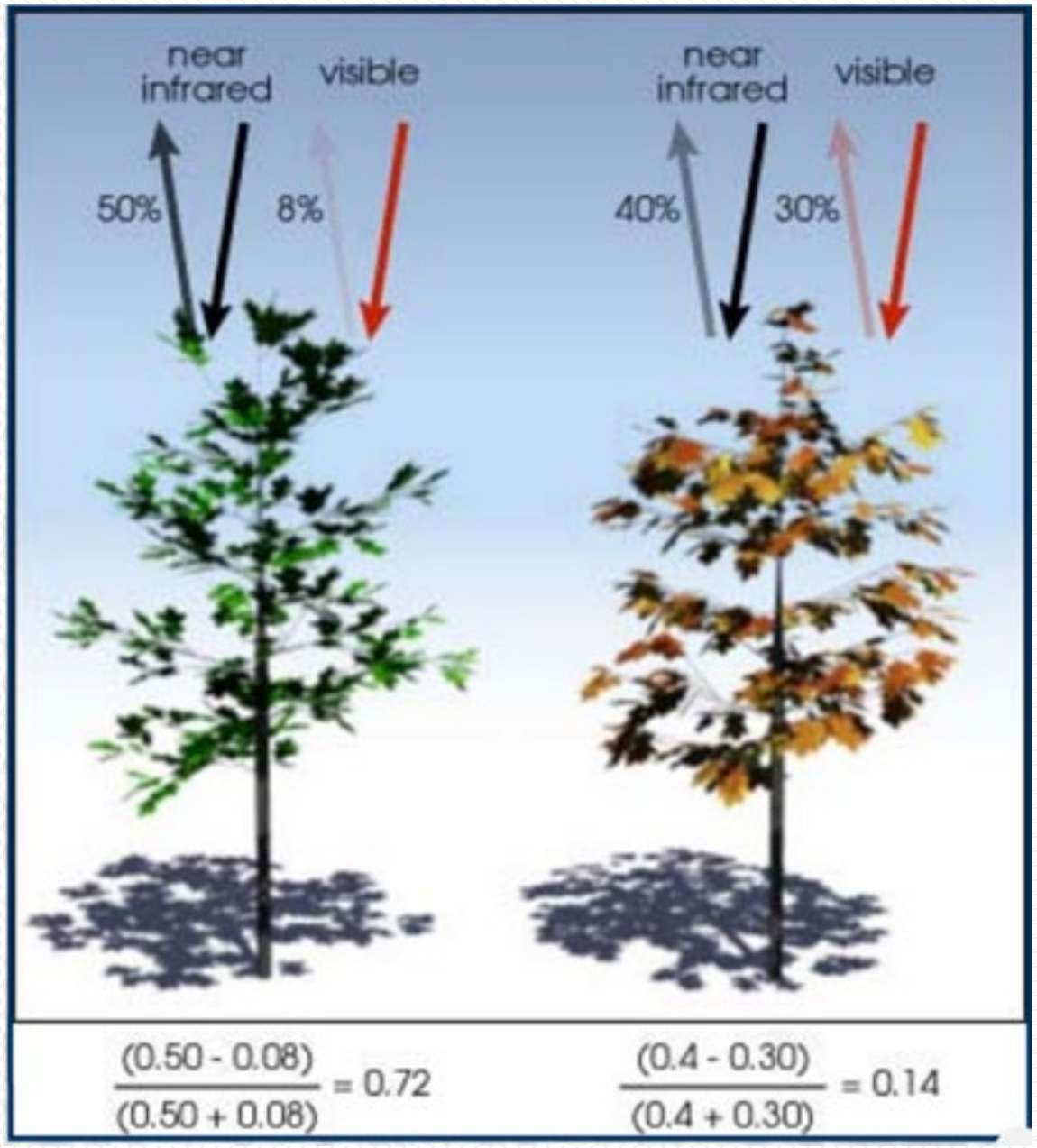
UAS LiDAR point cloud



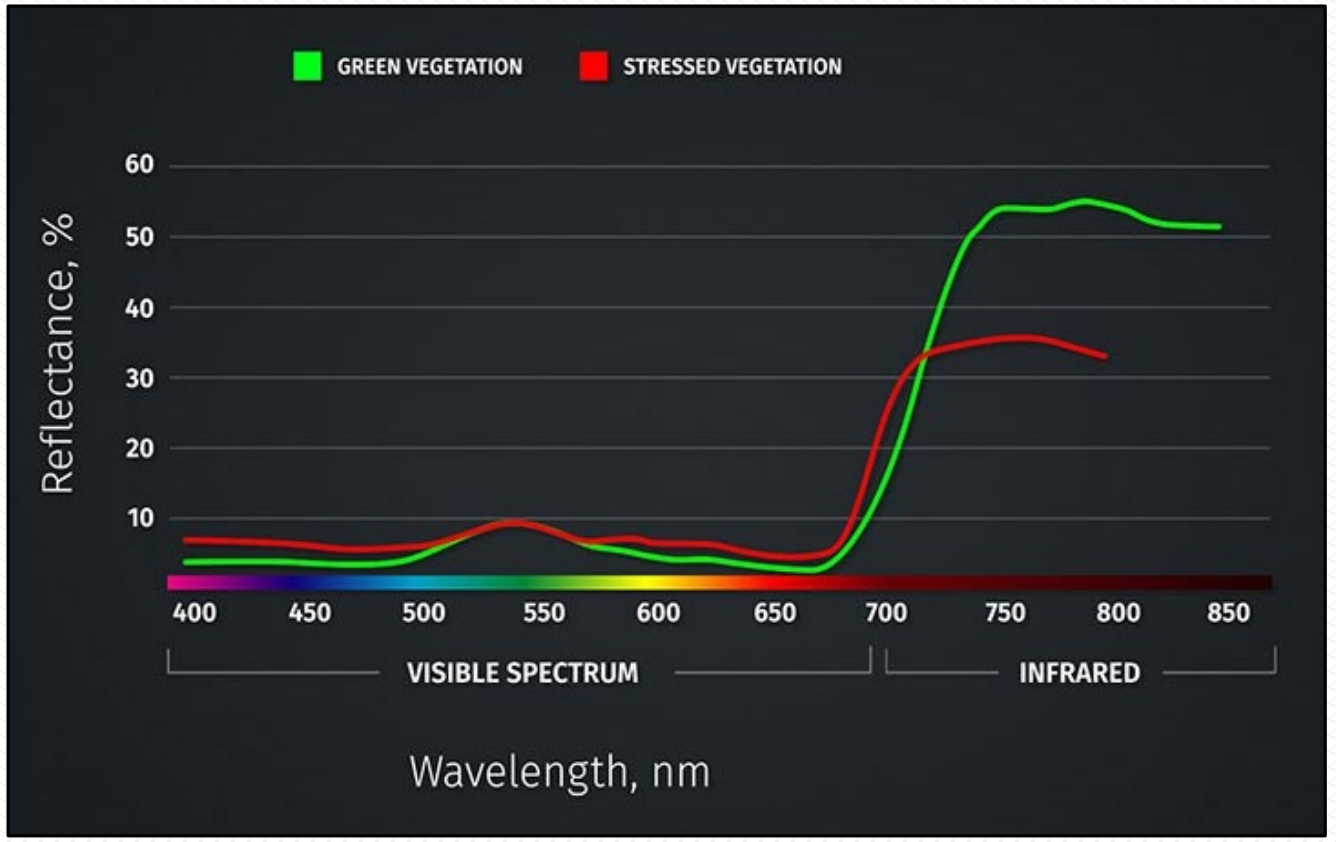
Each UAS/USV point cloud adds actionable engineering data for critical infrastructure assessment

