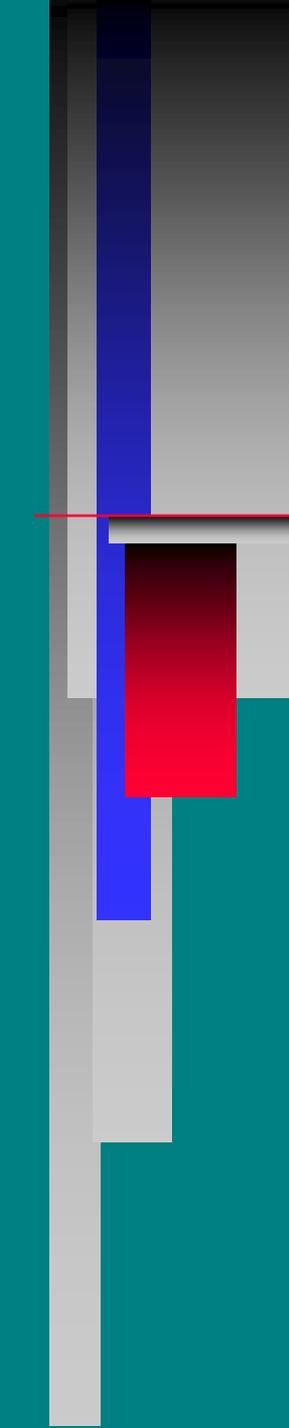


A photograph of a waterfall cascading over reddish-brown rocks in a lush green forest. The water is white and frothy as it falls. The surrounding vegetation is dense and vibrant green, including ferns and various leafy plants. A large, fallen log lies horizontally across the upper part of the waterfall. The text "Welcome to the Workshop" is overlaid in a white, italicized serif font.

Welcome to the Workshop

*2009 AMD Conference
Johnstown, PA*



Photogrammetry

*For the
Environmental
and Engineering
Professional*



Overview

- *Aerial Cameras & Flights*
- *Photo Products*
- *Field Control*
- *Map Compilation & Cad Edit*
- *Field Completion*
- *Digital Imagery, Ortho Photos and LIDAR*
- *Output Formats*
- *Quality Control & Estimating*



Photogrammetry

- *Engineering Design*
- *GIS / LIS Base Mapping*
- *Quantities & Inventories*
- *Land Use & Planning*
- *Change Detection*
- *Classification Surveys (Pipelines)*
- *Flood Studies*
- *Resource Management*
- *Emergency Services*



Aerial Cameras

■ *Conventional Film*

- *Leica, Kern, Zeiss, E. Coyote...*

■ *Digital*

- *Leica, Z/I Imaging, Vexcel, DiMAC...*

Digital Cameras

- *Large and Medium Formats*
- *Push Broom*
 - *Relies on Airborne GPS & IMU*
 - *Records Multiple Views Simultaneously*
- *Frame Capture*
 - *Z/I Has 8 Lenses W/12 Micron Pixel (340 MB Per Exposure)*
 - *Multiple Sensors, Color, B&W, CIR*
 - *Has 4096 Color Levels Available (Film 254 Color)*
 - *Works More Like a Conventional Aerial Camera*
 - *Relies on Airborne GPS*
- *Both Types*
 - *Multiple Sensors, Color, B&W, CIR*
 - *Idea for Image Classification Studies*
- *Geometric Accuracy*



Aerial Cameras

- *Built for Precision, Calibrated by USGS*
Focal Lengths ~ 3 1/2, 6 & 12 Inch
- *Fiducial Marks*
- *Forward Motion Compensation (FMC)*
- *Gyro-Stabilized*
- *Inertial Measurement Unit (IMU)*
 - *Tracks: Altitude, Location, Roll, Pitch, Yaw*
- *Airborne GPS*



Aerial Film Types

- *Panchromatic - Black & White*
- *Natural Color*
- *Black & White IR*
- *Color IR*
- *Negative & Positive*



