



# Congratulations, you are getting new Lidar – Now what?

November 10th, 2022

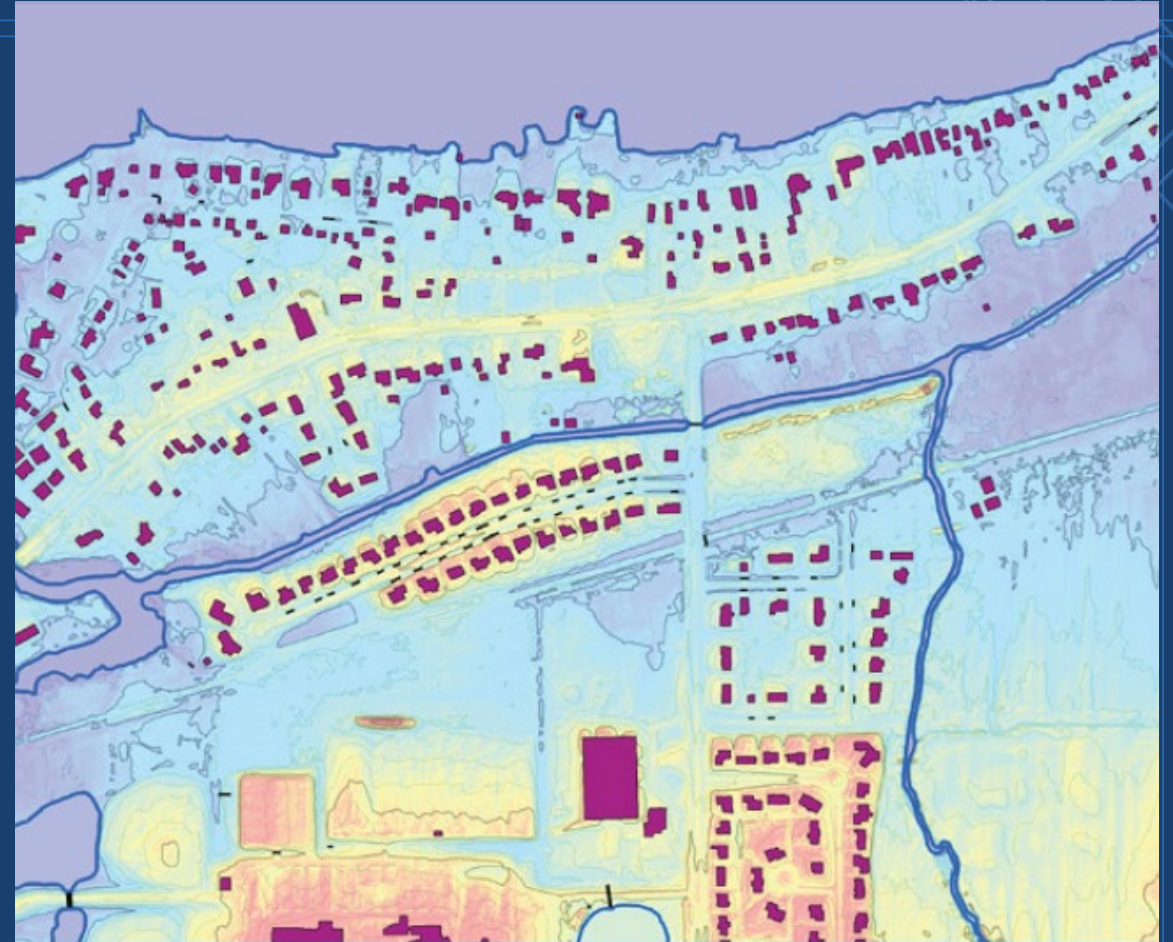
Adam Derringer, GISP  
Senior Project Manager

**AYRES**  
GEOSPATIAL

Ingenuity, Integrity, and Intelligence.

# Today's Agenda

- Background Info
- What is LiDAR
- Why is it important
- What's up with SE MN
- What can you do with it?
- LiDAR Demo



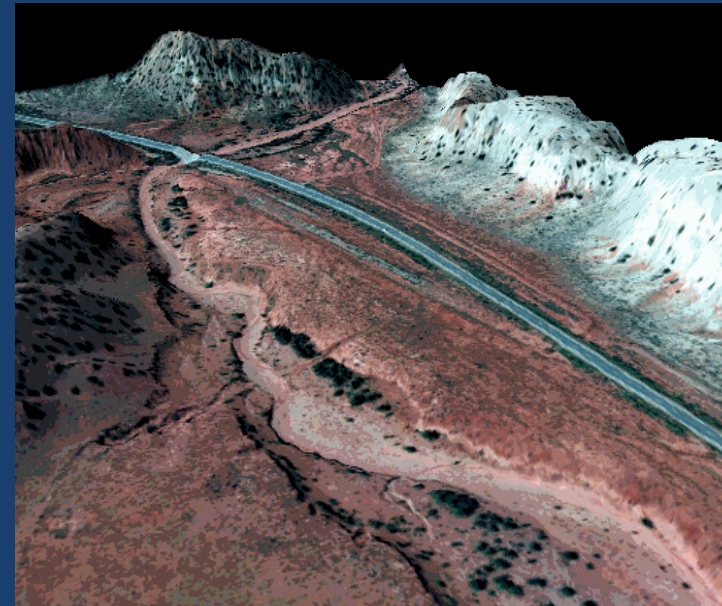
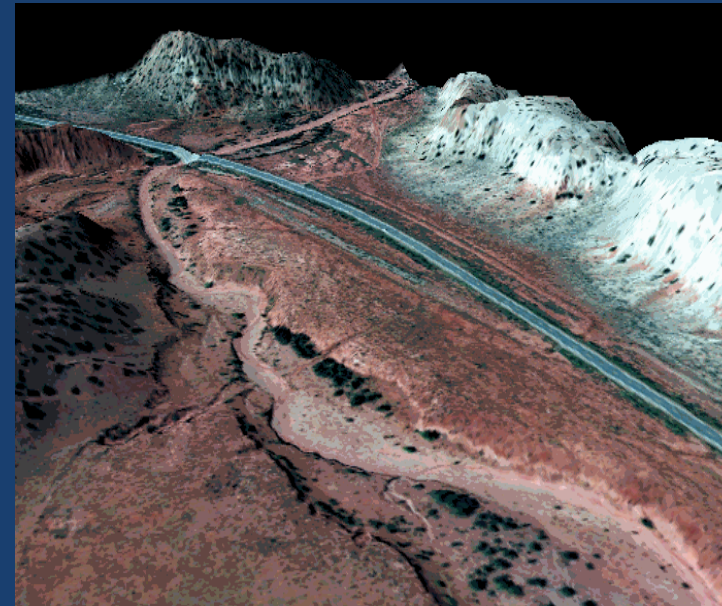
Buildings and hydrographic features extracted from  
Fond du Lac County, Wisconsin's lidar