UAS Multispectral Camera



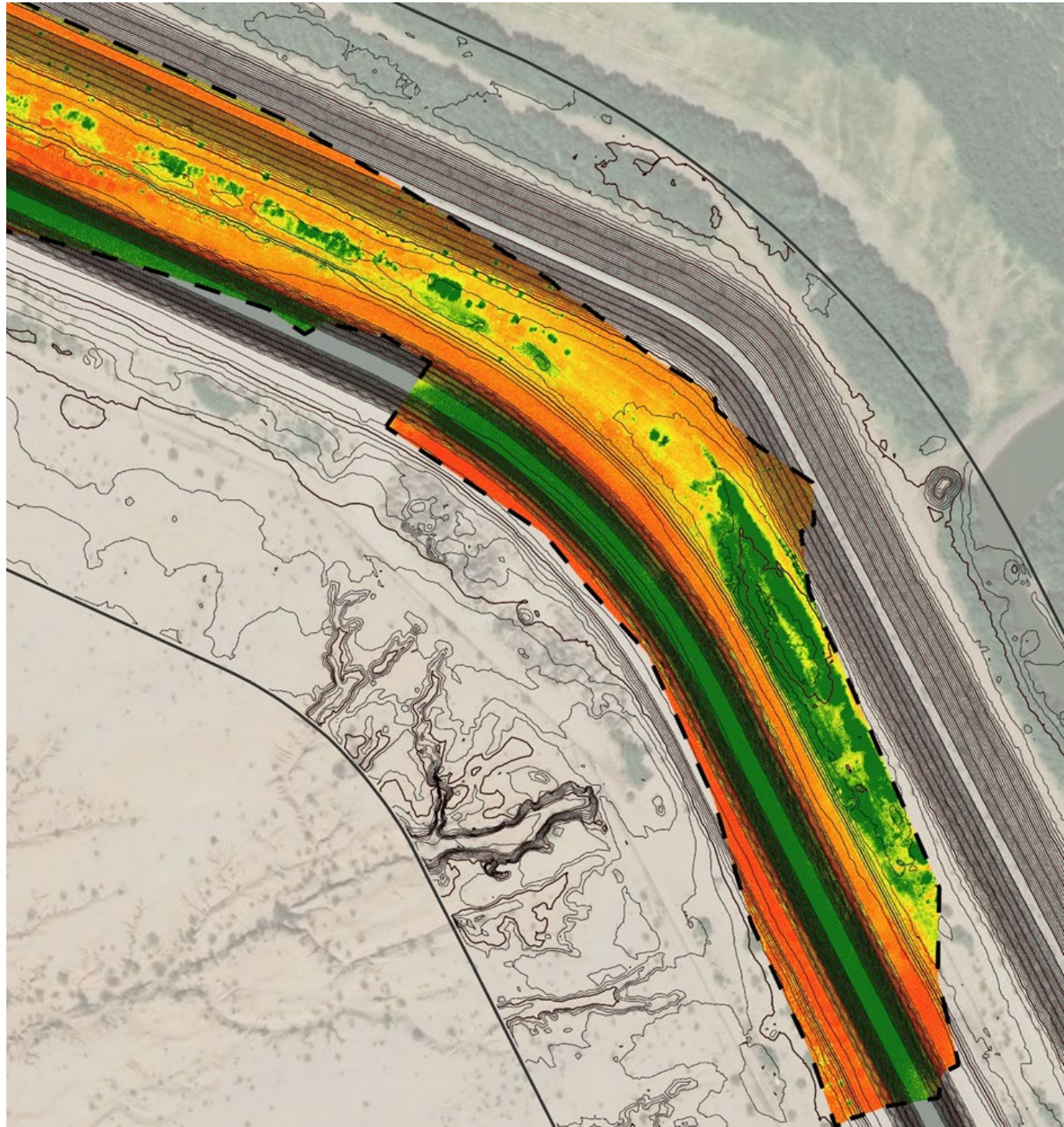


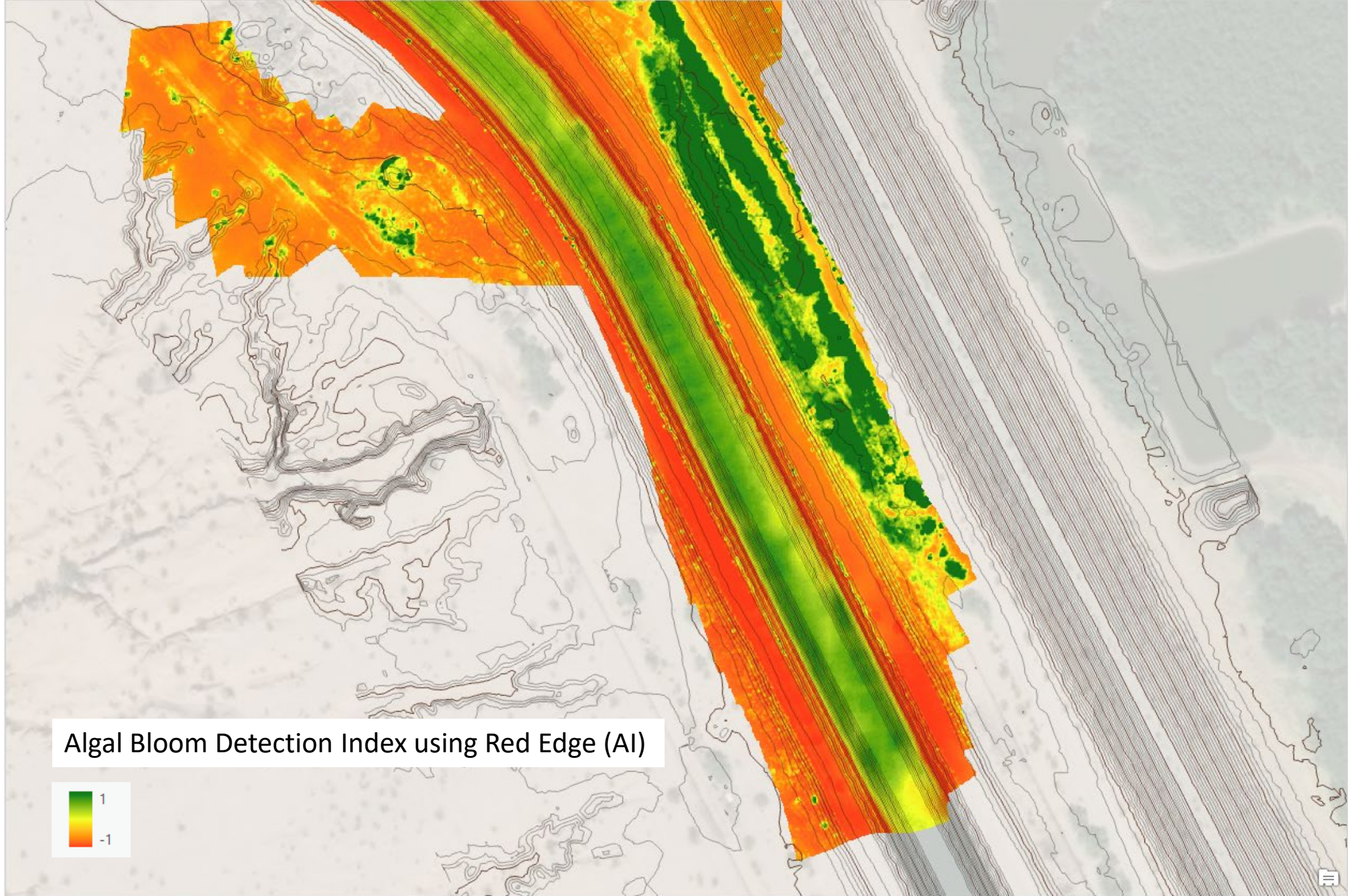
Multispectral Imagery has the ability to identify stressed before it is visible to the human eye – Normalized Distribution Vegetation Index (NDVI) is used to assess plant health



Multispectral

- Bright green areas show healthy vegetation
- Yellow areas are dryer and likely receive less water
- The green areas in the canal shows healthy alagal growth
- The green vegetation appears to be due to a surface depression




Algal Bloom Detection Index using Red Edge (AI)
1
-1

SRP Ditch NDVI Multispectral

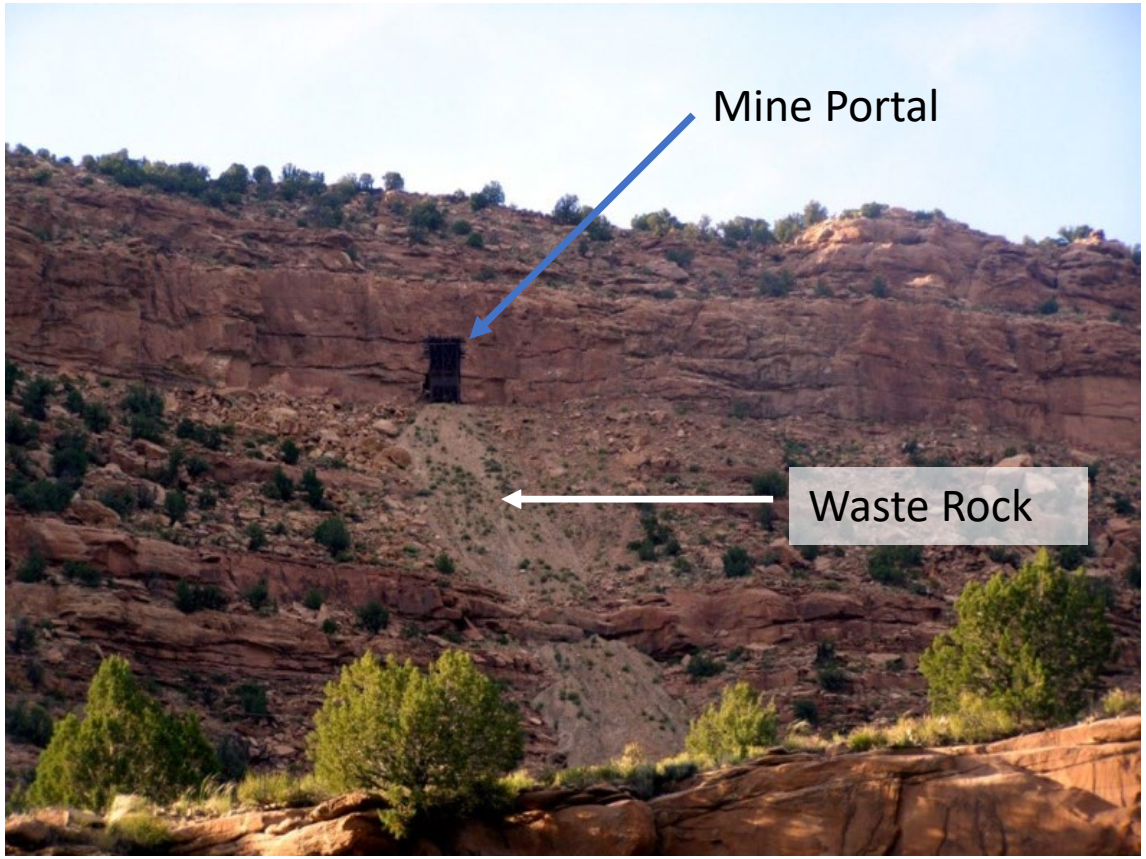
WASTE

UAS Radiological Assessment

- Uranium Mine Assessment
- Spectral Gamma Sensor
- Applications
  - Site Investigation (EE/CA)
  - Operation Monitoring
  - Restoration Performance

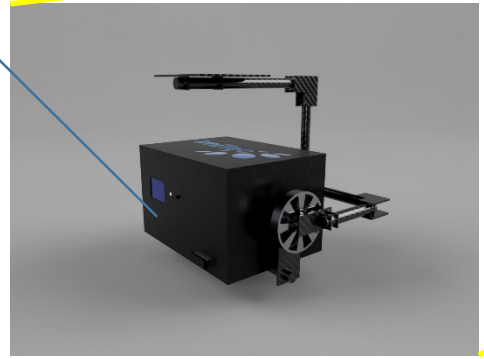
Common Investigation Methods Difficult to Apply at AUMs

- Often on cliffs or high relief terrain
- Many areas inaccessible
- Unknown uranium concentrations
- Difficult to distinguish background from mine waste
- Cleanup volumes are rough estimates