Photo Mission

■ *Flight Seasons*

- *Leaf-On* *Leaf-Off* *Sun Angle*

■ *Weather*

- *Snow* *O/C* *Clouds*

■ *Site Conditions*

- *High Walls* *Water Levels* *Tides*
- *Tall Buildings* *Brush* *Crops*

■ *Flight Area*

- *Accurate Map* *Outline of Area*

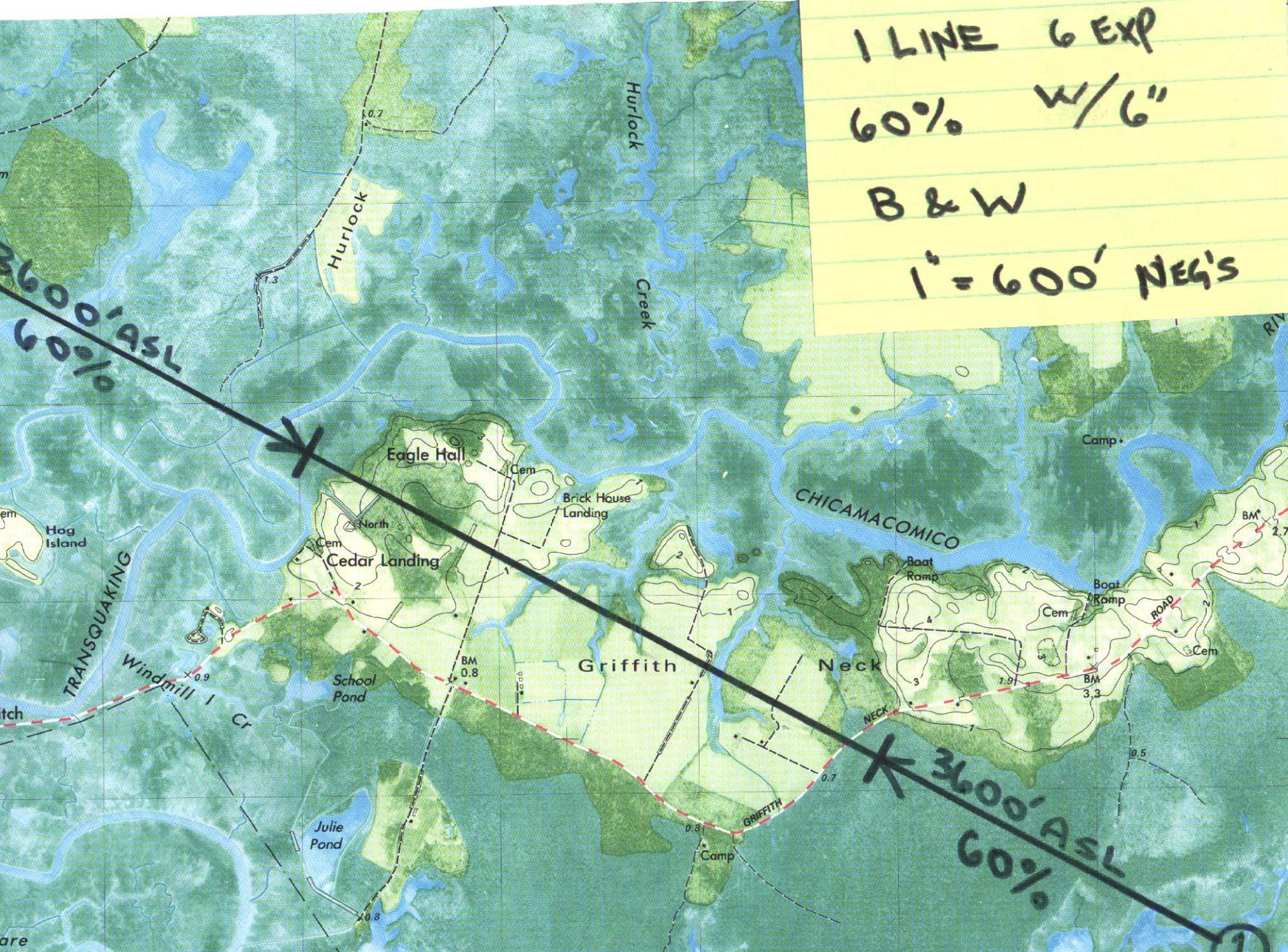


Super Low Altitude Flights





1 LINE 6 EXP
60% W/6"
B & W
1" = 600' NEG'S



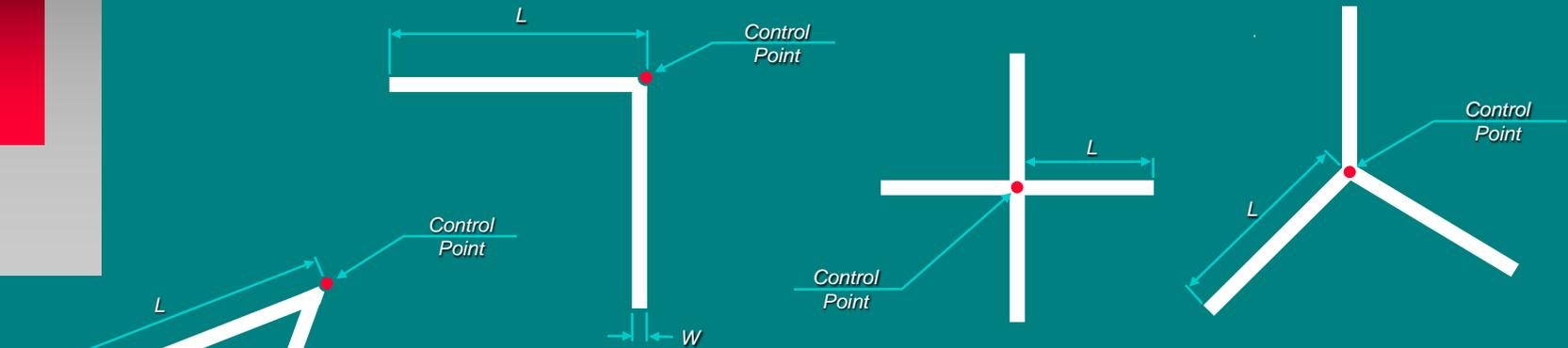


Field Control

- *Stereo Model ~ Scale & Level*
- *Feet or Meters ?*
- *Datum Systems*
 - *NAD 1927 NAD 1983 / 19***
 - *NGVD 1929 NAVD 1988*
- *Local & Site*
- *Grid or Scale Factor*
- *GPS & Airborne GPS*
- *Monumentation, If by others ask for a report.*
- *Closure Requirements*



Panel Shapes & Sizes



Mapping Scale

1"=400'

1"=400' to 1"=800'

1"=800' to 1"=1200'

1"=1200' & Over

W

6"-12"

18"-24"

24"

24" to 36"+

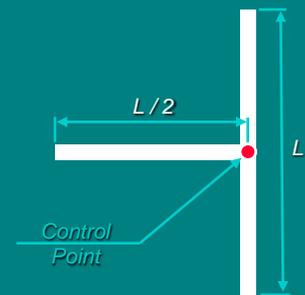
L

6'

12'

16'

24' Min.



1094355
1094377

1094555
1094577

1094179

1094299



Paneling Information

Maximum contrast between the target and its background is of primary interest. White material in areas of dark background and black in areas of light. On hard surfaced roads oil based paint is recommended, keeping out of the high traffic areas if possible. If needed a white panel can be

outlined with black material of approximately two panel widths to improve contrast.

While just about any material can be utilized for panels, oil based paint and roll plastic are the accepted materials. Plastic material can be secured with rocks, spikes wires, etc. Also in areas of high wind wire or plastic mesh can be used to extend durability. Painted boards could also be used as a alternative.

Just as in other areas of field survey we must place special consideration as to the location and material utilized in this process. The material can be ingested by livestock, destroyed by vandals or removed by property owners whom were never contacted.







4053



5062 ✓



4063



0199

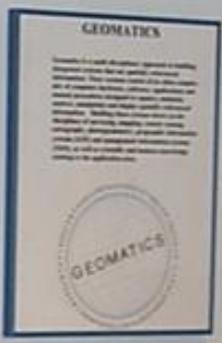


5063 ✓



Stereo Plotters

- *Optical Projection Instruments*
 - *Kelsh, Ballplex, Multiplex, Etc.*
- *Analog Plotters*
 - *PG-2, B-8S, Santoni 2C, Etc.*
- *Analytical Plotters*
 - *Zeiss P Series, Kern DSR Series*
 - *Wild BC Series, Etc.*
- *Softcopy*



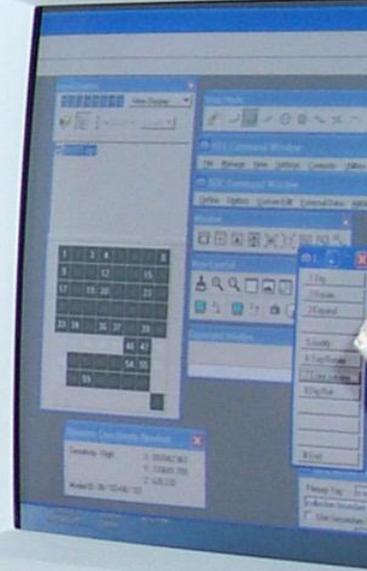
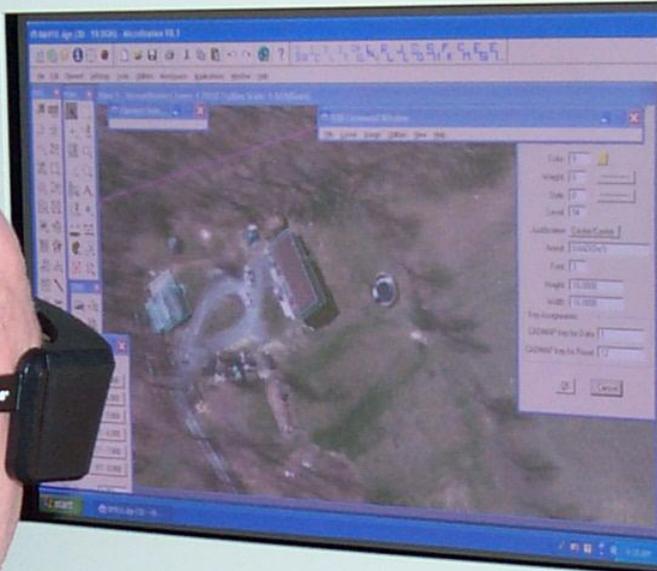
Softcopy