# Airborne LiDAR Technology

## LiDAR:

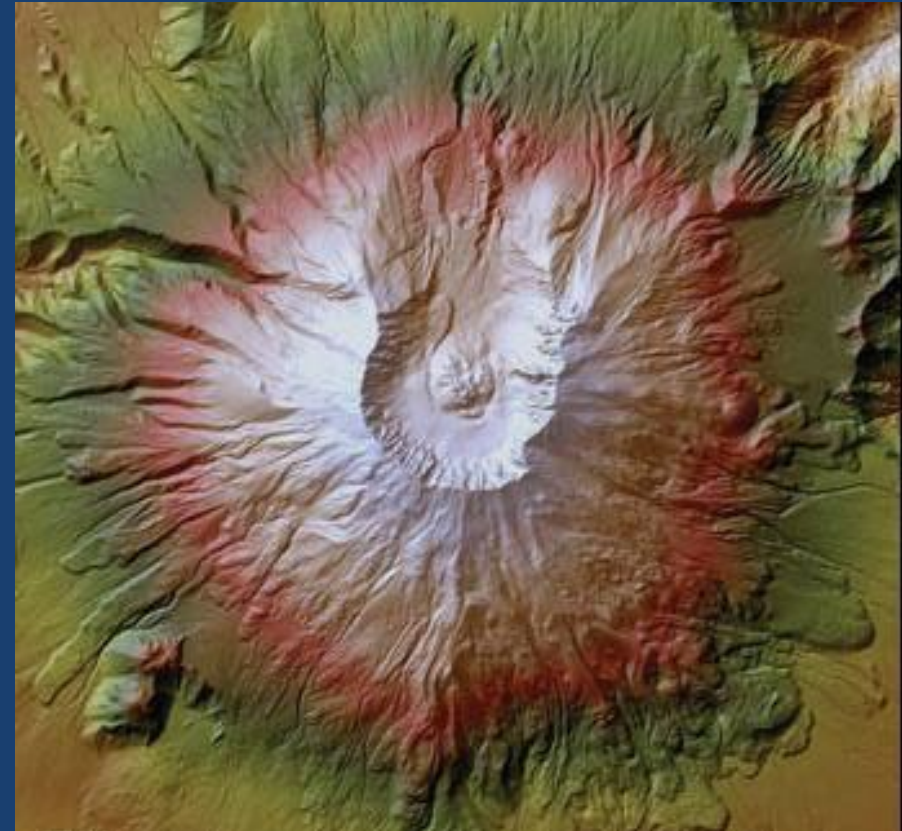
- Light Detection And Ranging:
- Similar to Radar or Sonar but using an optical source – a laser to measure location based on speed of light.
- Millions of measured points allows the interpretation of surfaces and models.





# What is 3DEP

- 3D Elevation Program
- 8 year cycle program for National LiDAR; 2015-23?
- Quality Level Standards
- Partnership Opportunities to Collect Data one time for use by many
- Cooperative or GPSC



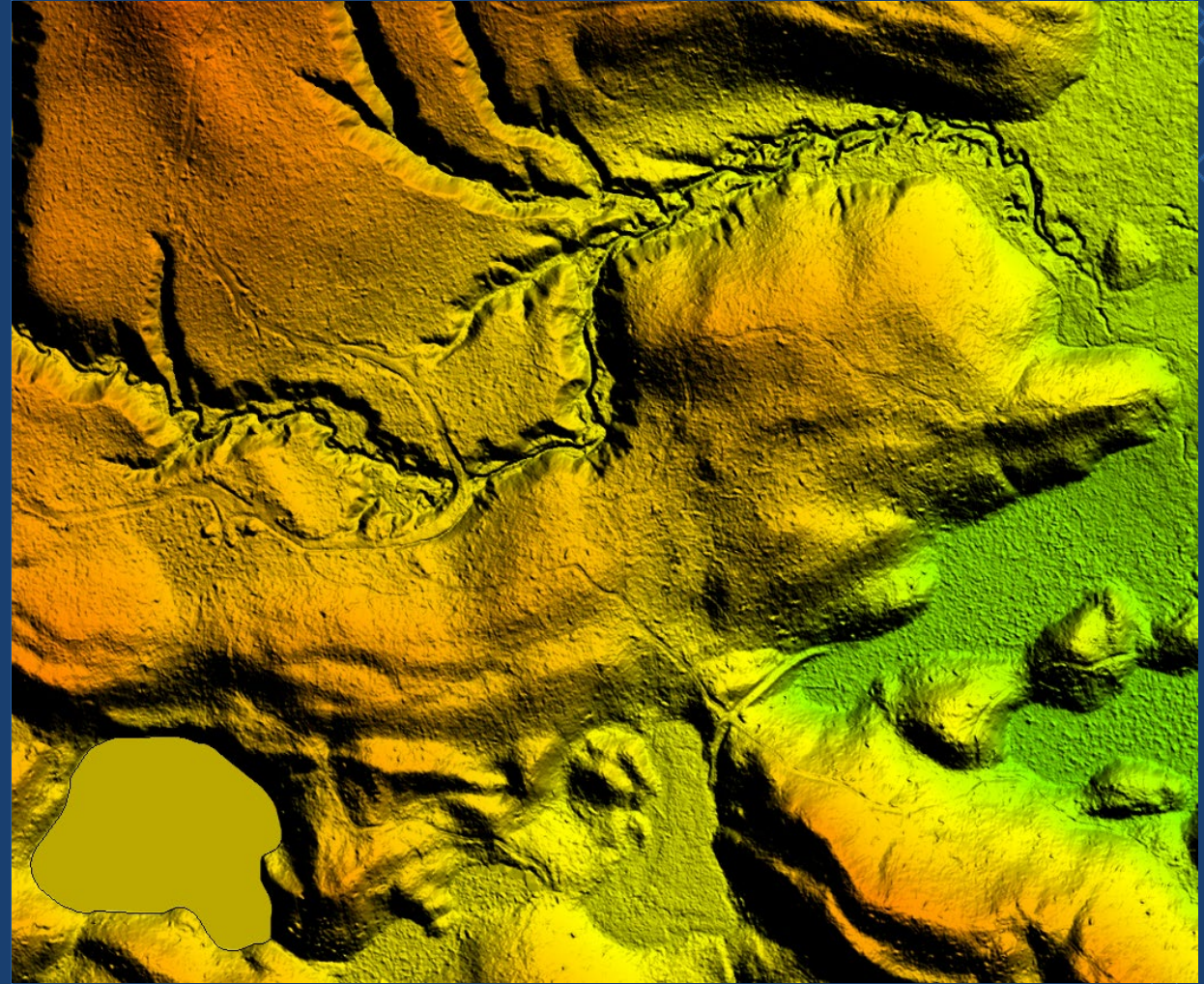


# Benefits of LiDAR

## The Uses:

- Flood risk management
- Infrastructure management
- Construction management
- Natural resources conservation
- Agriculture
- Precision farming
- Water supply
- Water quality
- Wildfire management
- Planning and response

“NEEA Valued LiDAR at \$690m annually or  
and ROI of 5:1”