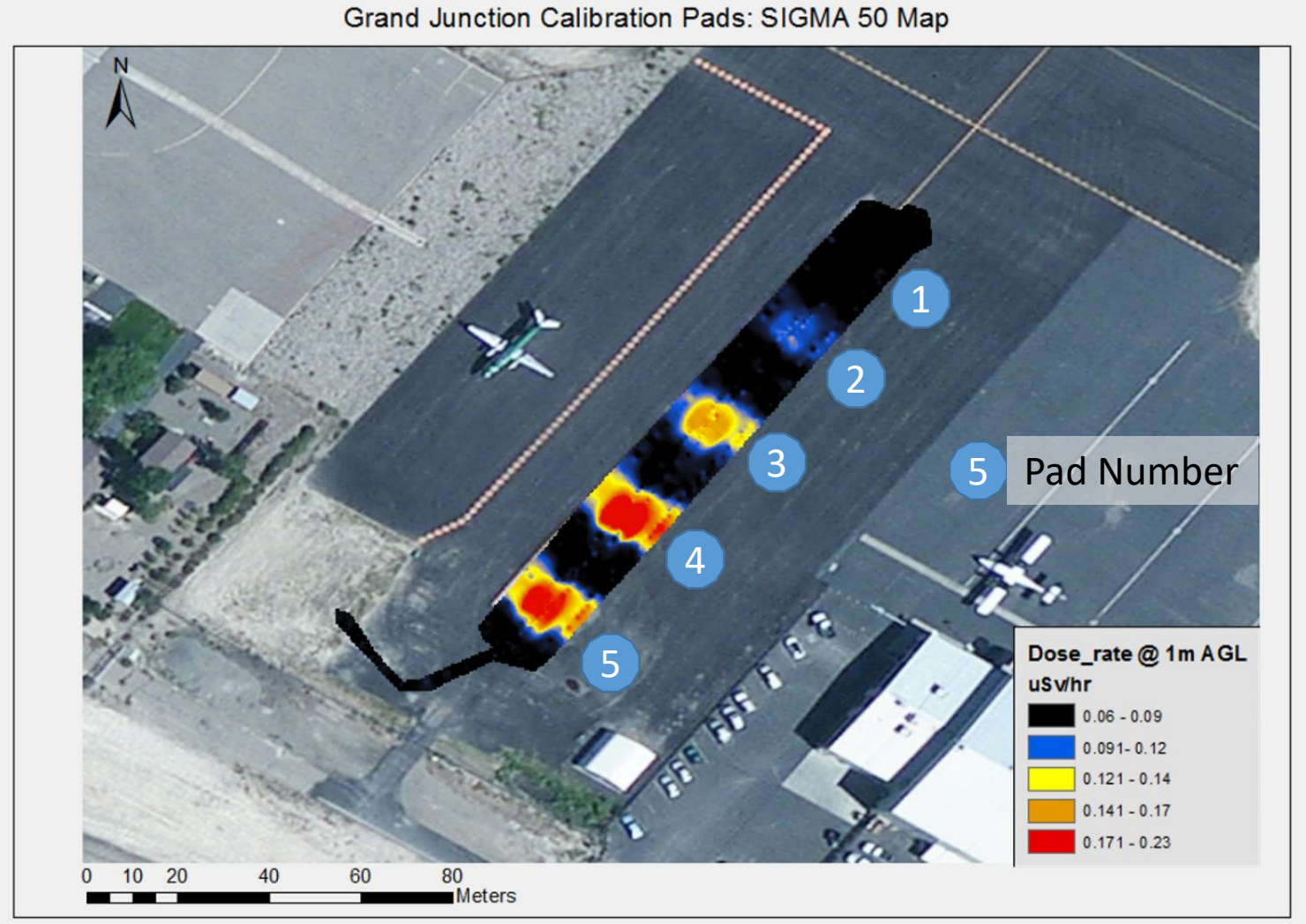


Integration of dual spectral gamma sensors for UAS survey of radiological contamination

5 pound gamma sensor with gimbal leveling system and altitude range finder



Sigma Sensor Results from Grand Junction Airport Calibration Pads



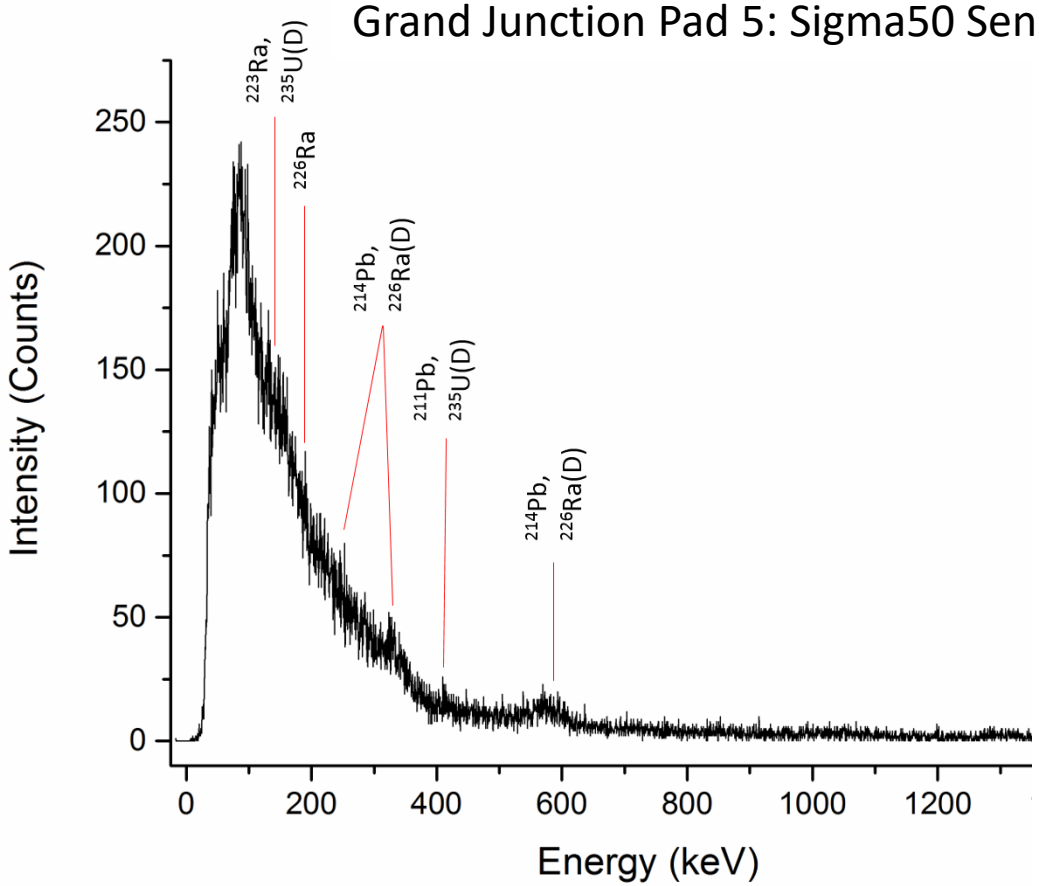
Calibrated Pad Data from 1988

Pad Number	Exposure Rate in µSv/hr @ 1 m
1 - Background	0.13
2 - Potassium	0.18
3 - Thorium	0.22
4 - Radium	0.24
5 - Mixed	0.25

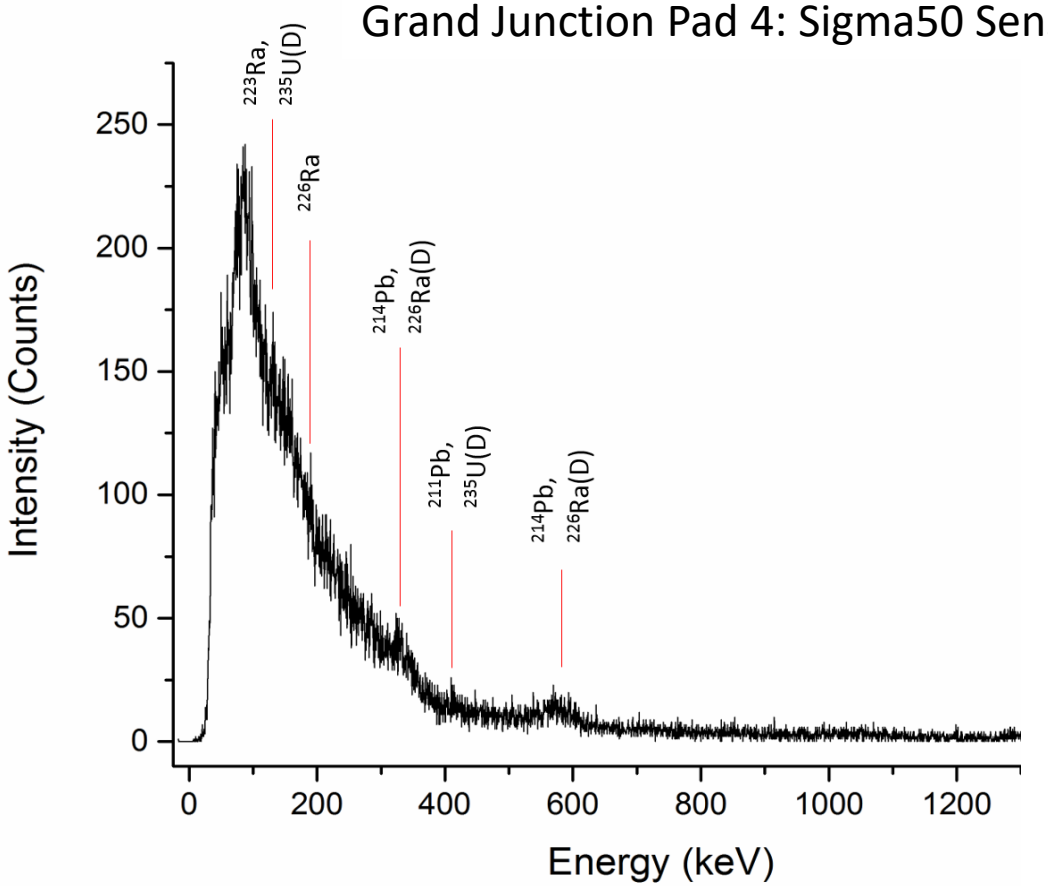
Example output from individual gamma sensor reading

