Tennessee Department of Transportation

Field and Aerial Survey Initiatives

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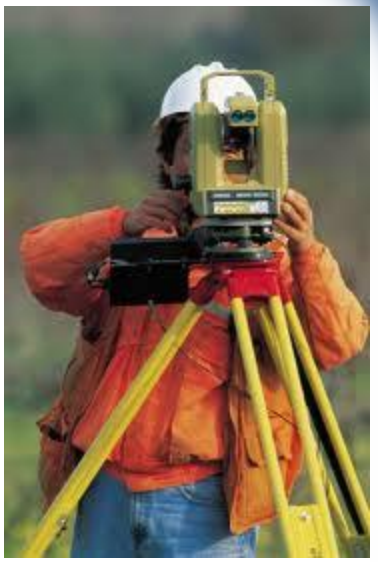
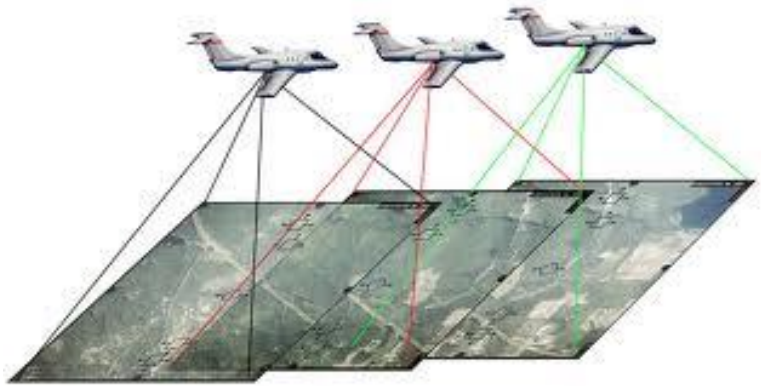
Design Division