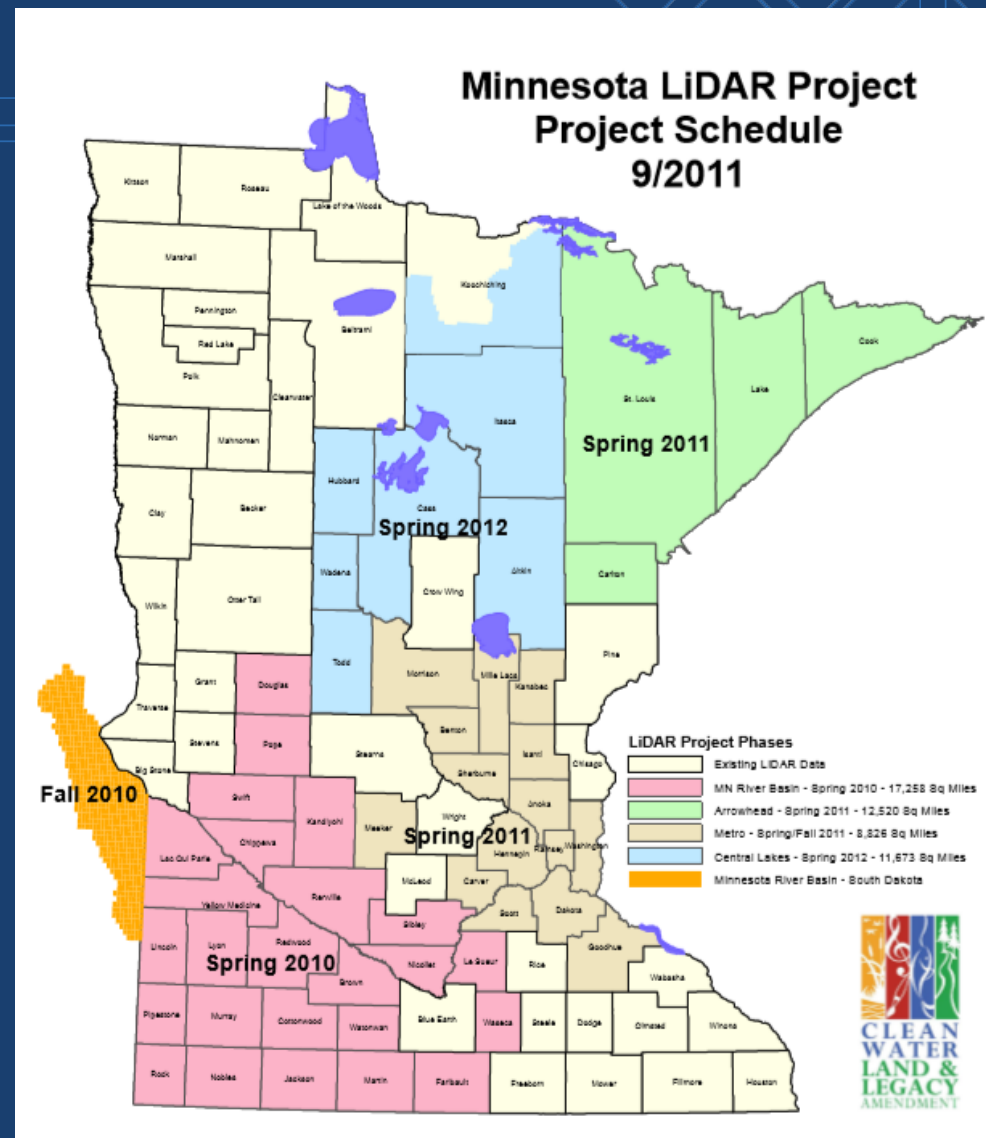


# History of MN LIDAR

## MN Elevation Mapping Project:

- Early Adopter
- 2007-2012
- < 1PPM
- State Provided 2-ft contours
- UTM

- **Southeast (Fall 2008)**
  - [Overview article](#)
  - [Documentation](#)
  - 8,800 square miles in nine counties: Dodge, Fillmore, Freeborn, Houston, Mower, Olmsted, Steele, Wabasha and Winona County.
- **Southwest (Spring and Fall 2010)**
  - 17,260 square miles in 25 counties: Brown, Chippewa, Cottonwood, Douglas, Faribault, Jackson, Kandiyohi, Lac qui Parle, Le Sueur, Lincoln, Lyon, Martin, Murray, Nicollet, Nobles, Pipestone, Pope, Redwood, Renville, Rock, Sibley, Swift, Waseca, Watonwan, Yellow Medicine.
  - [Documentation](#)