Full spectral count data with each gamma measurement

Grand Junction Pad 5: Sigma50 Sensor

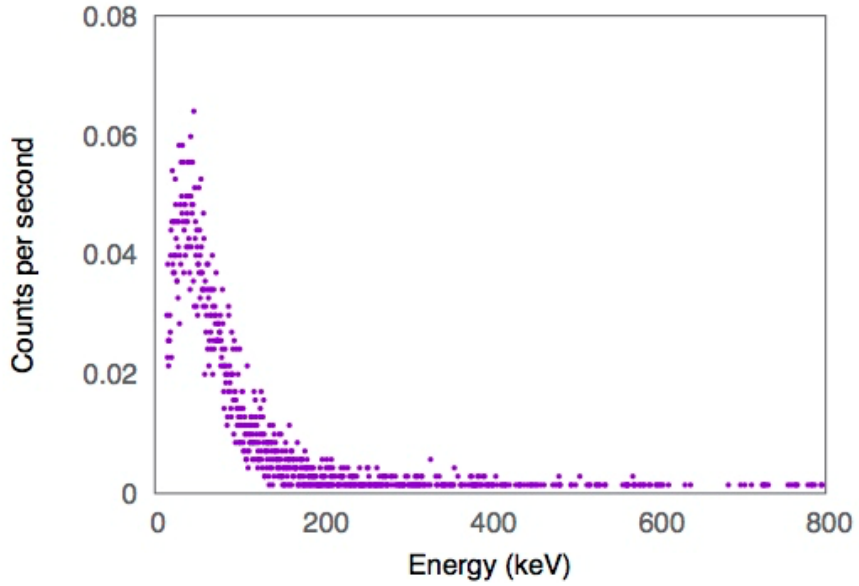


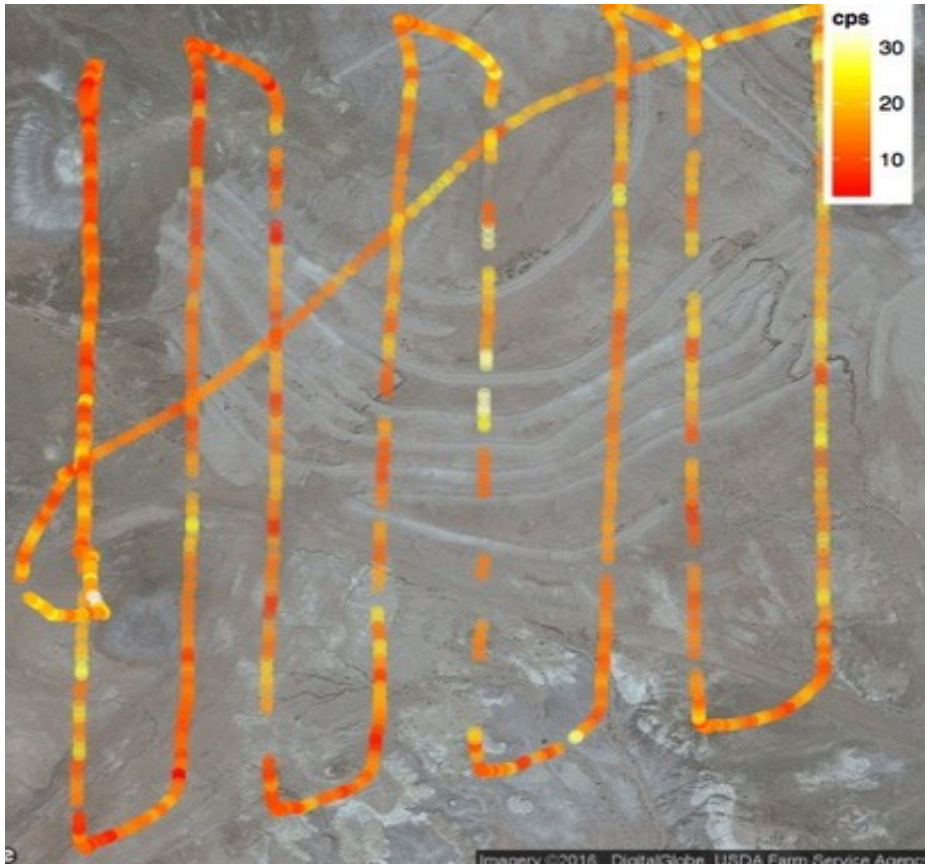
Grand Junction Pad 4: Sigma50 Sensor



Gamma Data – Level of Radiation from Uranium

- Data provided in Counts Per Second (CPS) along flight path
- As part of the future work, will convert the CPS data into units that will be used to assess cleanup levels

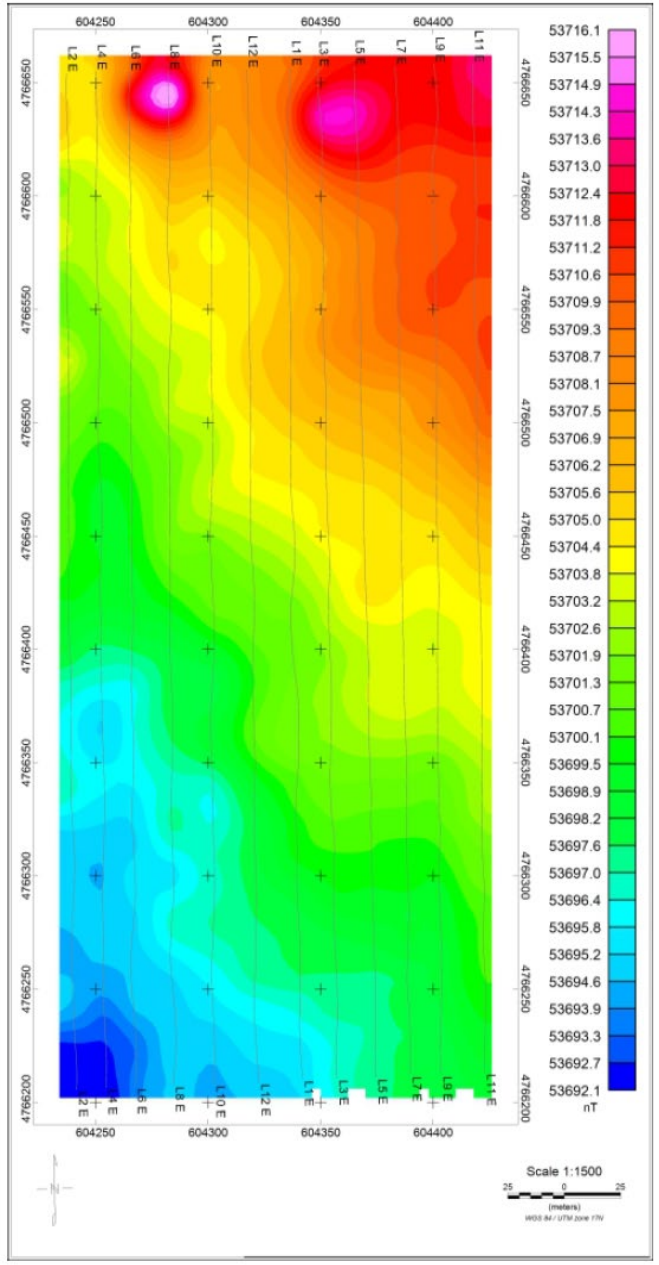


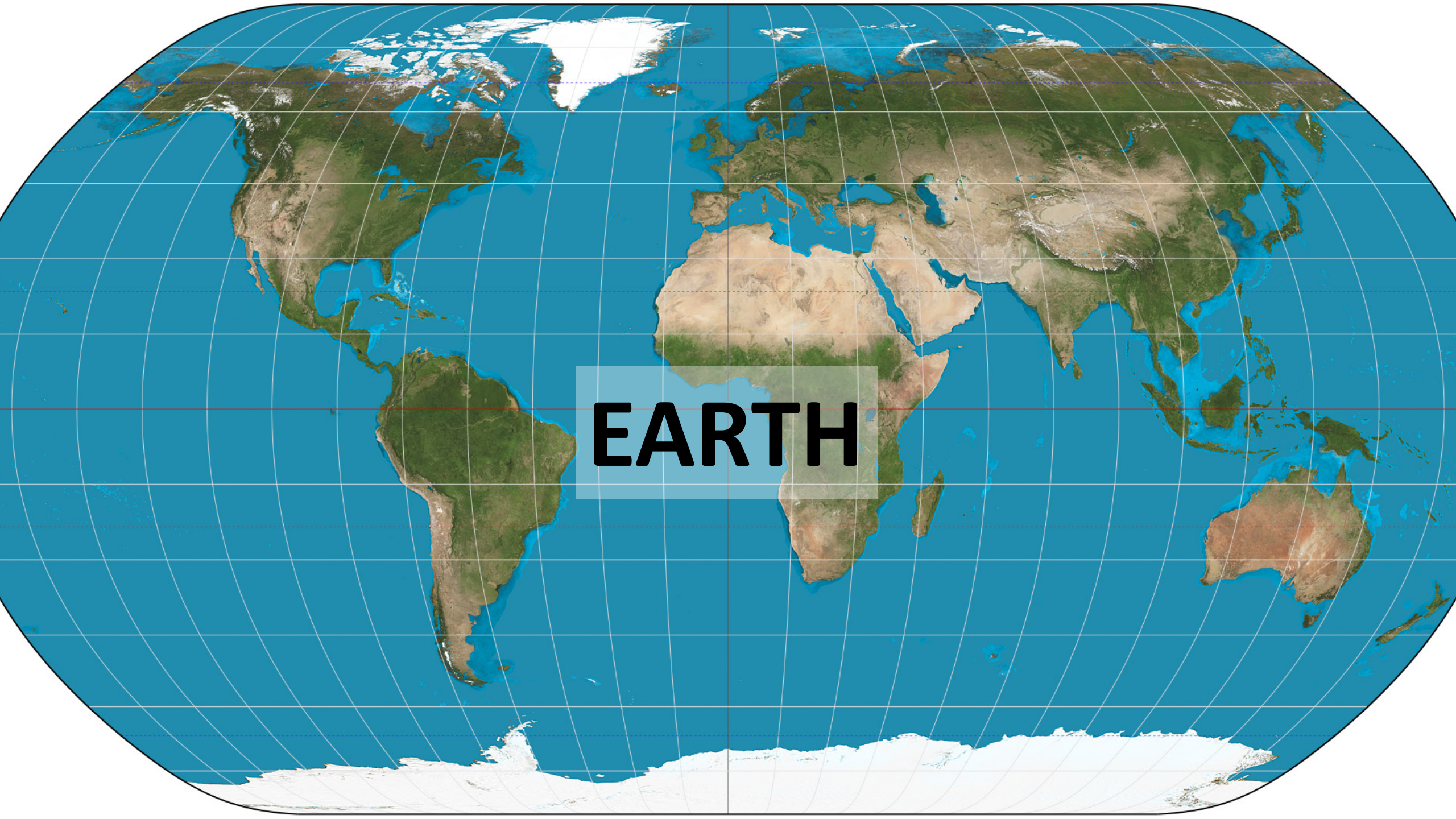


GemSystems G25U Magnetometer

- Potassium pump magnetometer sensor that sling loads below craft
- Fits on an DJI M600
- Extremely sensitive. Can see noise from a gas engine a ¼ mile away.
- Pipes, Tanks, Well Heads
- More sensitive G35U suitable for UXO
- Mag Base station required low nT readings