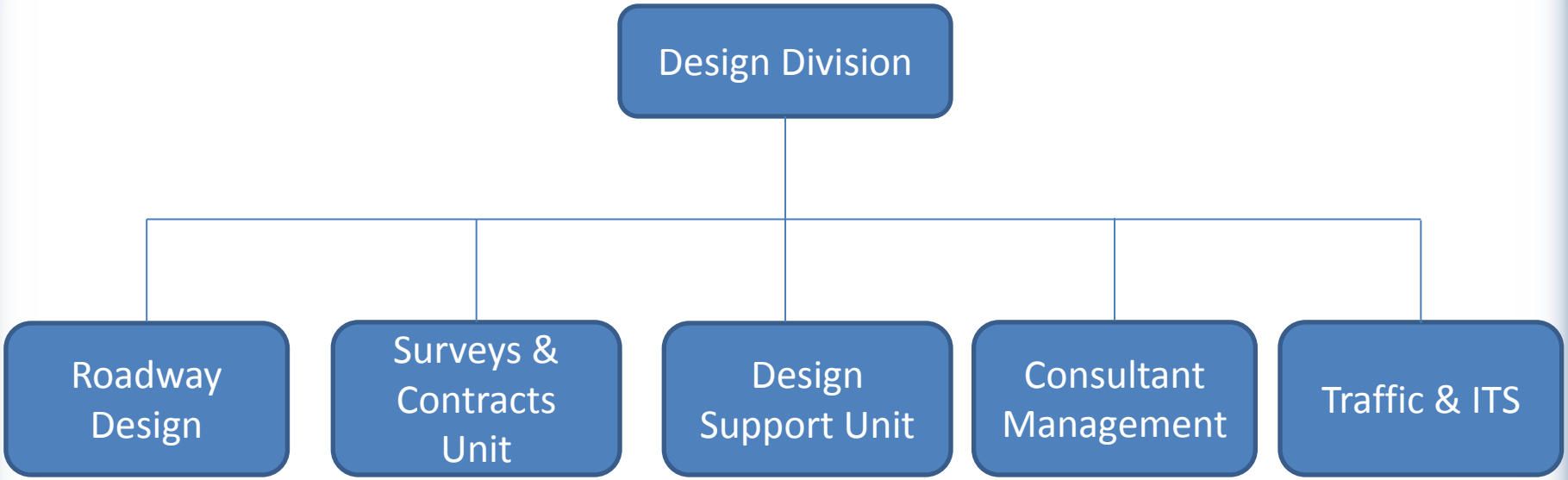
Discussion Topics



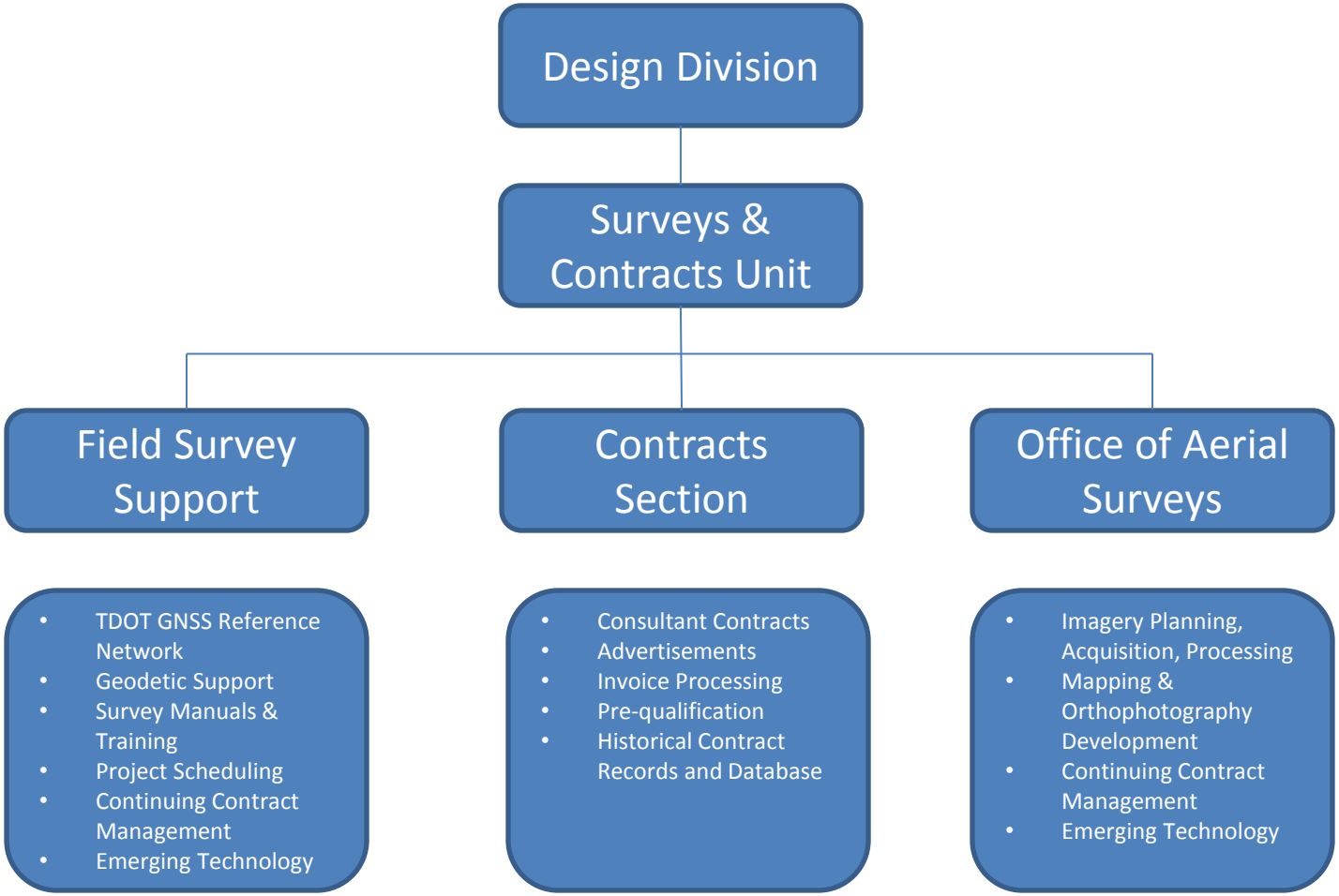
- Organization
- Survey Initiatives
- Aerial Survey Initiatives