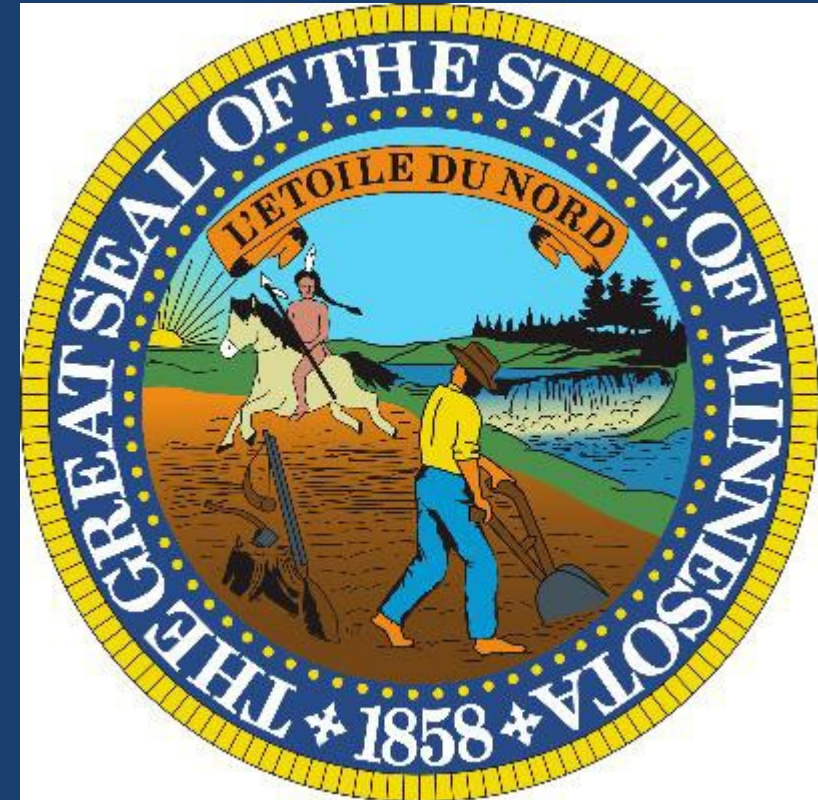




# Where is the State

## Current Draft Plan

- 3DEP
- Specifications
- Regions
- State Funding
- Local Partnering





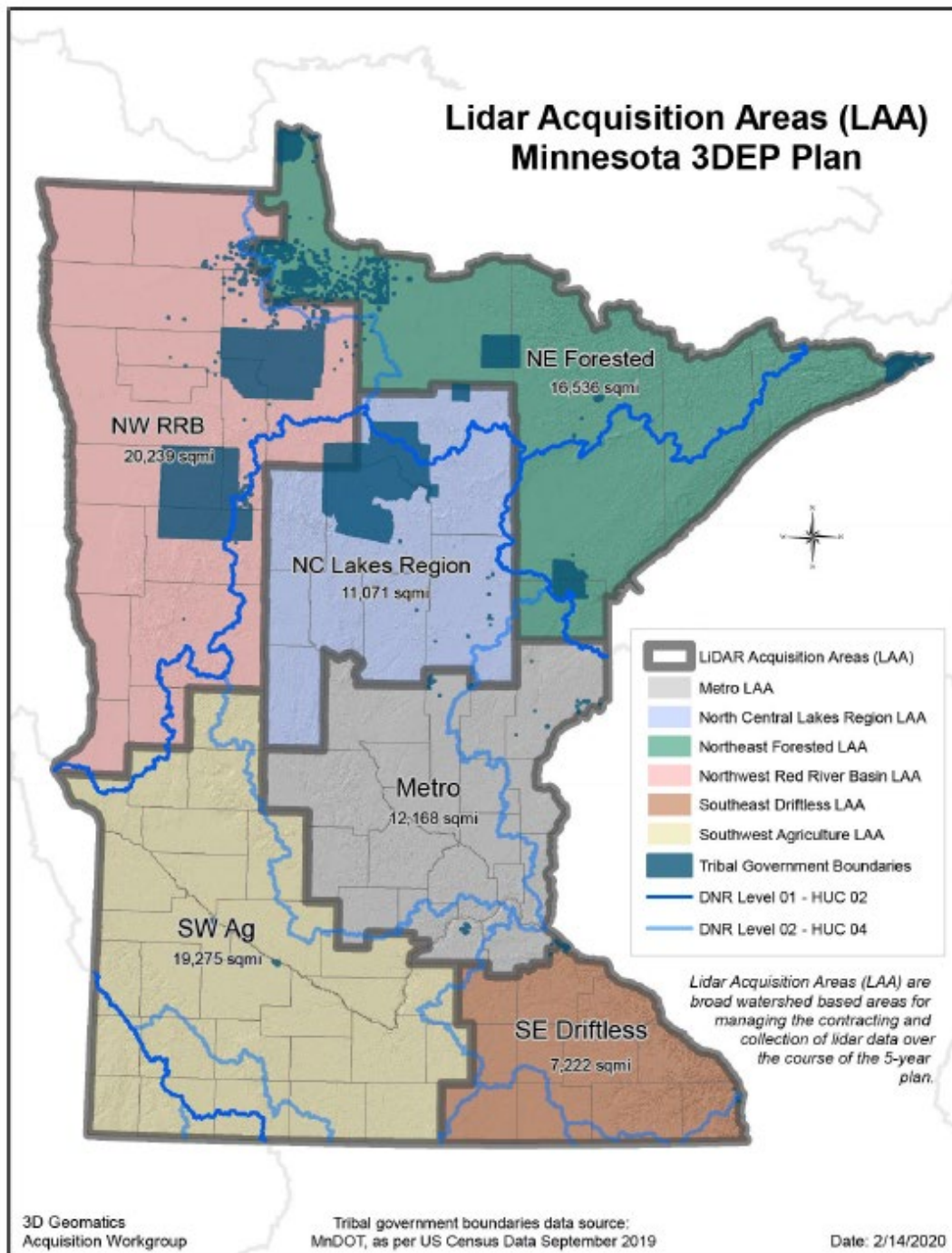


Figure 6: Map of the State's proposed lidar acquisition areas (LAA), depicting broad watershed and political-based areas.