- *100% All “Digital Flow” on Larger Projects*
- *Works Very Well With Digital Camera Output*
- *Accuracy Equal to Conventional High End Analytical Plotters*



LAND MAPPING SERVICES
PROFESSIONAL
SERVICES

Map Showing
Property Owned By



Map -
working on
4/1/07

Don
504-9307

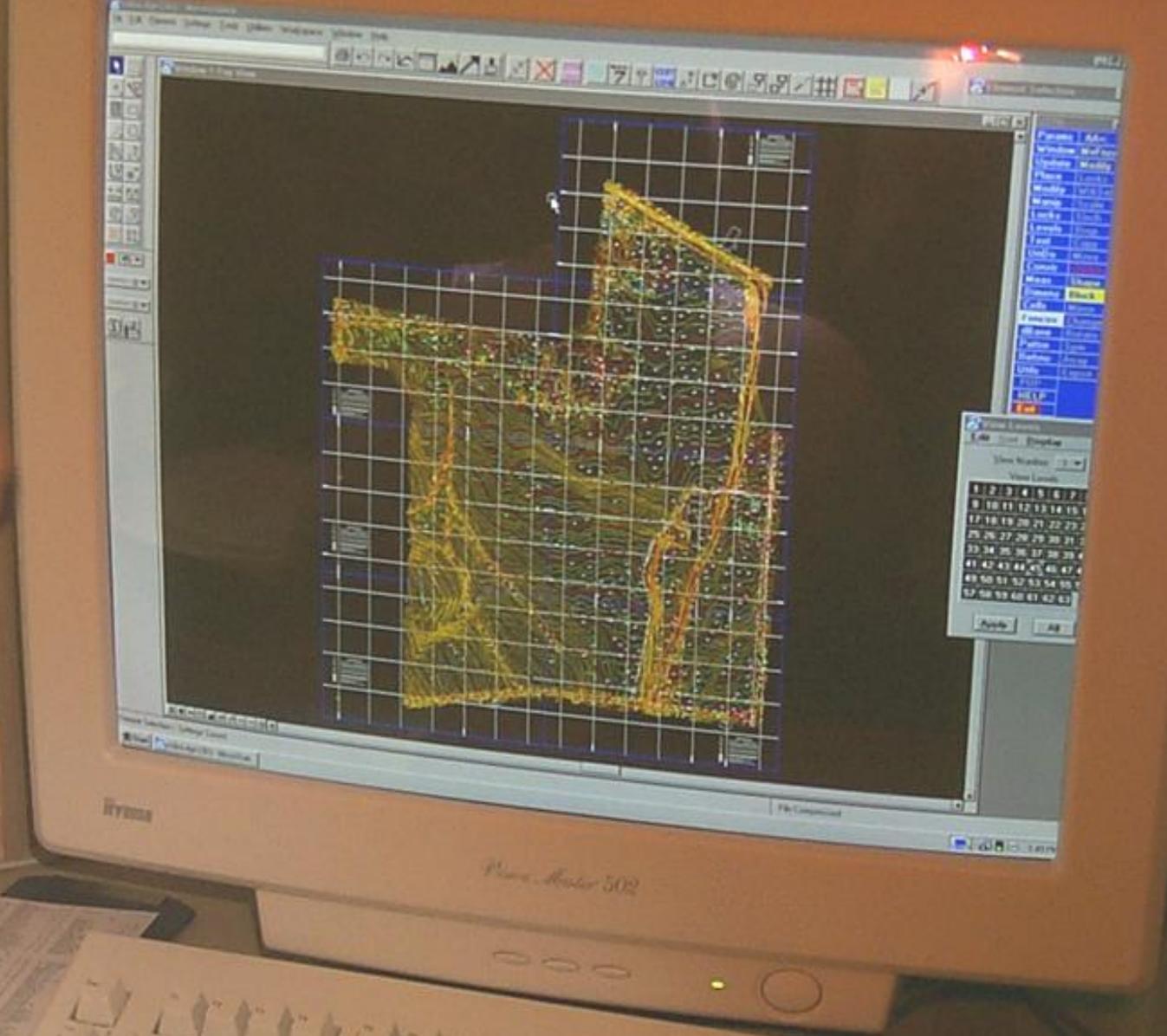
Map Compilation

- *Collection Procedures*
 - *Planimetric*
 - *Topographic*
 - *DTM & DEM*
- *Features & Content*



Cad Edit

- *Data Layers, Levels & Colors*
- *Sheet Layout “Seamless”*
- *Smoothing & File Size*
- *Translations*
- *Digital Images*



View Number	View Levels
1	0
2	10
3	11
4	12
5	13
6	14
7	15
8	16
9	17
10	18
11	19
12	20
13	21
14	22
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55	63