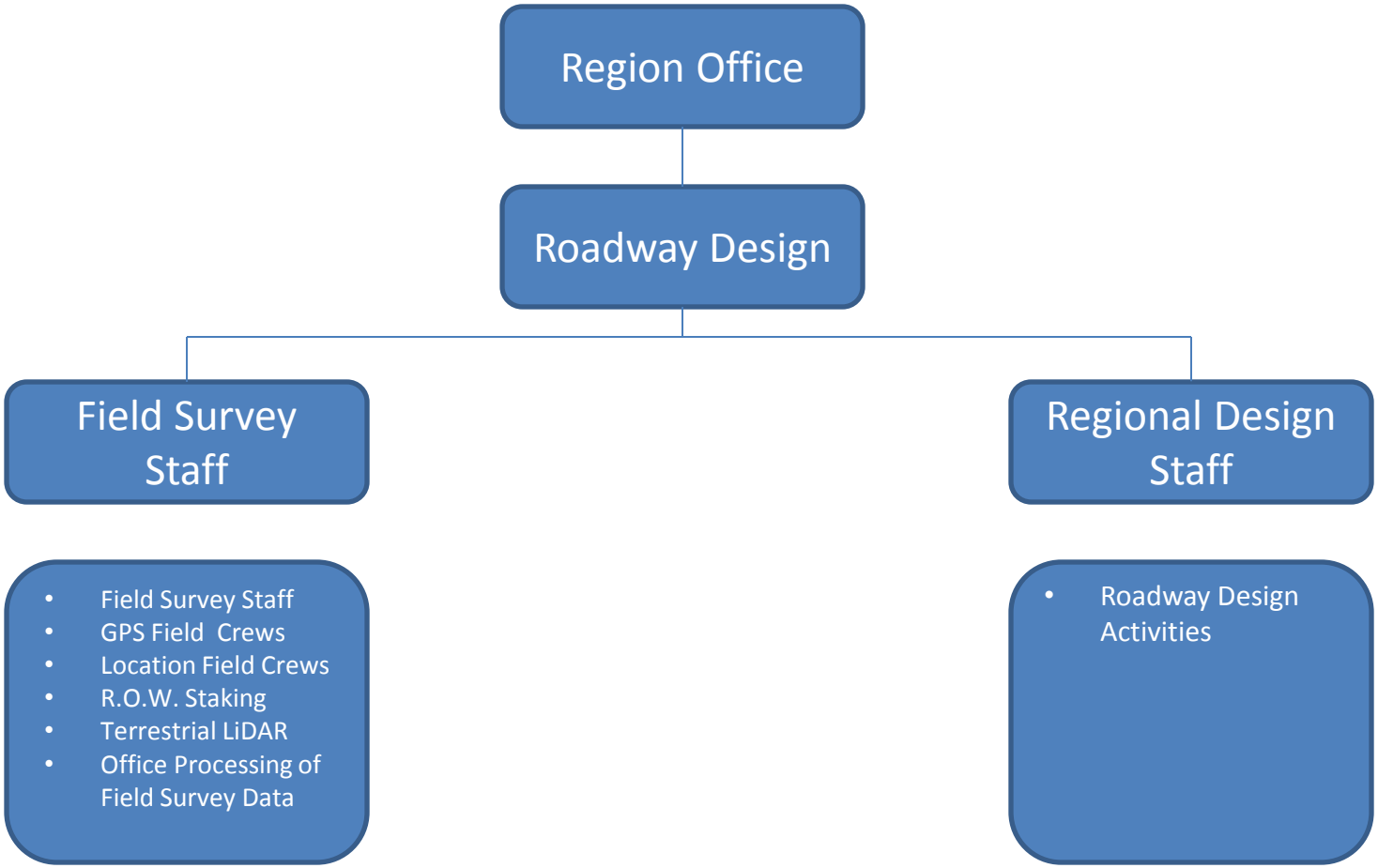
Organization



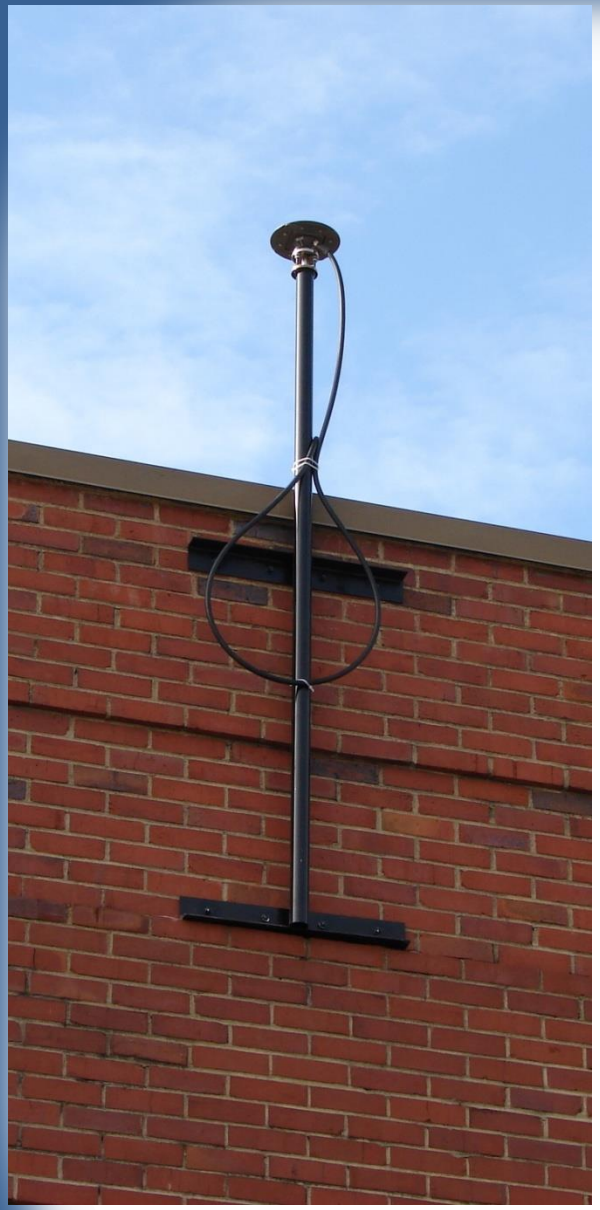
Headquarters



Field Staff Organization



Survey Initiatives