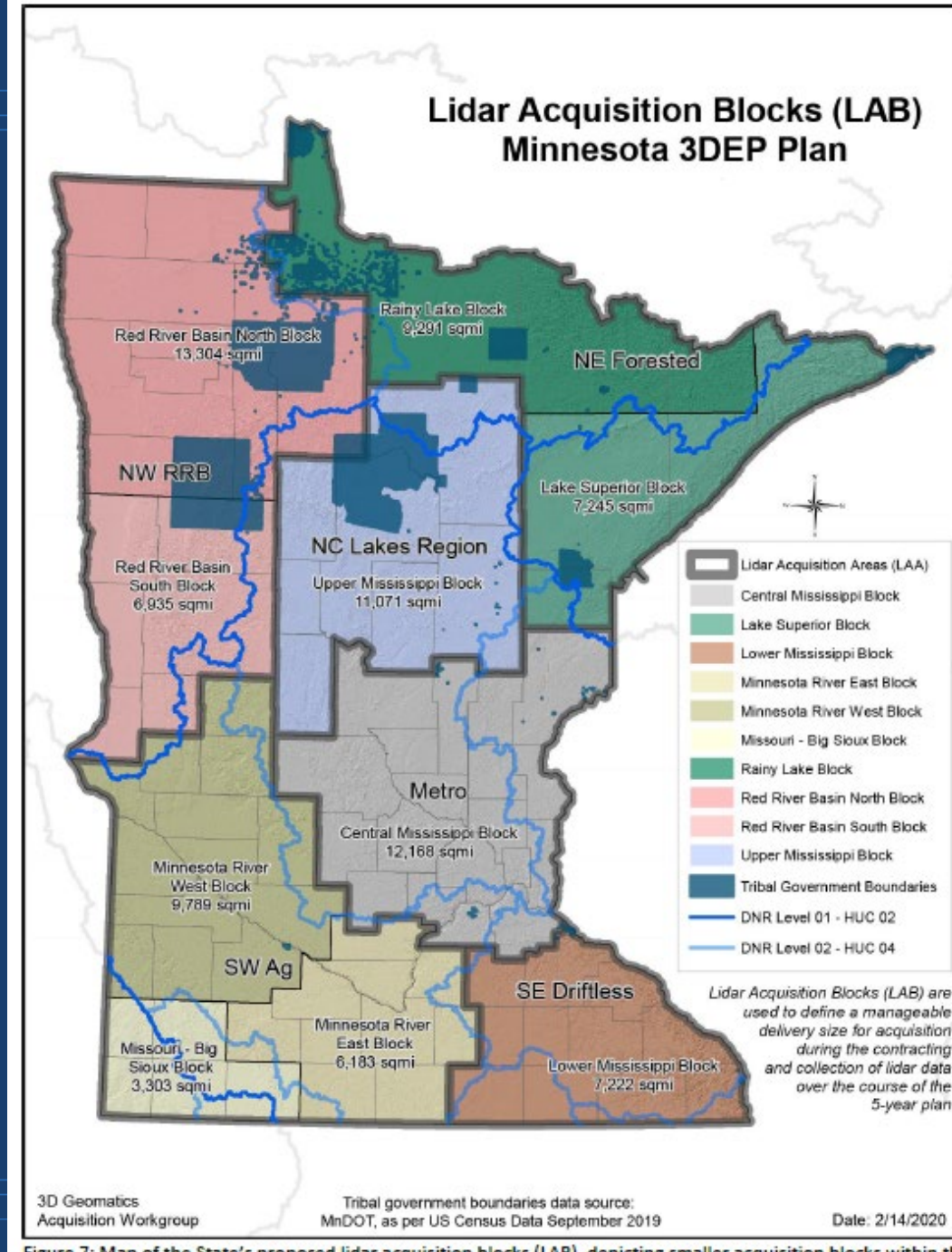
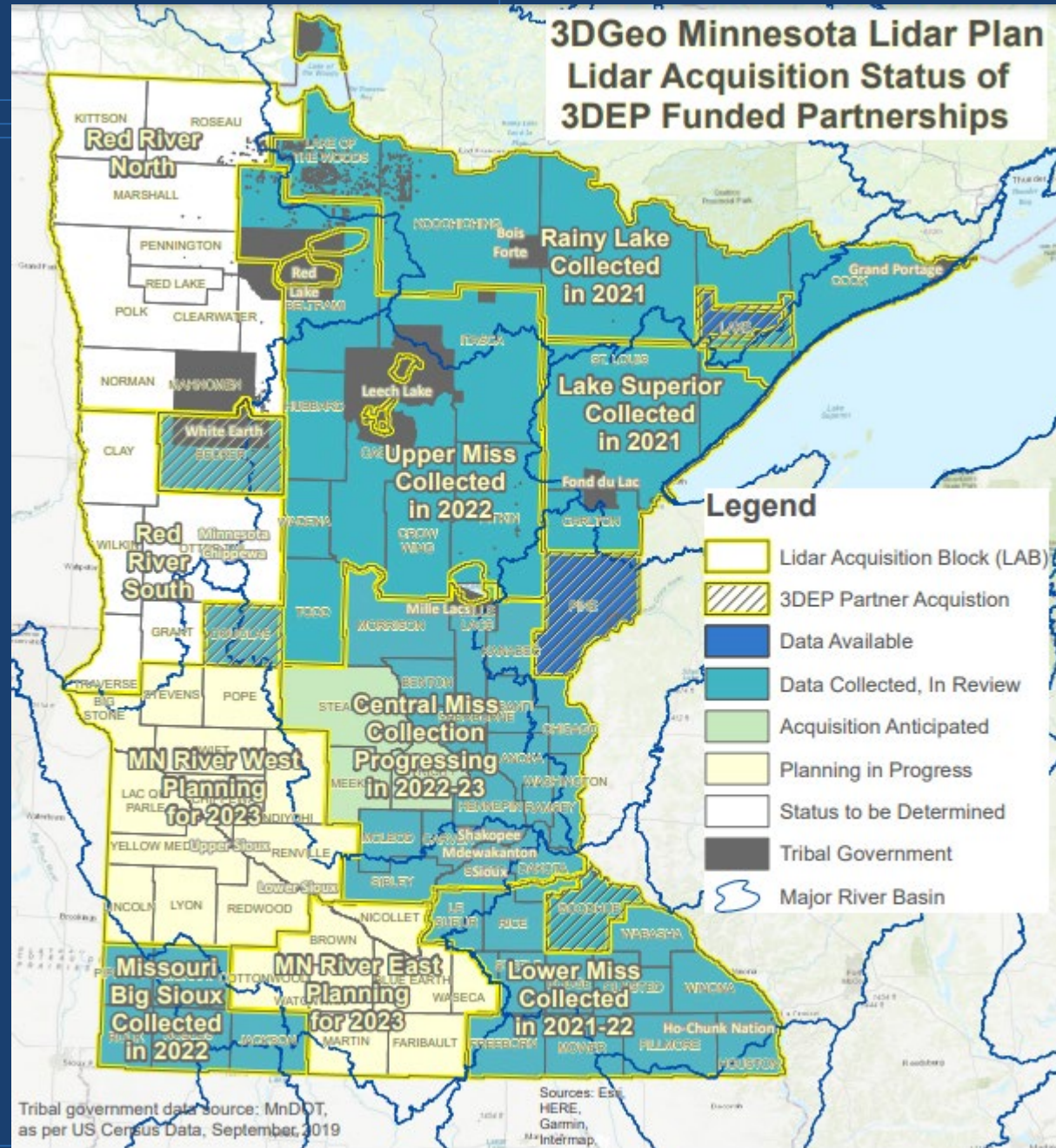


Figure 7: Map of the State's proposed lidar acquisition blocks (LAB), depicting smaller acquisition blocks within the lidar acquisition areas (LAA).