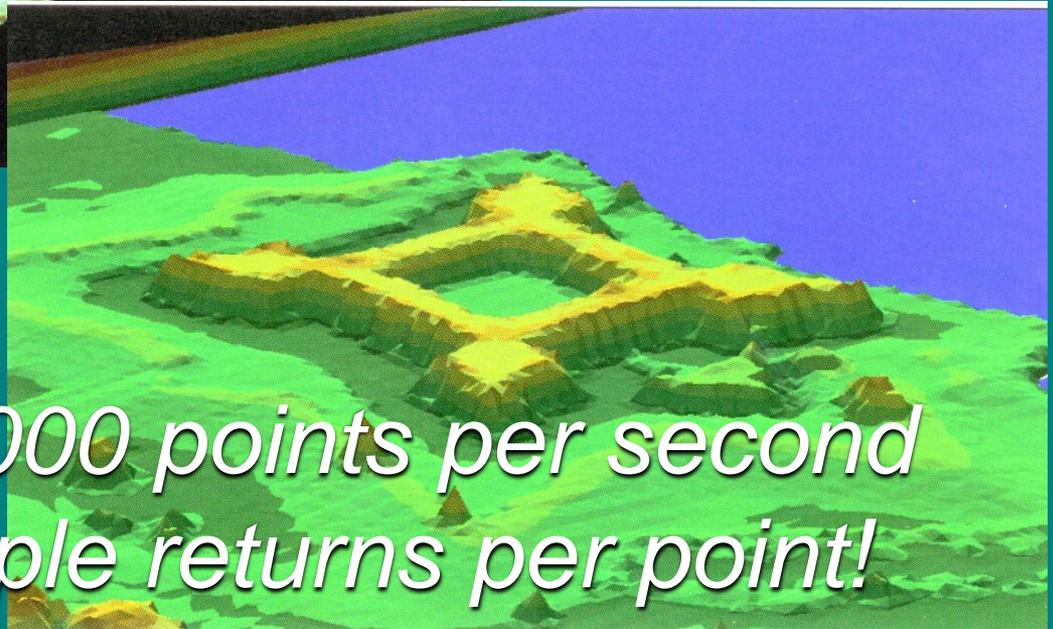
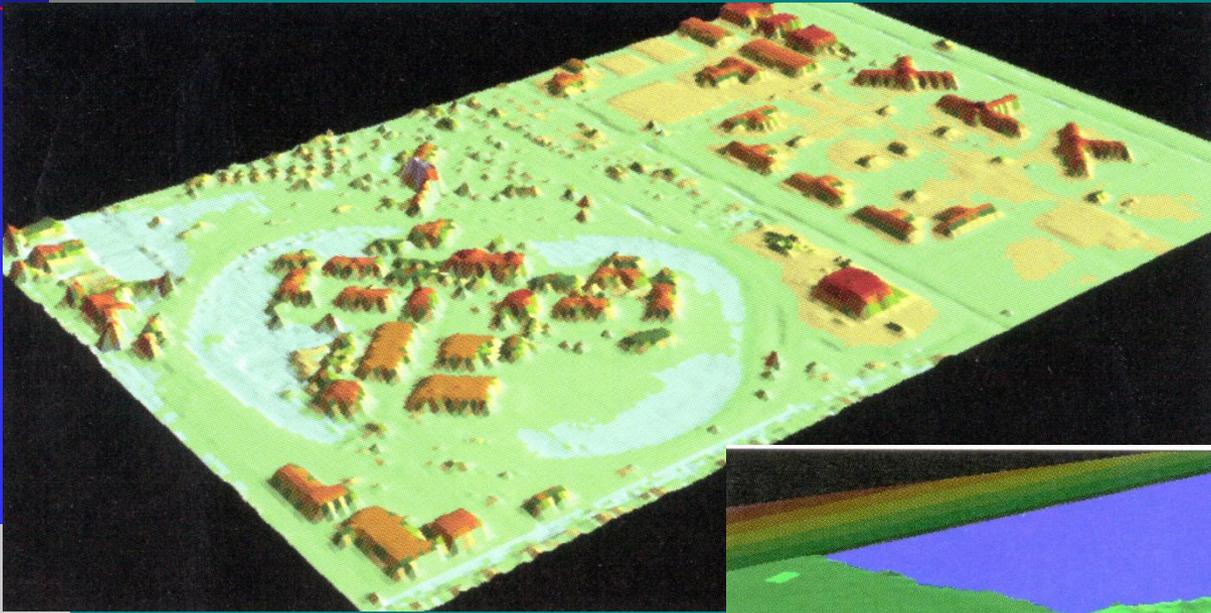
Digital Products

- *Raster & Vector*
- *Base Mapping*
- *Digital Orthos*
 - *Scanning Resolution*
 - *Sheet Center Photography*
- *Imagery*
- *Backdrops*