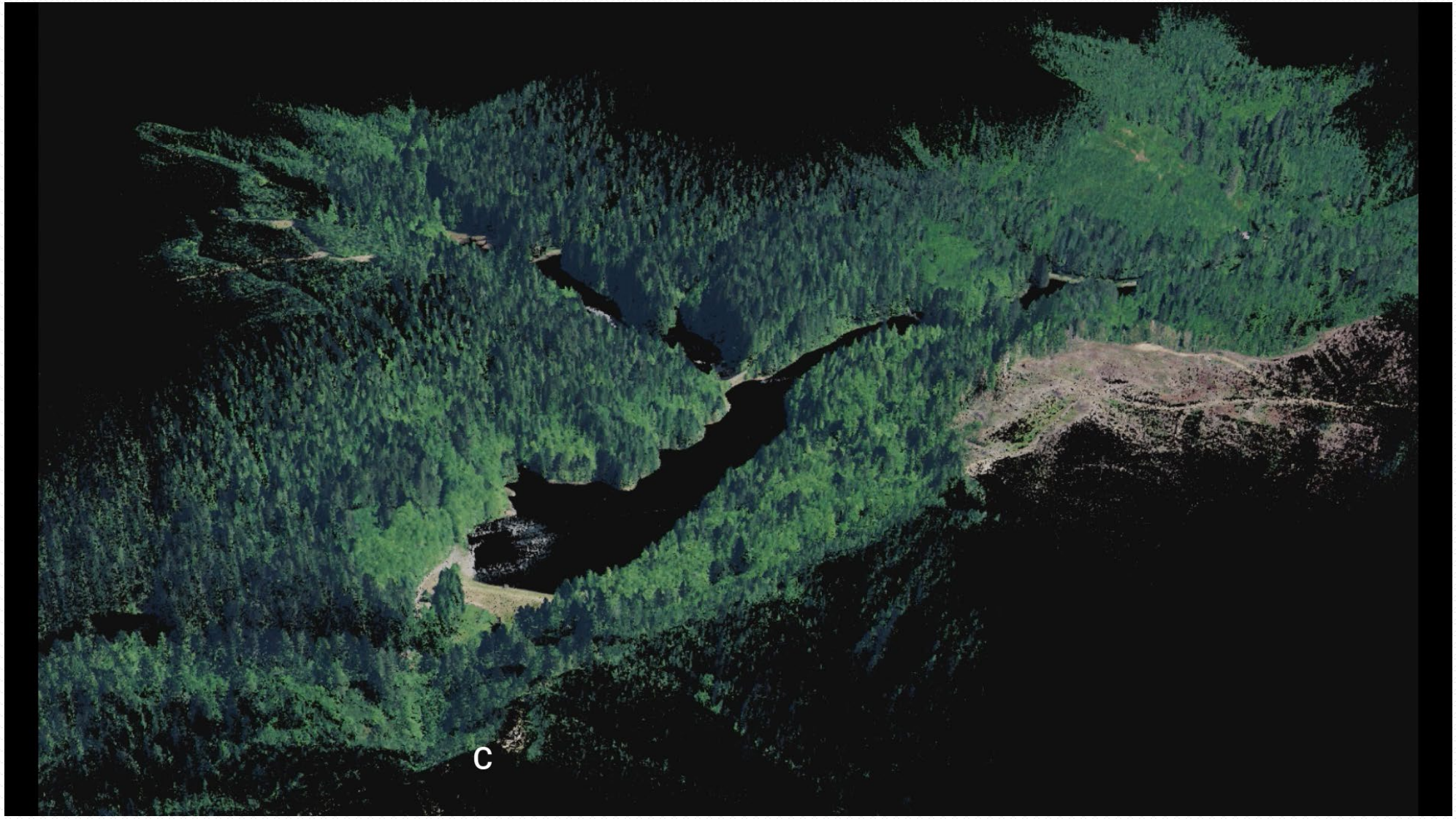
DRONEmag™ Surveys -- Replacing Ground & Airborne




EARTH

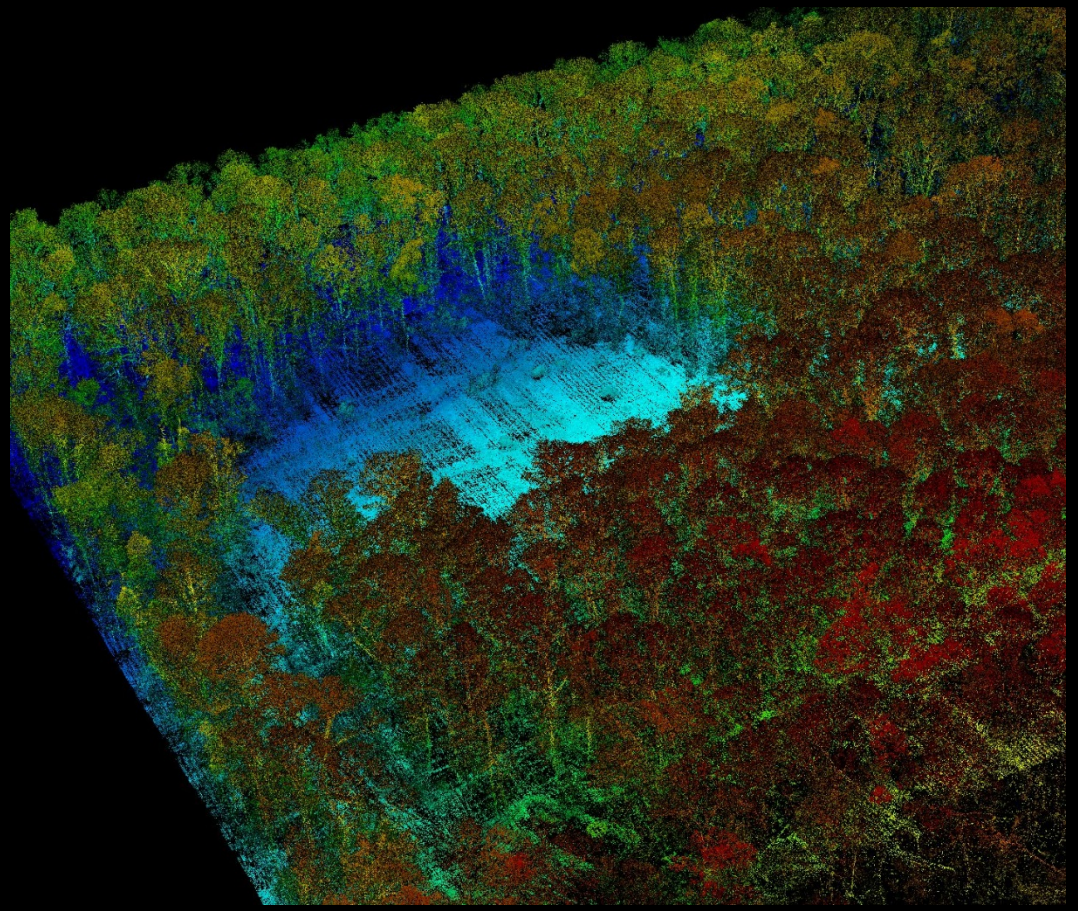
Dense Forest Data Collecton

Dense Forest Data Presentation



2 Return Velodyne LiDAR (non-survey grade sensor)

7 Return Riegl LiDAR (survey grade sensor)



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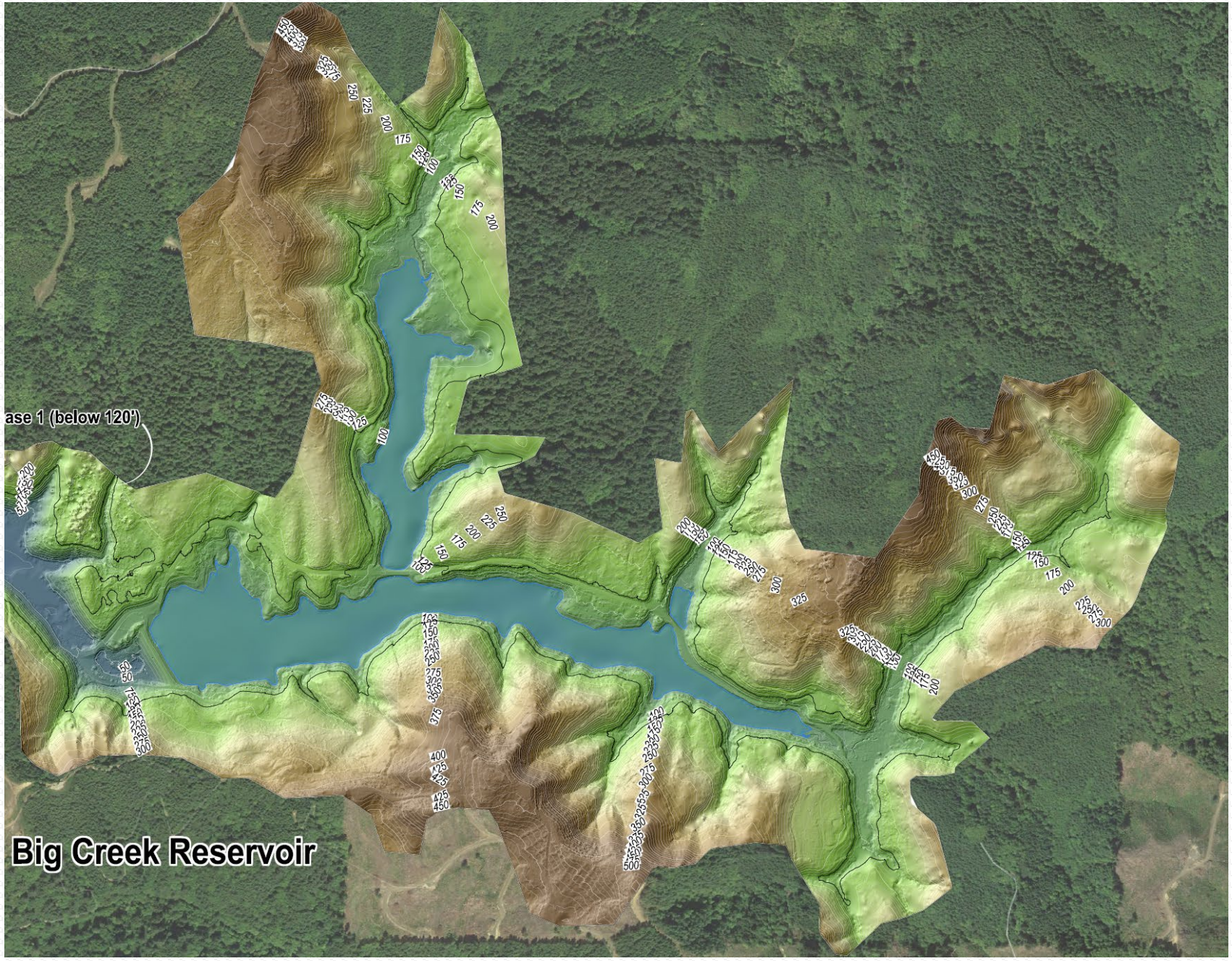
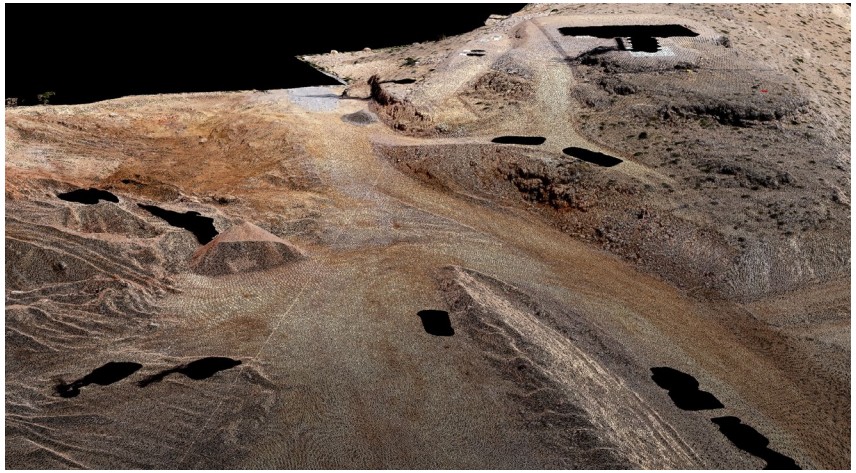
Contours and Hill Shade based on LiDAR