TDOT GNSS Reference Network

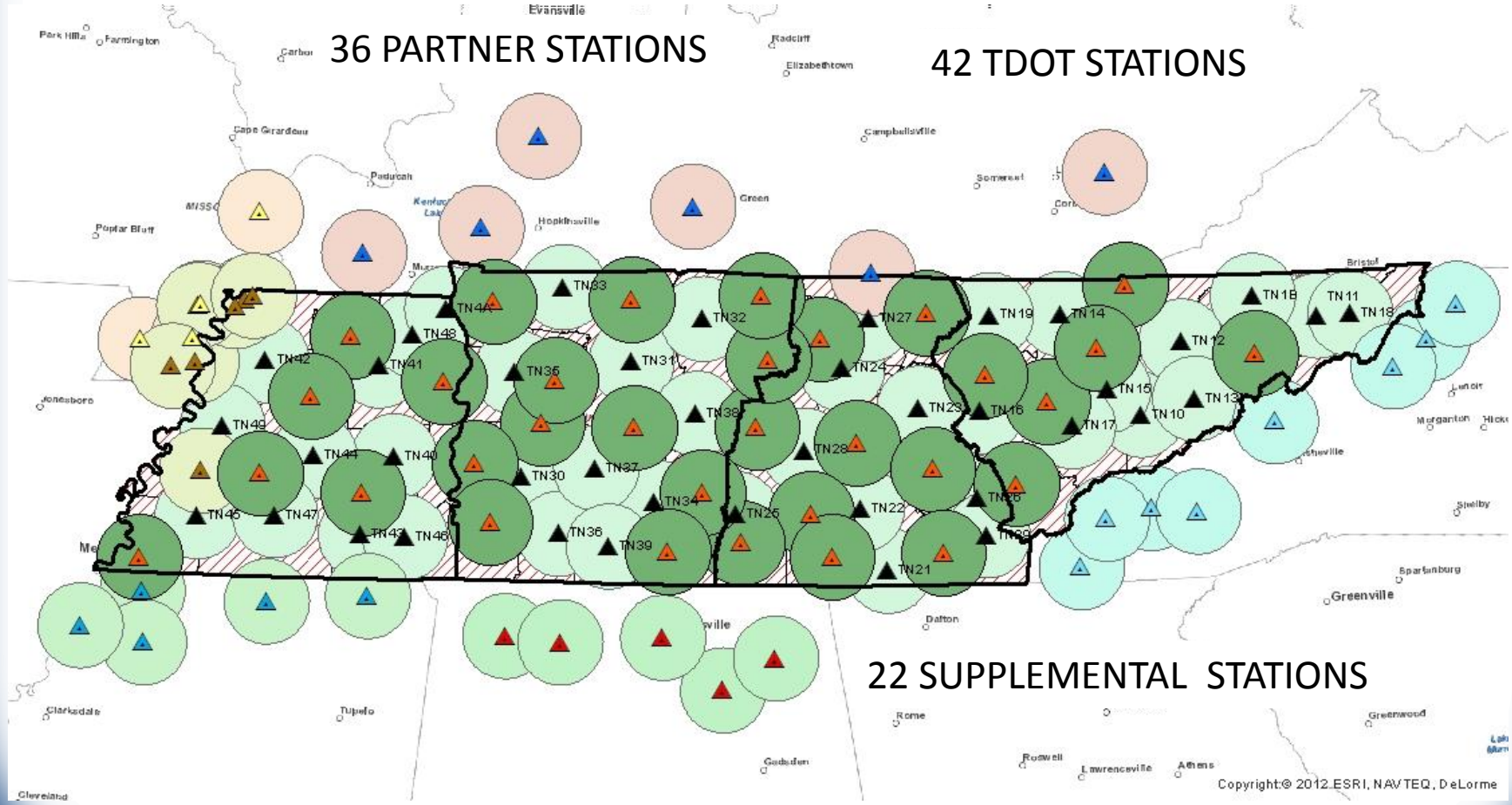
TDOT GNSS Reference Network

- Installation Began in January 2007
- Reference Stations
  - 42 TDOT Owned Stations
  - 5 ALDOT Stations
  - 9 CERI Stations
  - 6 KYTC Stations
  - 4 MODOT Stations
  - 8 NCDENR Stations
  - 5 USM Stations