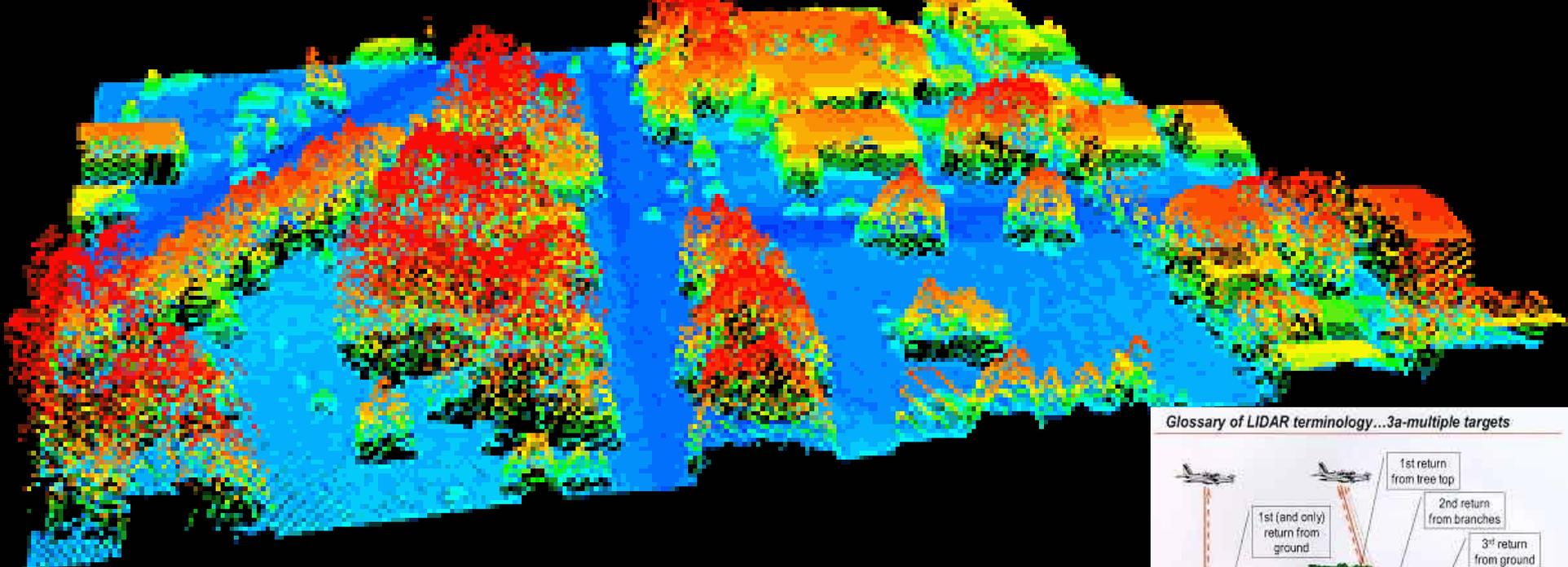


LiDAR

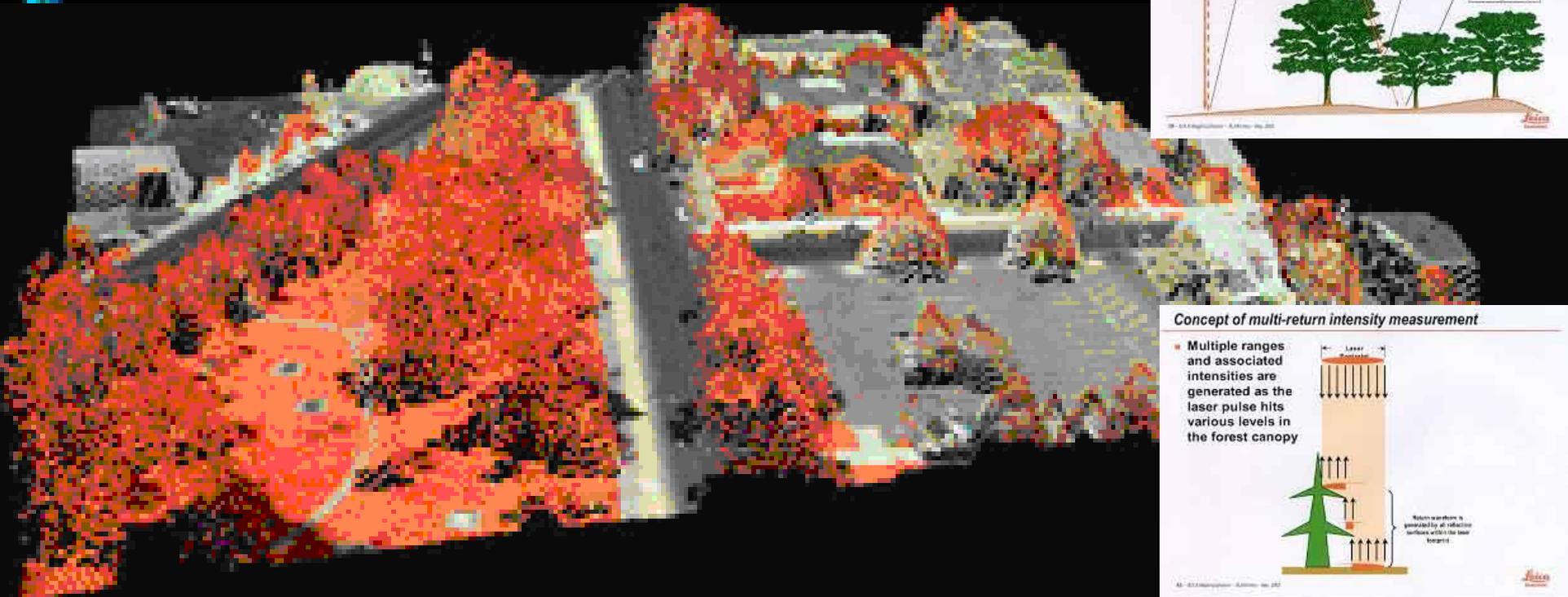
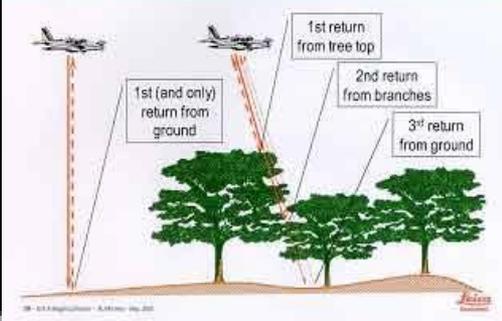
(Light Detection And Ranging)



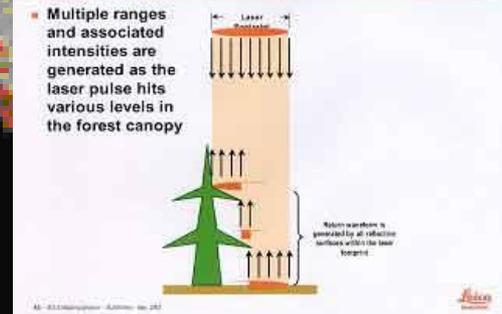
*Over 100,000 points per second
with multiple returns per point!*



Glossary of LIDAR terminology...3a-multiple targets



Concept of multi-return intensity measurement

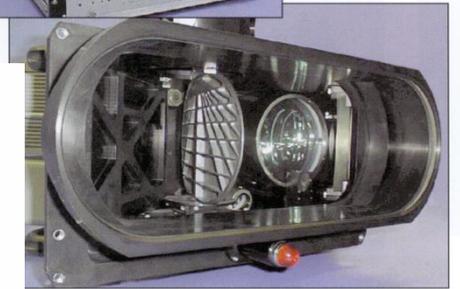


LiDAR Units

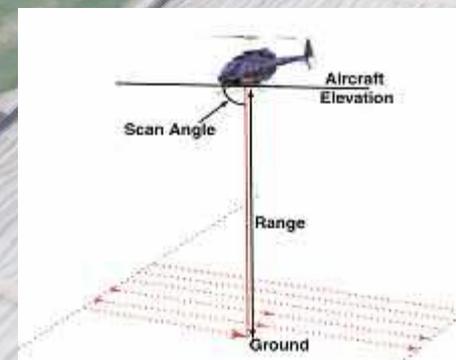
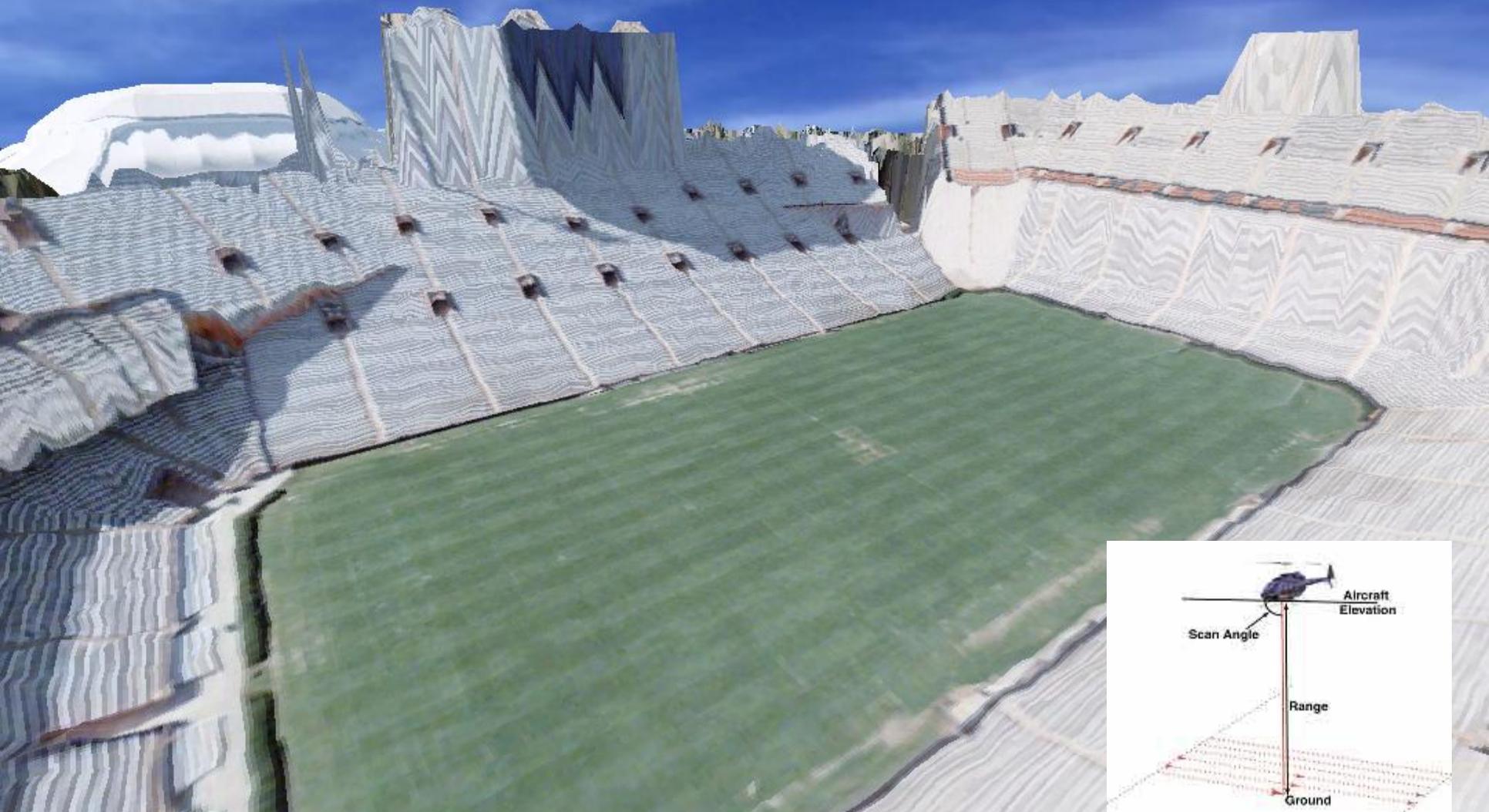


◀ Top:
Aeroscan System
Processor Rack

Bottom:
Aeroscan Scanner
Mirror and Lens
Assembly ▼



"Color aerial photography draped over LIDAR surface model, University of Florida stadium."