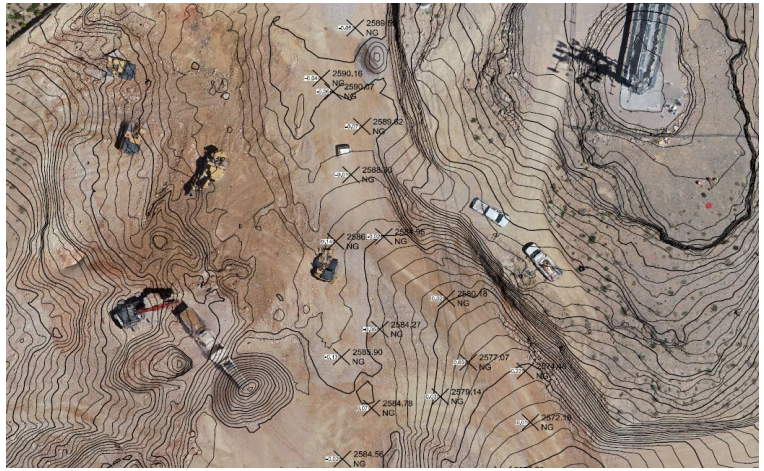


Geospatial Cleaning and Compression

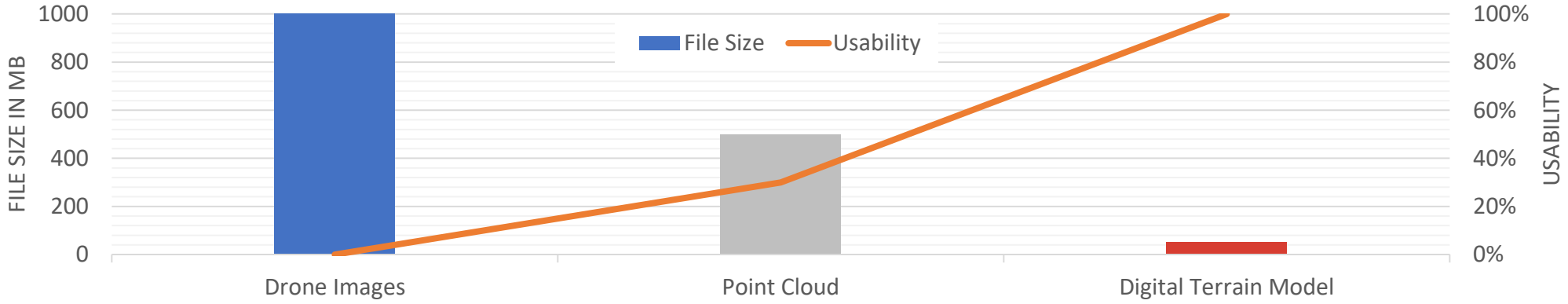
Drone Images



Point Cloud



Digital Terrain Model



UAS Aerial Mapping for the Durango Pit

- 250-foot deep pit
- 55 Acre Project
- RMSE of 0.17 feet
- Completed within 6 days of Notice to Proceed.

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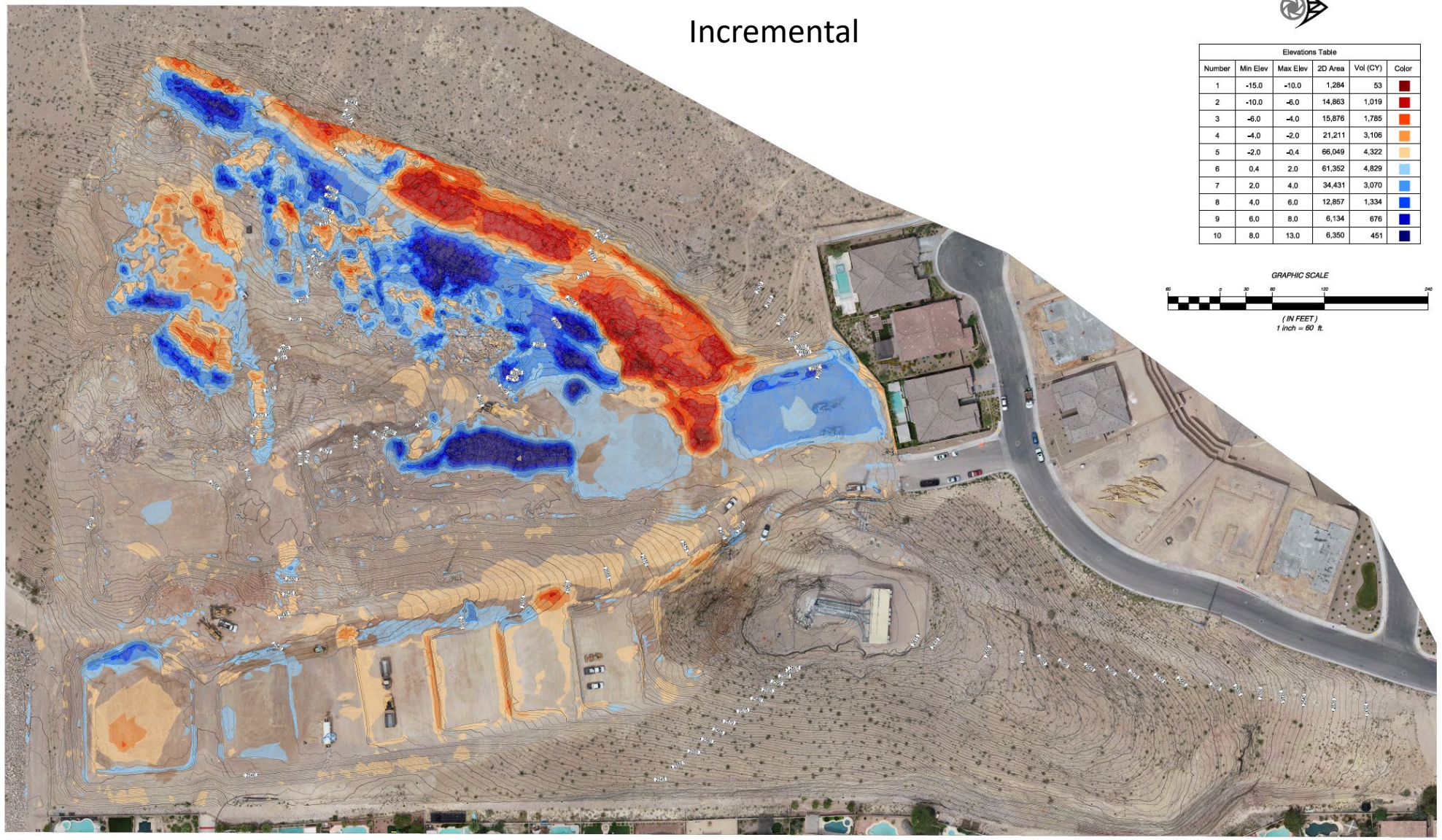
Incremental



Elevations Table					
Number	Min Elev	Max Elev	2D Area	Vol (CY)	Color
1	-15.0	-10.0	1,284	53	
2	-10.0	-6.0	14,863	1,019	
3	-6.0	-4.0	15,876	1,785	
4	-4.0	-2.0	21,211	3,106	
5	-2.0	-0.4	66,049	4,322	
6	0.4	2.0	61,352	4,829	
7	2.0	4.0	34,431	3,070	
8	4.0	6.0	12,857	1,334	
9	6.0	8.0	6,134	676	
10	8.0	13.0	6,350	451	