# 3DGeo Minnesota Lidar Plan

## Lidar Acquisition Status of 3DEP Funded Partnerships

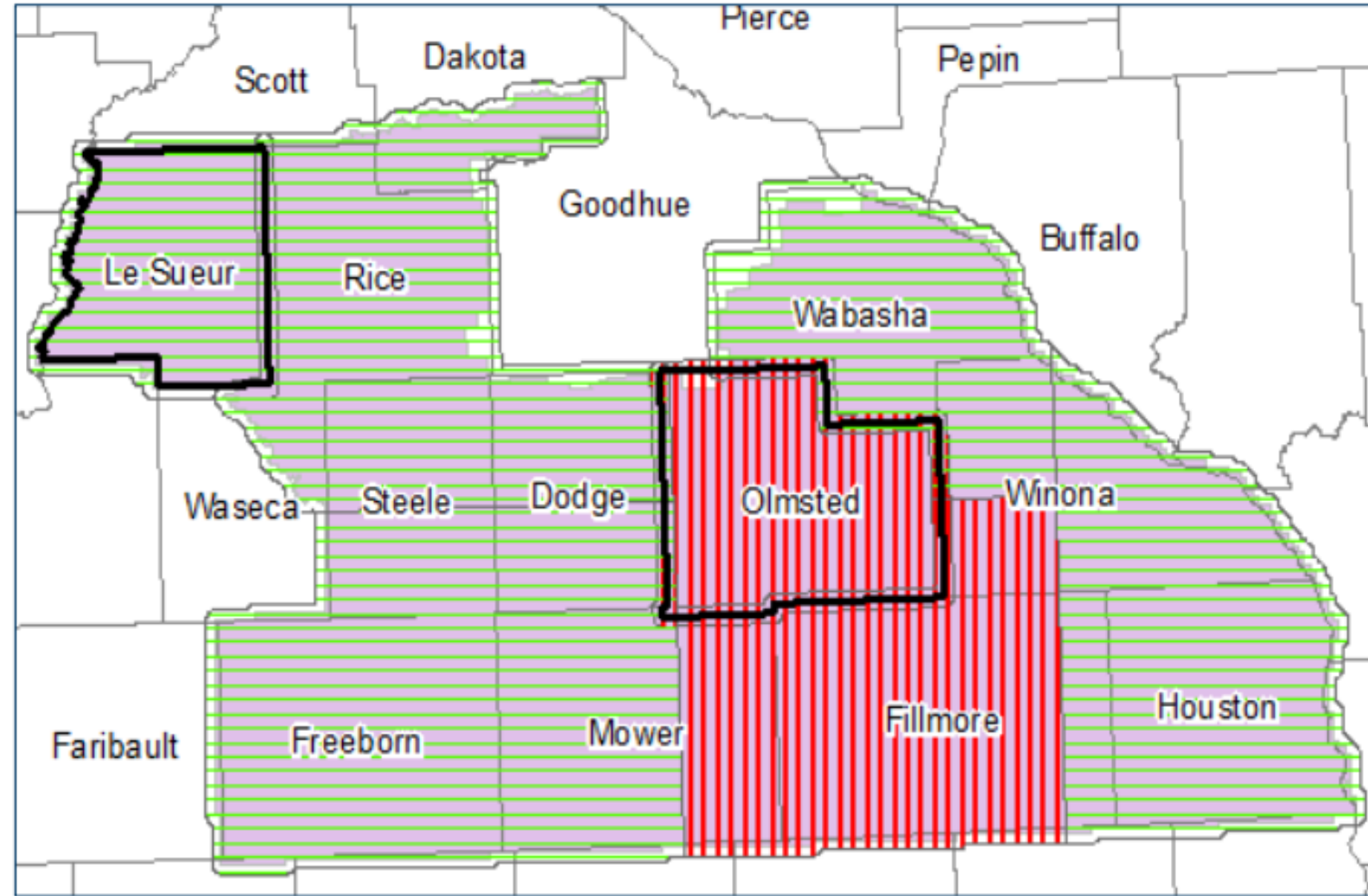


Some anticipated 2022 collections will be completed in spring 2023. Remaining areas need 3DEP partners.



# Description

- Vendor was able to put aircraft on this project following completion of a nearby job.
- Collection was outside of contract, but vendor understands lidar base specification and the QC the data must met for certification
- QLO Counties
  - ASPRS Compliant QLO Lidar
  - Will meet **1.67** cm RMSEz Non-veg accuracy for check points





# QL1 LiDAR Summary

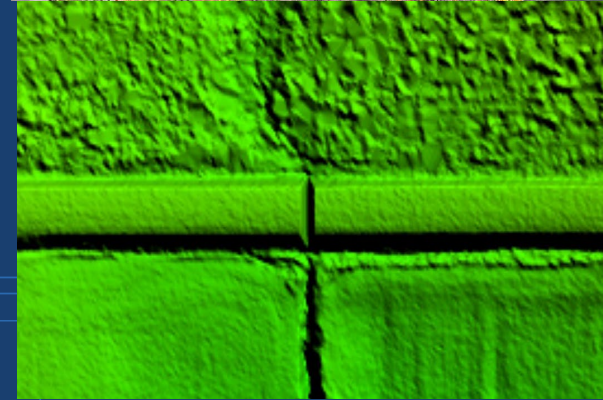
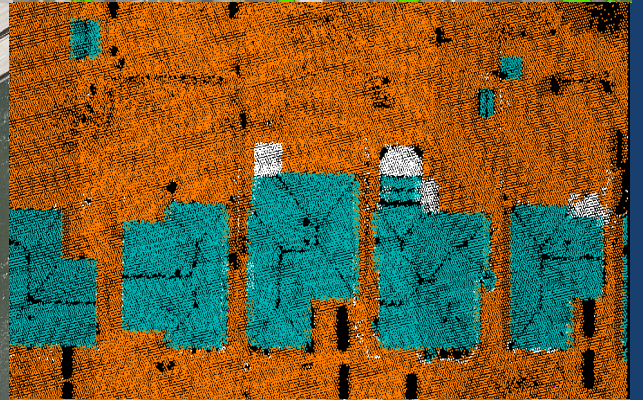
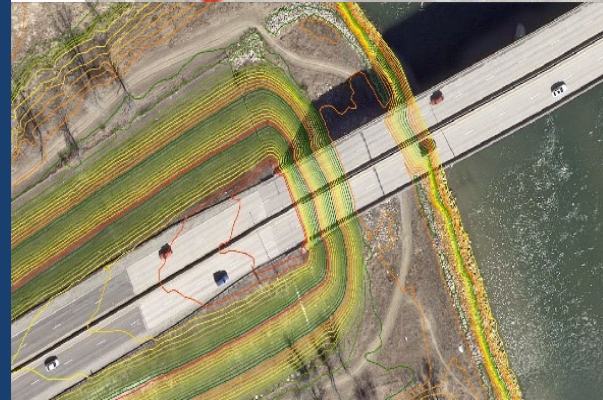
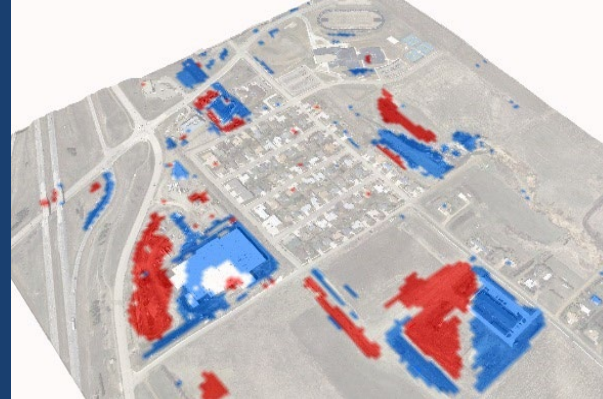
- 8ppm project wide
- Vertical accuracy of 10cm RMSEz
- USGS lidar bases specification
- Hydro Breaklines (100ft streams/2 acre ponds)
- Classified Lidar: Bare-earth, water, bridge decks, noise
- Collect calibration ground control to meet vertical specs
- Vertical accuracy checkpoint collection assessment
- Reports: Data collection, Survey report, Processing report, QA/QC report, FGDC metadata

❖ QL2  
▪ 2ppm

❖ QL1+ (Le Sueur and Olmstead)  
▪ 30ppm, accuracy

# Additional Products

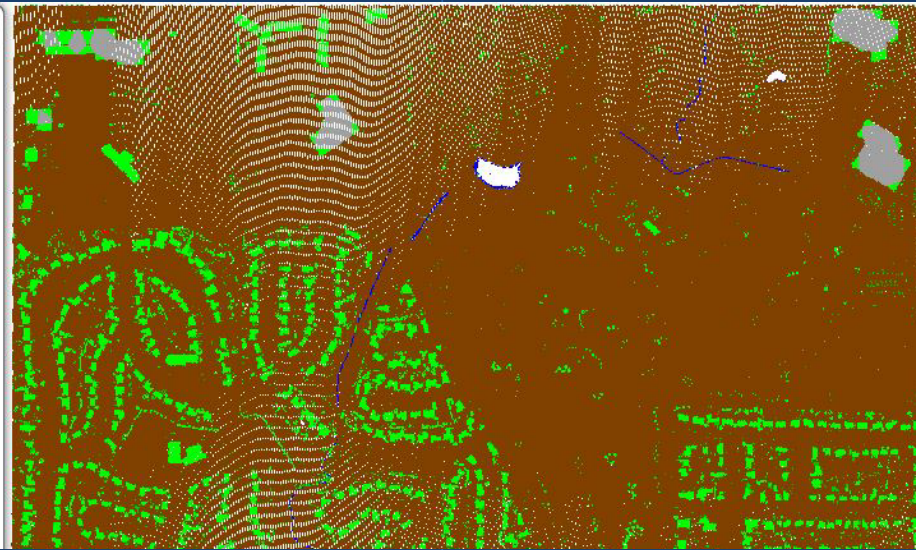
- Improved hydro mapping
- 2D building outlines
- Tree canopy polygons
- 1-ft contour dataset
- Culvert collection from lidar and imagery
- Hydro-enforced DEM
- Slope Analysis
- Erosion susceptibility mapping
- Zoning Analysis
- Map closed depressions
- Asset Mapping
- Digital Surface Model