Output Formats

- *Operating Systems*

- *PC / Workstation*

- Software Format*

- *Intergraph*

- *AutoCAD*

- *ARC / INFO*

- *Map Info*

- *And Many More*



Data Sources

■ *Private*

- *Aerial Photography Firms*
- *Photogrammetry Firms*
- *Large Tract Holders ~ Timber, Mining Etc.*

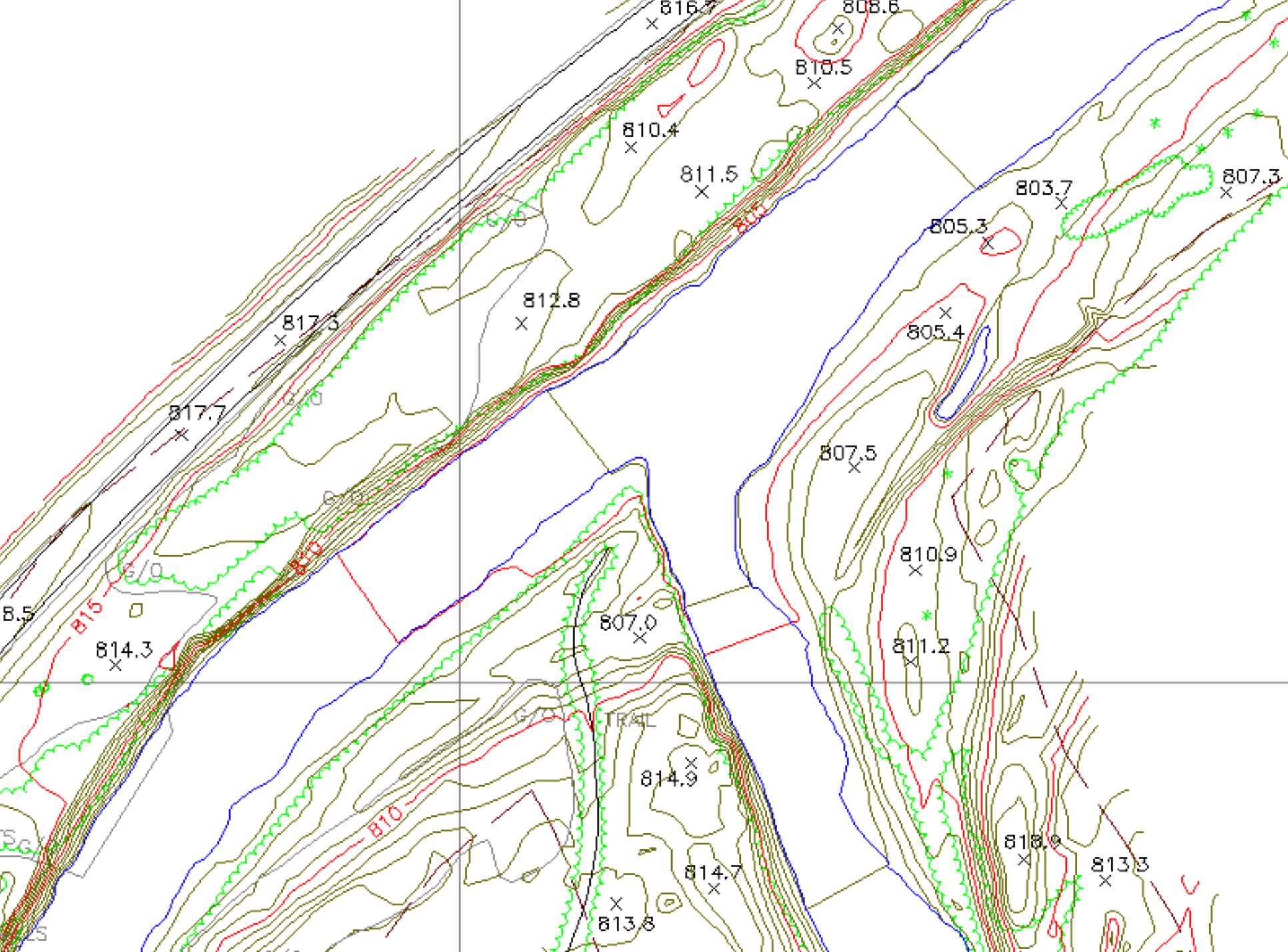
■ *Public*

- *Local*
- *State*
 - *PA Map Program, State Forest, DOT, SCS / CO-OP Ext., Etc.*
- *Federal*
 - *USGS, NAPP / NHAPP, USDA, US Army COE*