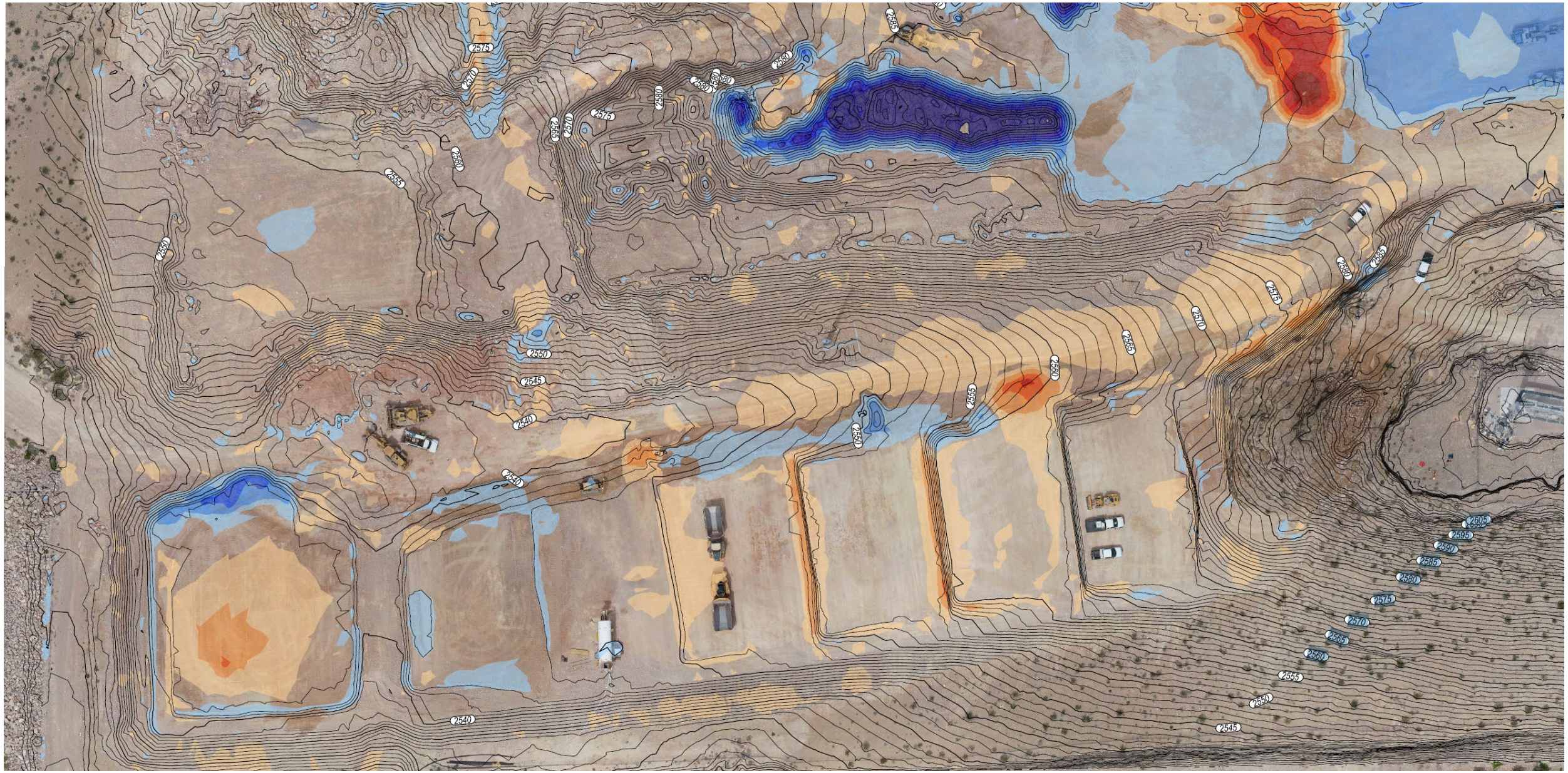
GRAPHIC SCALE

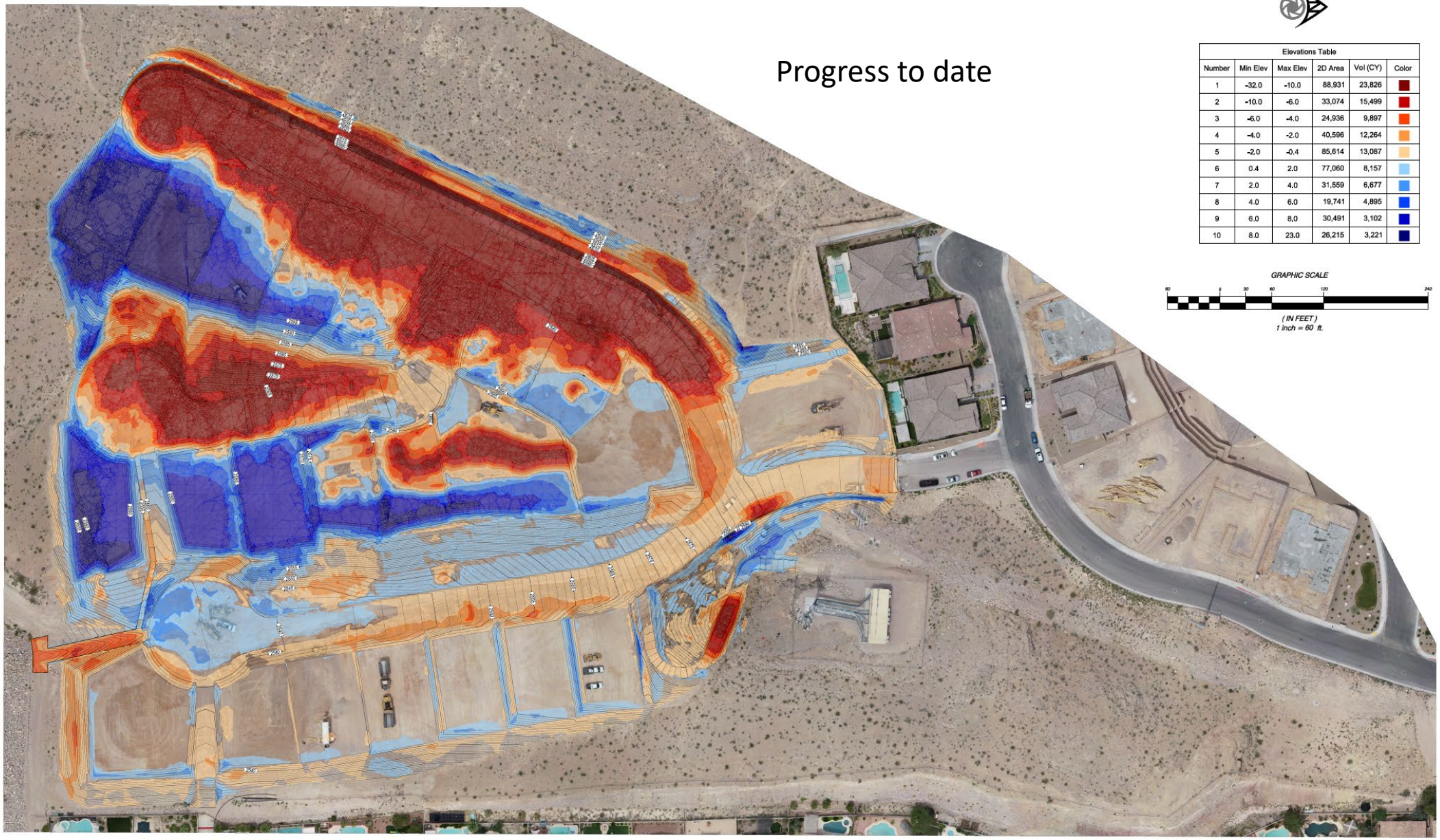
60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Vol_0605 to 0611	1.000	1.000	584918.39 Sq. Ft.	13328.03 Cu. Yd.	12726.45 Cu. Yd.	601.58 Cu. Yd.<Cut>


2575
2570
2560
2555
2550
2545
2540
2535
2530
2565
2580
2595
2590
2585
2605



Progress to date

Elevations Table					
Number	Min Elev	Max Elev	2D Area	Vol (CY)	Color
1	-32.0	-10.0	88,931	23,826	
2	-10.0	-6.0	33,074	15,499	
3	-6.0	-4.0	24,936	9,897	
4	-4.0	-2.0	40,596	12,264	
5	-2.0	-0.4	85,614	13,087	
6	0.4	2.0	77,060	8,157	
7	2.0	4.0	31,559	6,677	
8	4.0	6.0	19,741	4,895	
9	6.0	8.0	30,491	3,102	
10	8.0	23.0	26,215	3,221	

GRAPHIC SCALE

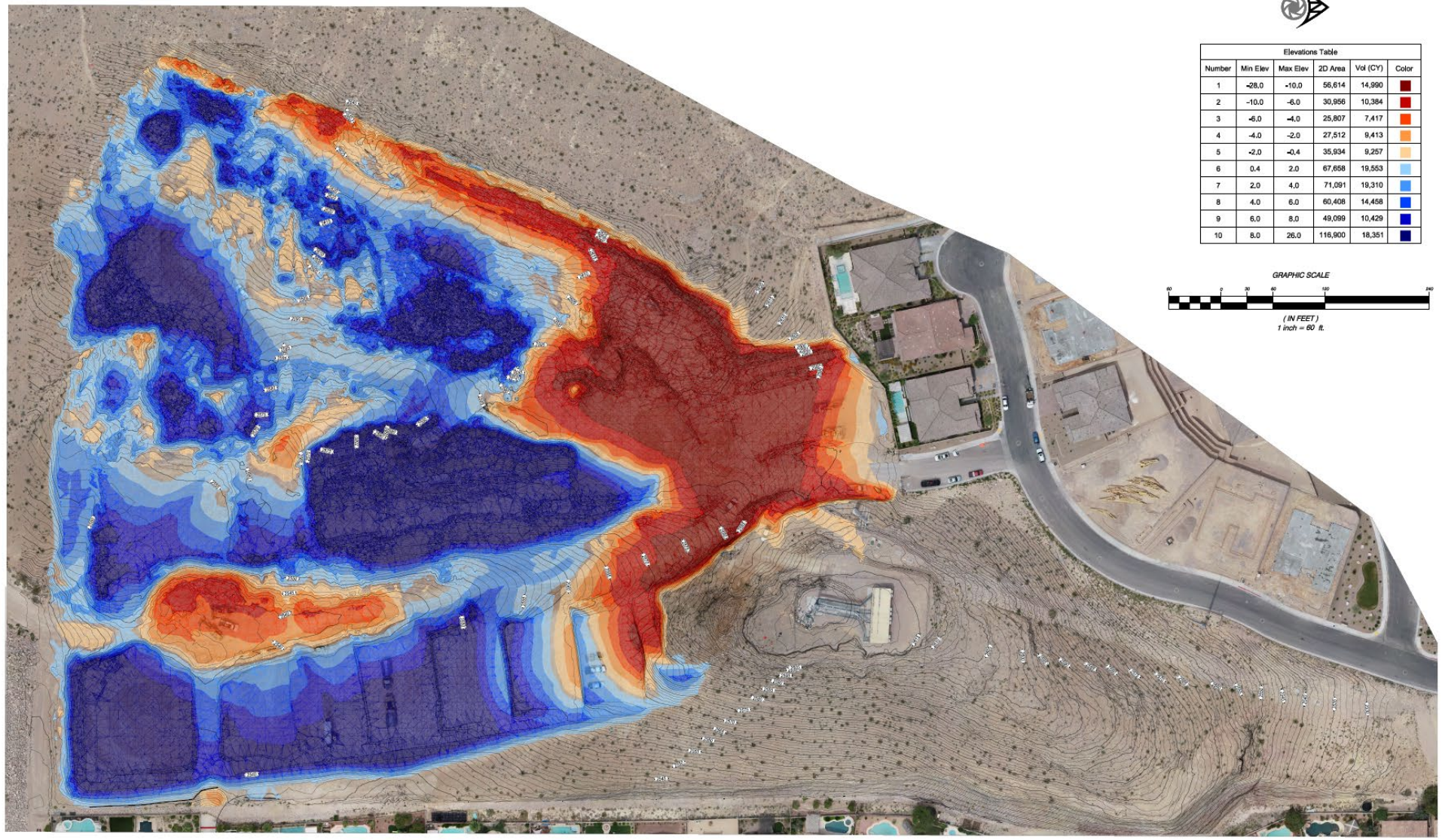
60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Vol_0611 to BID_DESIGN	1.000	1.000	585832.67 Sq. Ft.	78932.89 Cu. Yd.	29117.50 Cu. Yd.	49815.39 Cu. Yd.<Cut>