# Data Keeps getting bigger!

- Existing Data
- QL3 Specifications
- 1 PPM
- 19cm RMSEz



Metadata (13908032.las)

Metadata Statistics Histogram Projection

Returns

Return	Point Count	%	Z Min	Z Max
All Returns	997,801	100.00	1649.97	4337.09
Unknown	0	0.00	0.00	0.00
First	822,511	82.43	1649.97	4337.09
Second	130,247	13.05	1651.93	1858.41
Last	821,580	82.34	1649.97	1865.03
Single	691,565	69.31	1649.97	1865.03
First-of-Many	130,946	13.12	1659.01	4337.09

Attributes

Name	Min	Max
Return No.	1	4
Intensity	0	5100
Class Code	1	21
Scan Angle	-19.00	17.00
User Data	32	32
Point Source	723	724

Classification Codes

Classification	Point Count	%	Z Min	Z Max	Min Intensity	Max Intensity	Syr
1 - Unclassified	9,862	0.99	1650.16	1865.03	0	220	
2 - Ground	709,680	71.12	1649.97	1847.17	0	5100	
3 - Low Vegetation	2,686	0.27	1651.19	1833.97	1	400	
4 - Medium Vegetation	32,070	3.21	1651.73	1838.21	0	3020	
5 - High Vegetation	242,095	24.26	1665.66	1918.72	0	1300	
7 - Low Point (Noise)	71	0.01	1671.82	1799.76	4	131	

Metadata (13908032.las)

Metadata Statistics Histogram Projection **2 PPM, 10cm RMSEz**

Returns

Return	Point Count	%	Z Min	Z Max
All Returns	13,635,726	100.00	1649.66	1895.96
Unknown	0	0.00	0.00	0.00
First	9,804,207	71.90	1649.66	1895.96
Second	2,179,684	15.99	1650.05	1881.53
Last	9,803,956	71.90	1649.66	1865.93
Single	7,624,470	55.92	1649.66	1865.93
First-of-Many	2,179,737	15.99	1654.06	1895.96

Attributes

Name	Min	Max
Return No.	1	4
Intensity	1	4085
Class Code	1	17
Scan Angle	-23.00	23.00
User Data	0	0
Point Source	28	32

Classification Codes

Classification	Point Count	%	Z Min	Z Max	Min Intensity	Max Intensity	Synthetic	Withheld
1 - Unclassified	298,698	2.19	1650.16	1841.04	1	4084	0	
2 - Ground	4,557,818	33.43	1649.66	1846.89	1	4084	0	
5 - High Vegetation	1,955,071	14.34	1656.77	1895.96	1	4082	0	
6 - Building	571,845	4.19	1674.69	1883.84	1	2483	0	
7 - Low Point (Noise)	218	0.00	1656.83	1799.16	1	73	0	
11 - Withheld	6,252,019	45.85	1653.00	1872.25	1	4085	0	

Metadata (13908032.las)

Metadata Statistics Histogram Projection **30 PPM, 5cm RMSEz**

Returns

Return	Point Count	%	Z Min	Z Max
All Returns	615,266,012	100.00	602.28	1237.08
Unknown	0	0.00	0.00	0.00
First	536,970,644	87.27	729.96	1237.08
Second	58,543,497	9.52	602.28	1231.94
Last	536,975,611	87.28	602.28	1221.21
Single	478,430,076	77.76	729.96	1221.21
First-of-Many	58,540,568	9.51	922.83	1237.08

Attributes

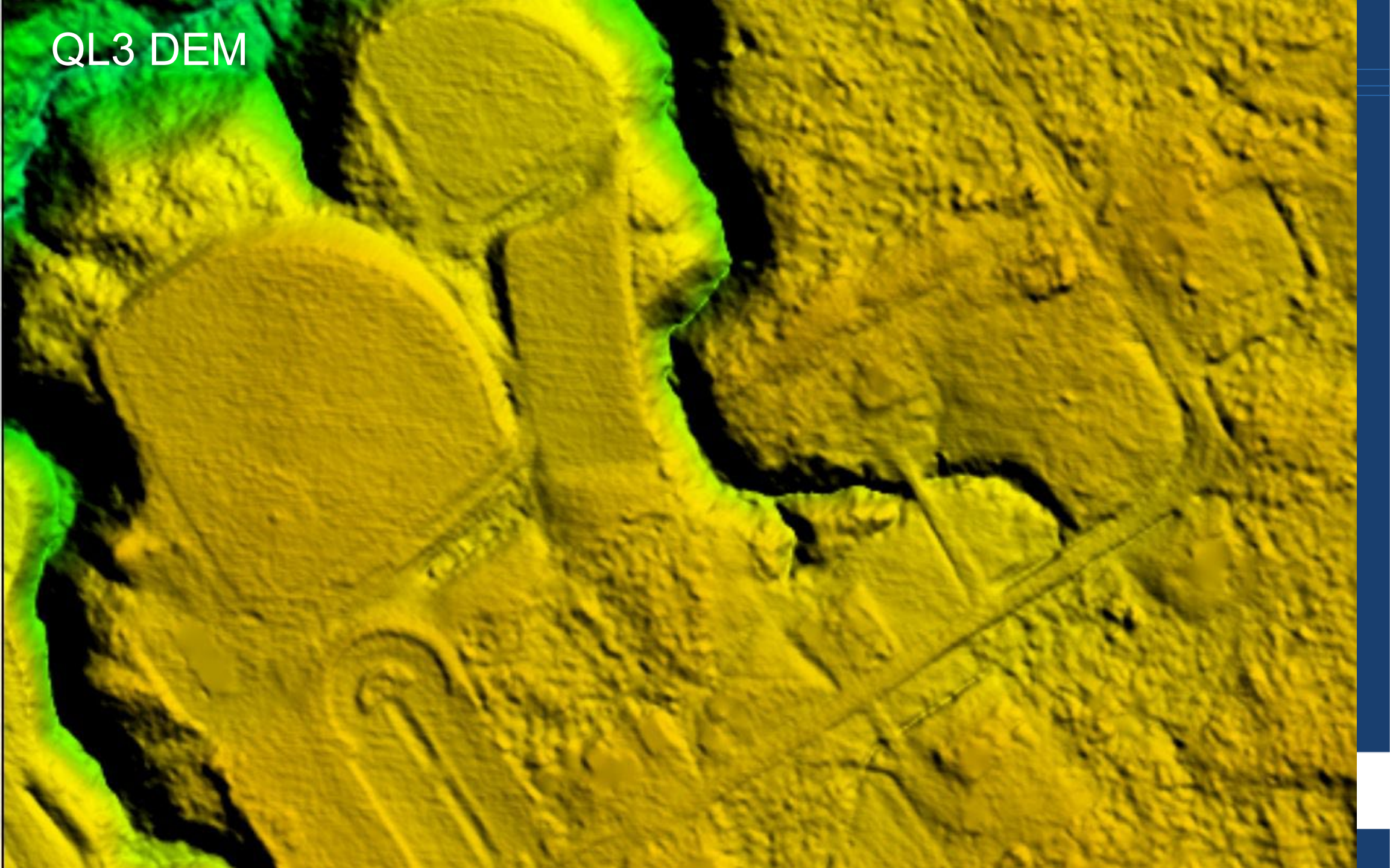
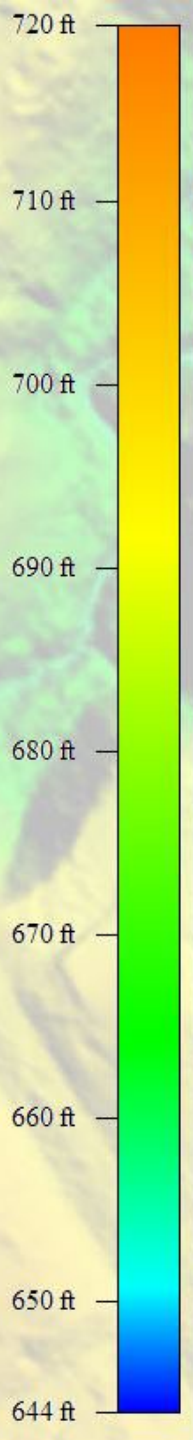
Name	Min	Max
Return No.	1	5
Intensity	1	3710
Class Code	1	1
Scan Angle	-12.00	11.00
User Data	0	0
Point Source	111	2011