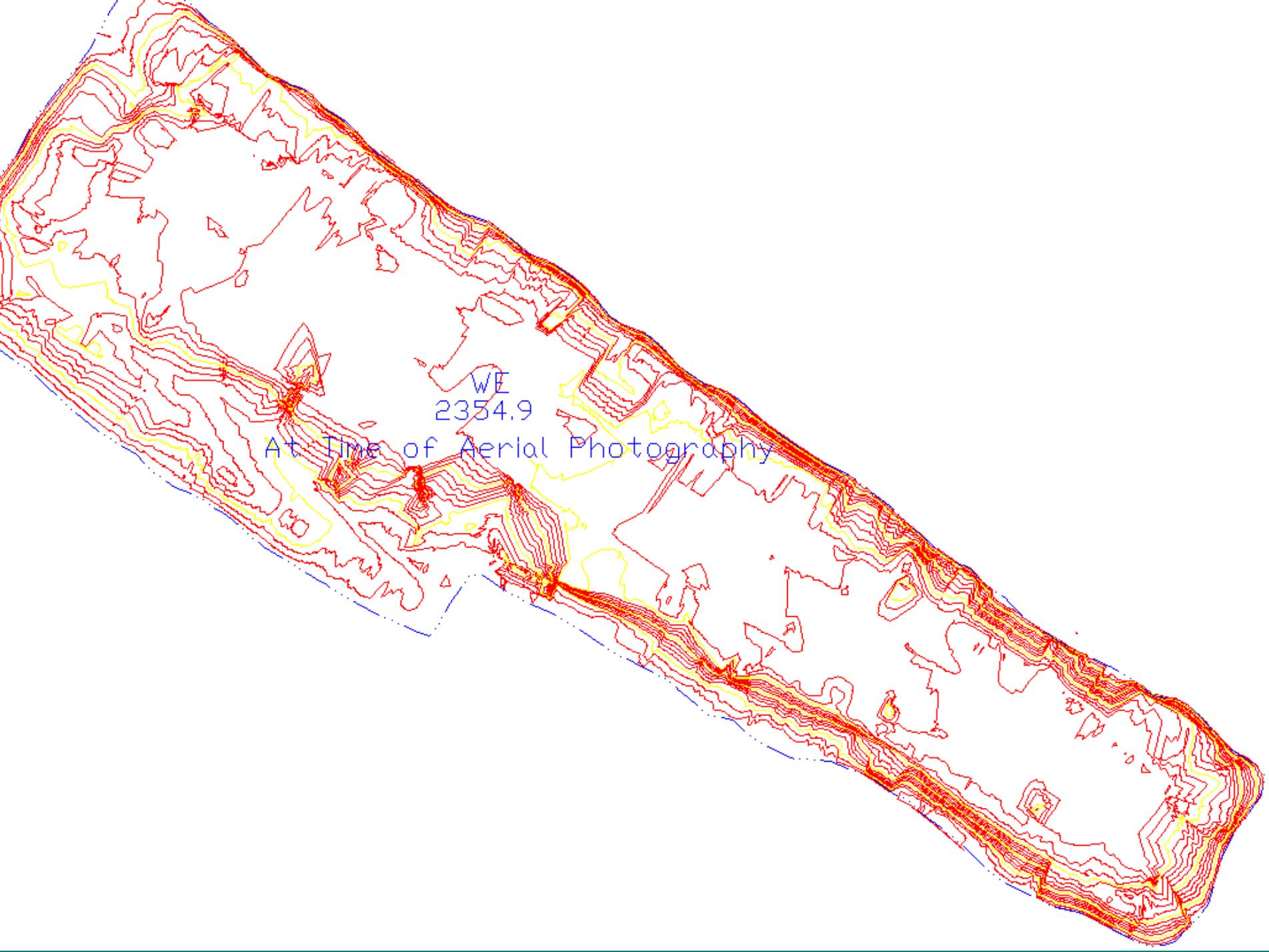
Field Completion & Edit

- *Preliminary Mapping*
- *Field Location Methods*
 - *Swing Ties*
 - *Station Offset*
 - *Total Station*
 - *GPS*
- *Missing Information*
 - *Obscured & Shadow Areas*
 - *Building Lean*
 - *Addition of Underground Utilities*



Estimating

- *Area of Coverage*
 - *Allow coverage to bring in utilities, buffer area, intersection improvements, etc.*
- *Working Scale, Contour Interval, Accuracy*
- *New Vs. Existing Photography*
- *Flight Seasons & Weather*
- *Control Requirements (Future Use)*
- *Site Conditions, Access, Locked Gates*
- *Digital Formats, Levels, Layers, Colors, Etc.*
- *Shipping Media*



WE
2354.9

At Time of Aerial Photography

Jumbo Mapping Services

“Providers of the most technologically advanced solutions available in the industry today”

Jumbo Mapping Services invites your inquiry for an estimate on your next surveying and mapping project. So that we may respond accurately, please complete the attached *“Fax Quote”*.

Client: _____

Attn.: _____

Phone: (____) ____ - _____ Fax: (____) ____ - _____

Project Name: _____

Project Location - City: _____ State: _____

Quad Name: _____

Property, R/W or Boundary Survey Required Yes No

Aerial Photography Required: Yes No (If provided at What
Negative Scale 1”= _____ & Source _____)

Sets of Photo’s Required: 1 2 3 _____

Additional Photo Products: _____

Include a Quote for Field Control. Yes No

If Required, What Datum’s. Horiz.: _____ Vert.: _____

Mapping Scale: 1”= _____’ Contour Interval: _____

Hard copy Requirements: Mylar Paper

Final Computer Output Format: _____

Shipping Media for Digital Files: 3 ½” CD DAT Tape

Cartridge Tape (Type _____) Other _____

Other Specifications or Requirements: _____

Anticipated Schedule: _____

Additional Information Required: Jumbo Brochure SF255

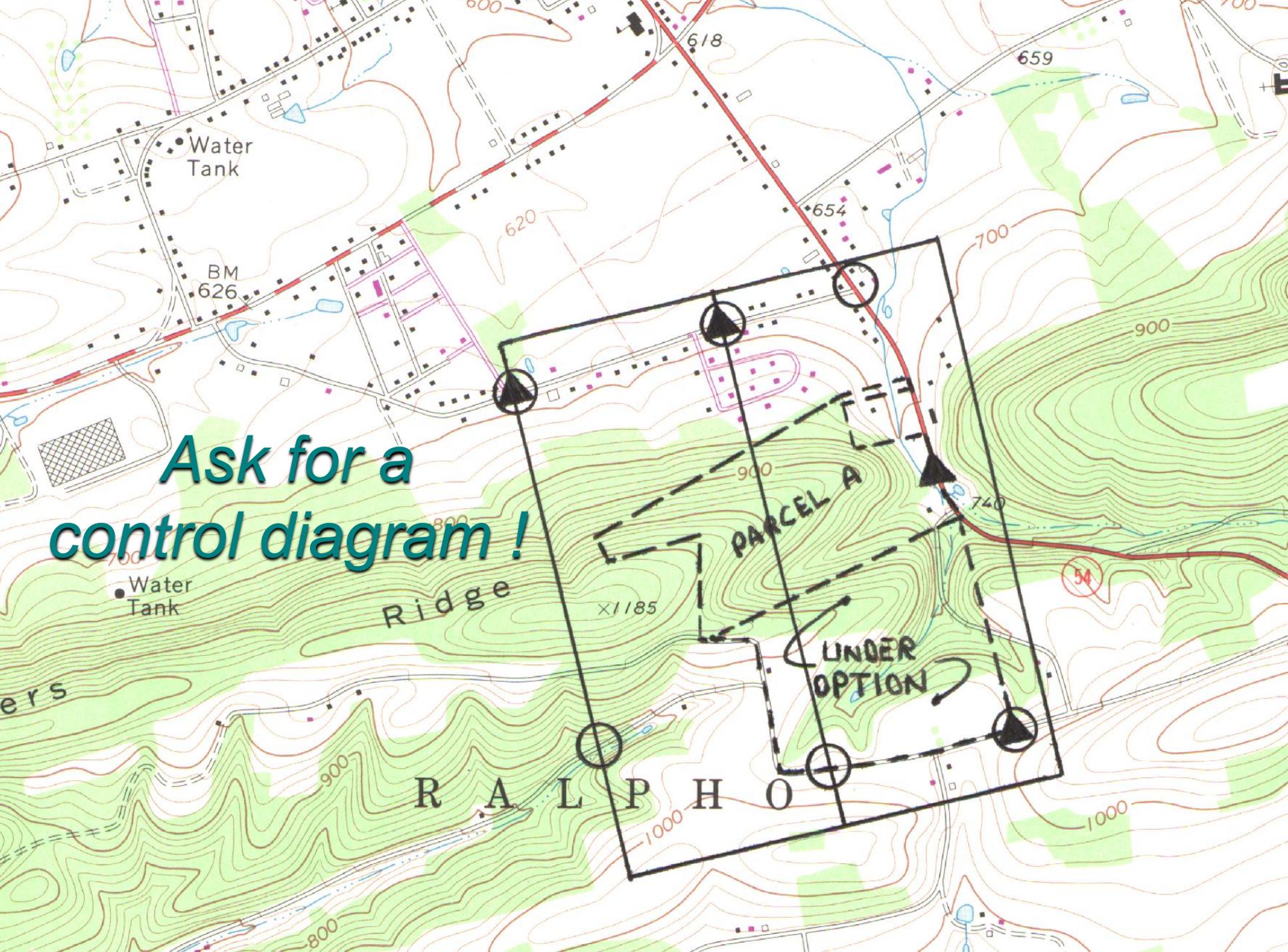
Sample Digital Files Equipment Listing

Call to setup a meeting

“Jumbo Mapping Services ~ Committed to Excellence”