Bid to Excavation



Elevations Table					
Number	Min Elev	Max Elev	2D Area	Vol (CY)	Color
1	-28.0	-10.0	56,614	14,990	
2	-10.0	-6.0	30,956	10,384	
3	-6.0	-4.0	25,807	7,417	
4	-4.0	-2.0	27,512	9,413	
5	-2.0	-0.4	35,934	9,257	
6	0.4	2.0	67,658	19,553	
7	2.0	4.0	71,091	19,310	
8	4.0	6.0	60,408	14,458	
9	6.0	8.0	49,099	10,429	
10	8.0	26.0	116,900	18,351	

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Vol_BID_EX to 0611	1.000	1.000	583750.15 Sq. Ft.	54209.05 Cu. Yd.	87675.56 Cu. Yd.	33466.51 Cu. Yd.<Fill>

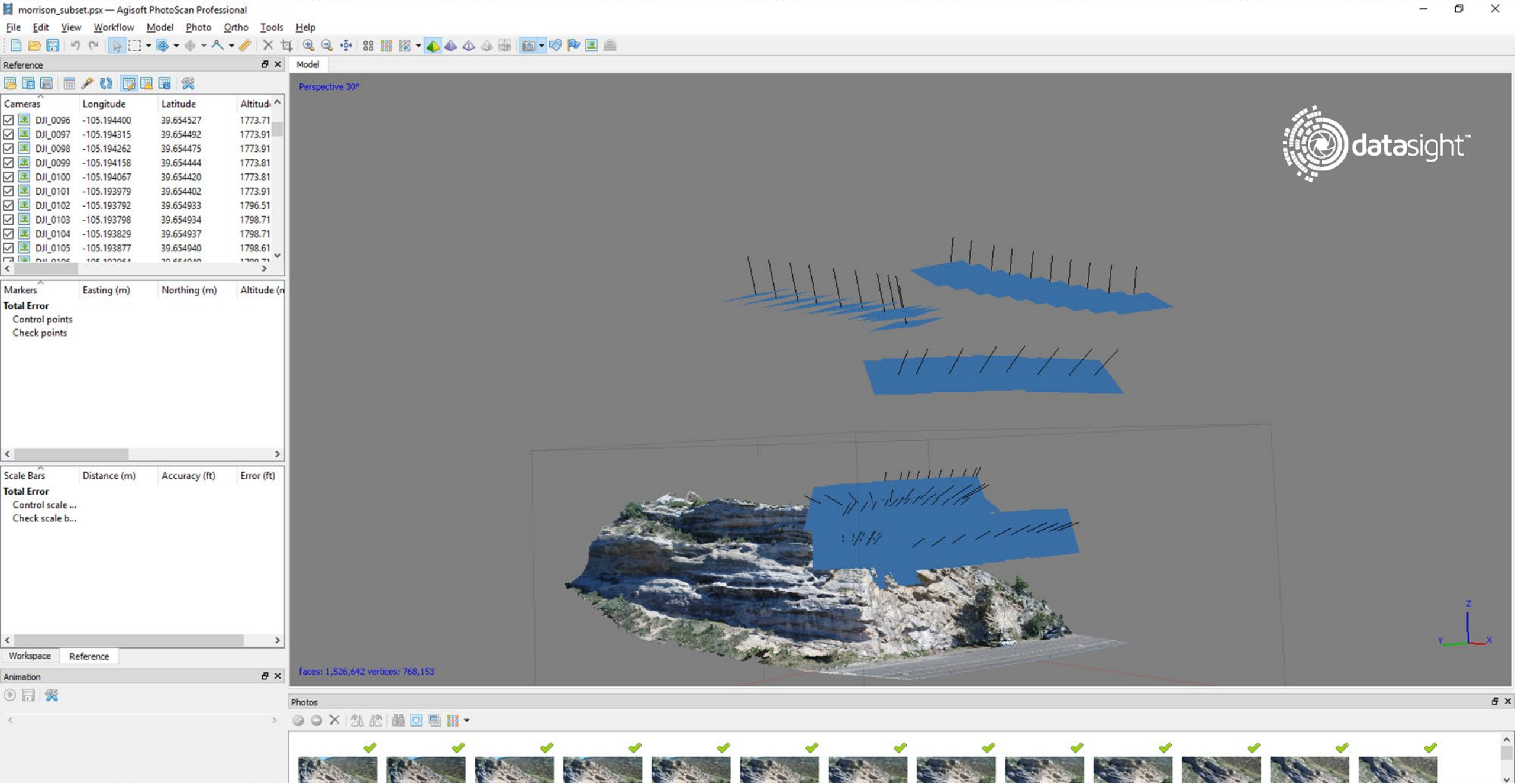
DESCRIPTION | DATE | REV

LAS VEGAS PAVING
BLM 160 - RAPID GRADING TEST
2019 CUT/FILL PROGRESS
BID EXISTING TO JUNE 11

CLARK COUNTY
NEVADA
LAS VEGAS

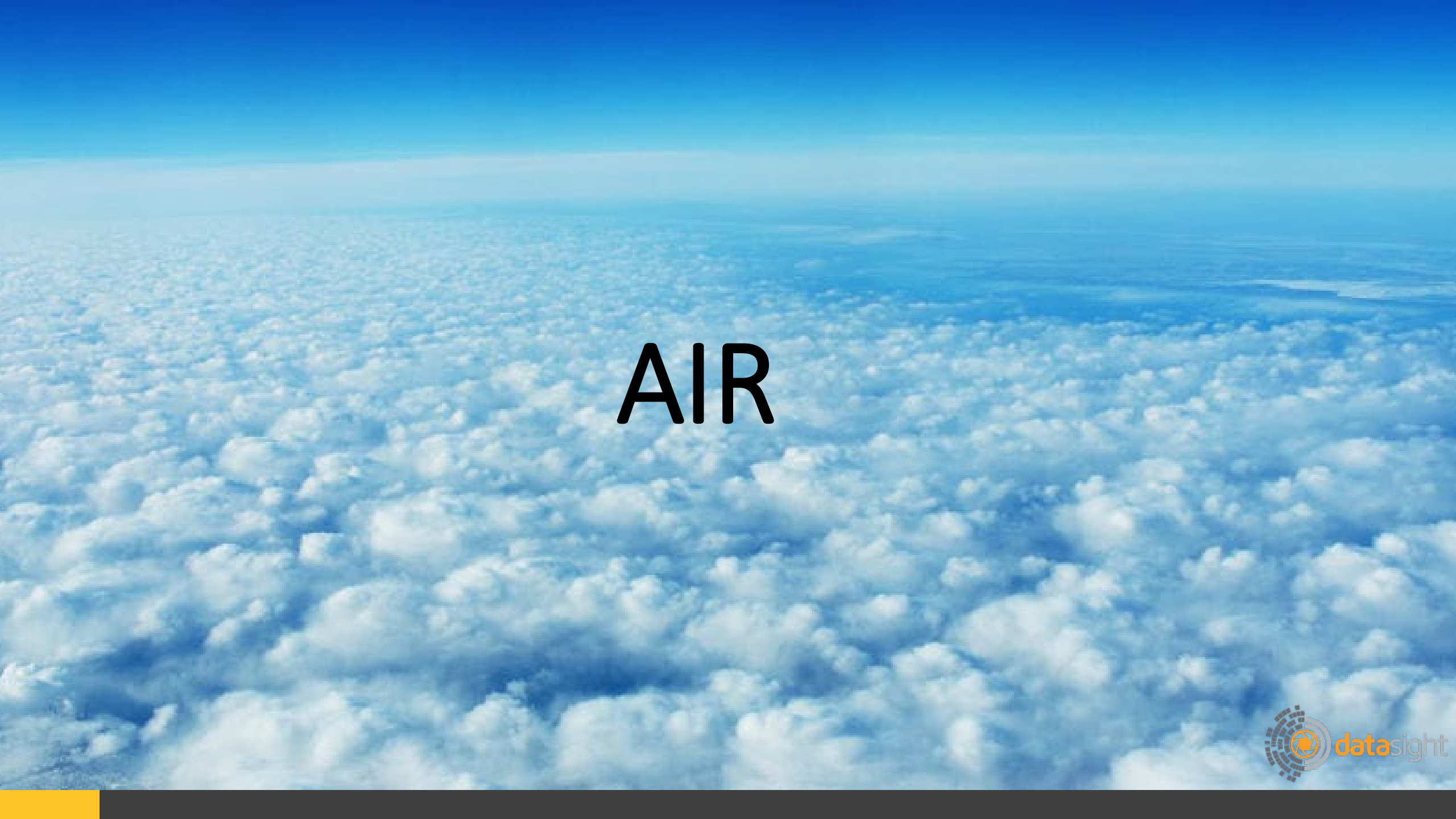
datasight
2451 S BUFFALO DR. #105
LAS VEGAS, NV 89117
OFFICE: 702-442-0095 | DATASOFTUSA.COM

Oblique UAS Imagery – Road Cut Scale



UAS Oblique Imagery Point Cloud – 70 Million Points

Point Cloud Facet Model – Strike 210 degrees, Dip 78 degrees


AIR

Methane Sensor System

- Open path Tunable Diode Laser Absorption Spectrometry (TDLAS) methane detection (+/- 0.5 ppm methane)
- FT 205 Wind Sensor
- Micasense Rededge Multispectral Camera
- Full GPS location recording

Methane Sensor System on M600

PPM: 14.44
R2: 0.34
Light: 2145
Status: 0x3
22:40:11 UTC
Directions: To here - From here

UAS/USV Technology Enablement and Optimization Services Through Customized Workflow Solutions

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