  79 Stations
- 22 Supplemental Stations Planned

Typical Reference Station Equipment

TDOT GNSS Reference Network

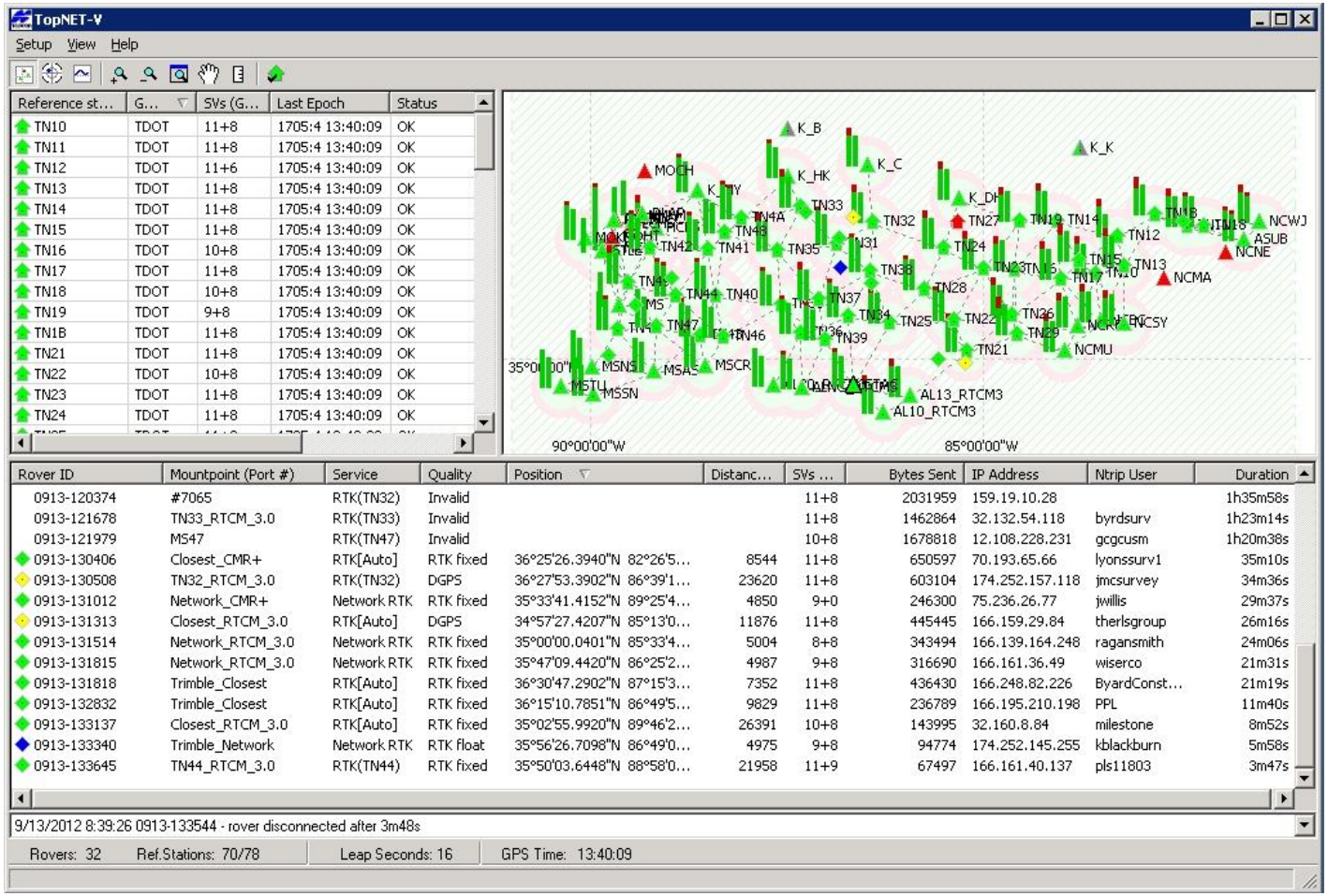


TDOT GNSS Reference Network

- User Information
  - 164 Contracts in Place
  - 229 Private Rovers
  - 50 TDOT Rovers
  - 279 Potential Rovers
- Contract Fees
  - $150 Application Fee
  - $ 25 Per Rover/Per Mo.