Classification Codes



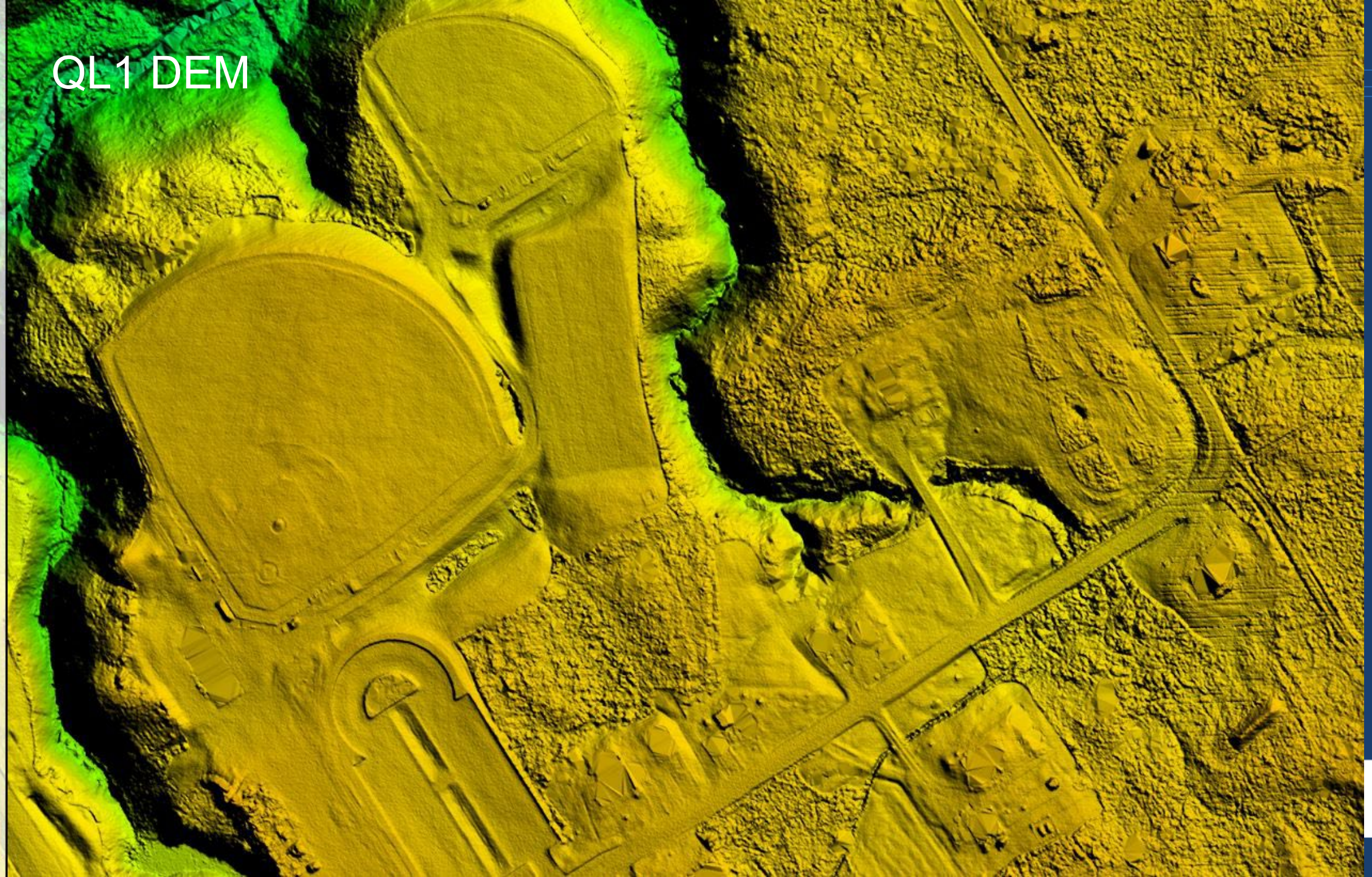
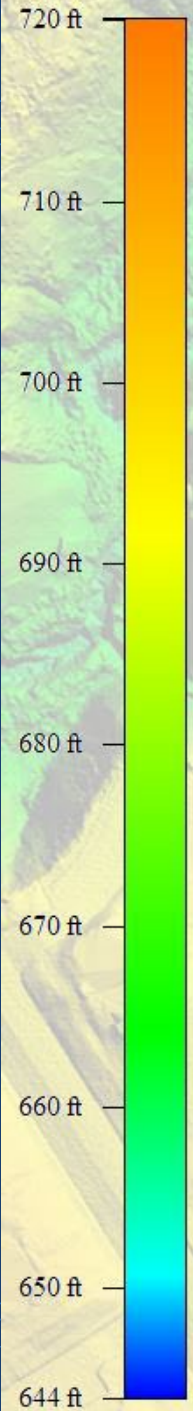


# QL3 DEM





# QL1 DEM





# QL3 Point Cloud





# QL1 Point Cloud





# Data Demo



# Questions?



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