Be sure to visit our web site @ www.jumbo.com

**Ask for a
control diagram!**





P A S D A

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The Pennsylvania Geospatial Data Clearinghouse

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Aerial Photography



Topographic Maps



State-wide Data



Browse FTP



Download New Data

- **PAMAP LiDAR**

data now available for download [Quick Link>>](#)

- **Allegheny County**

data now available in Mapservices and for download [Quick Link>>](#)

- **PAMAP Imagery**

- Imagery now available in Mapservices and for download [Quick Link>>](#)

- **DVRPC Imagery**

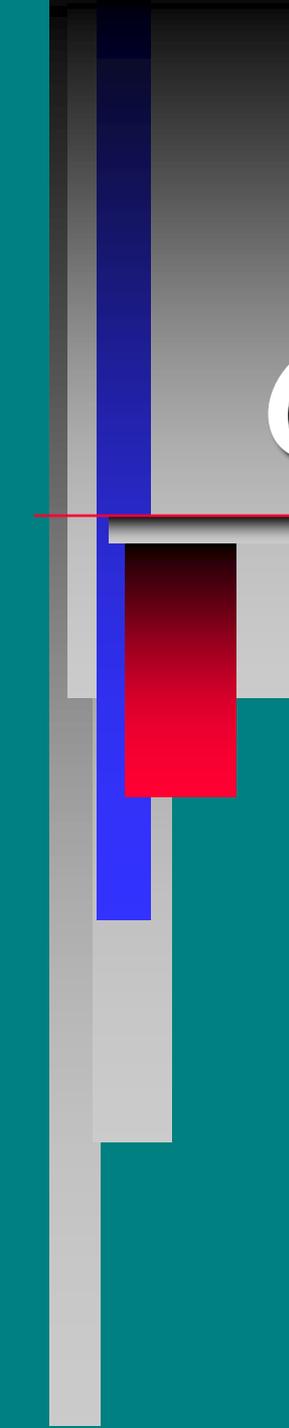
-

Imagery now available in Mapservices and for download [Quick Link>>](#)

- **FEMA DFIRM**

flood insurance rate map data by county is now available for download [Quick Link>>](#)

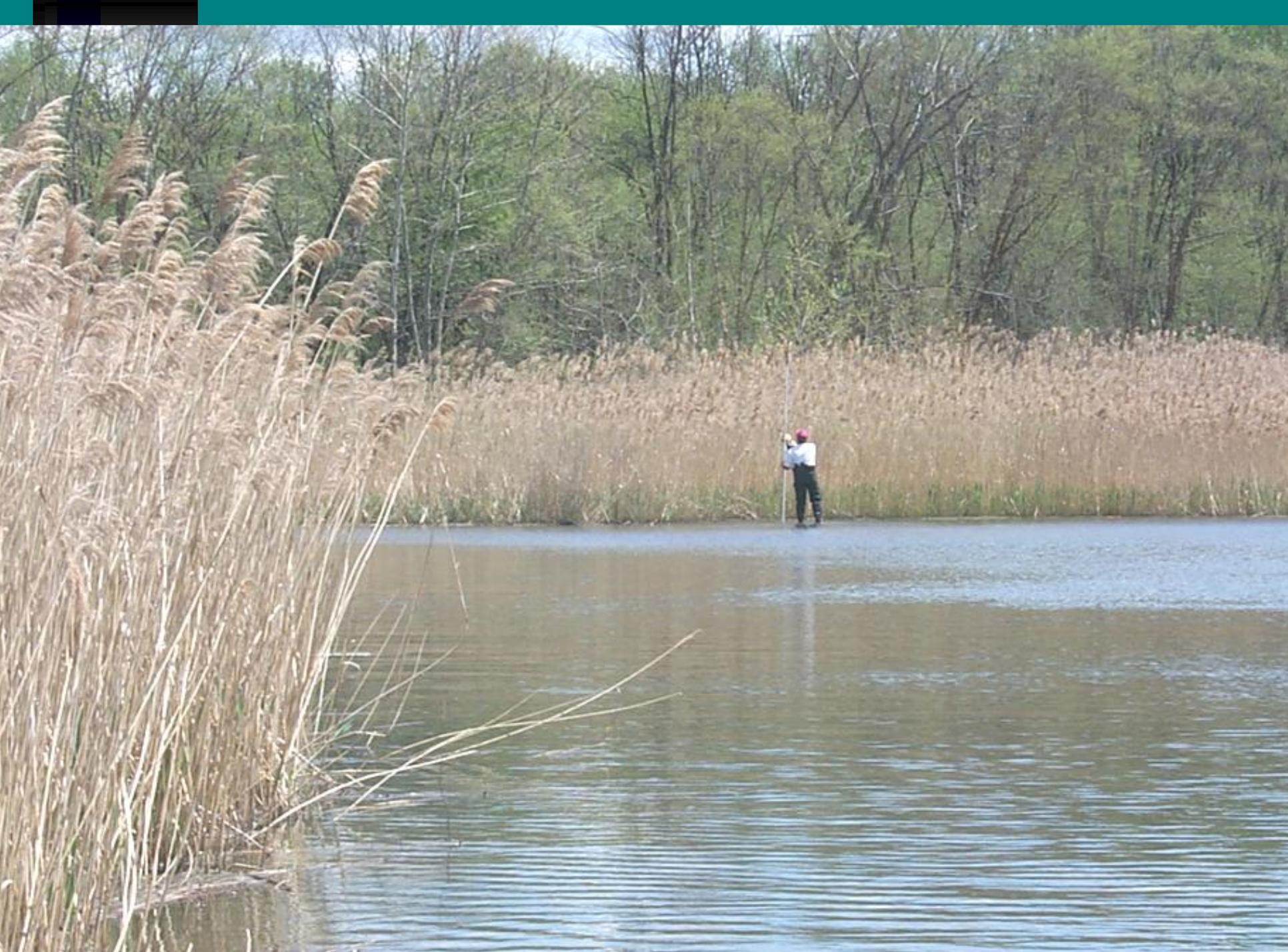




Contact Information

Jeff Gilmore

jgilmore@mapres.com





The End