- Types of Users
  - Surveying and Engineering Companies
  - Local, State, & Federal Government
  - Equipment Vendors
  - Agricultural Users
  - Utility Companies
  - Construction Contractors
  - Universities
  - Law Enforcement
  - Cemetery
  - Real Estate

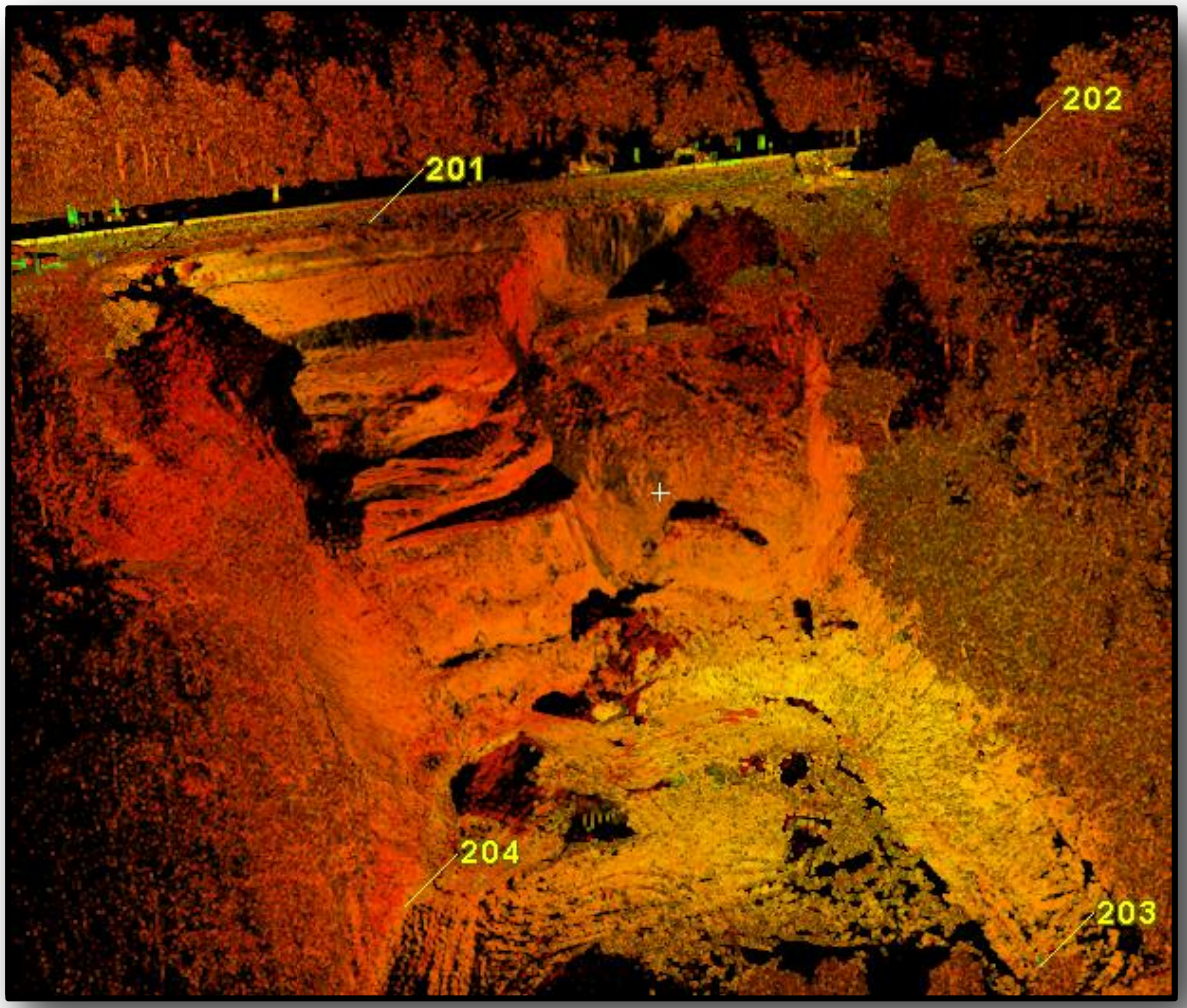
TDOT GNSS Reference Network



TDOT GNSS Reference Network

- Benefits
  - Ability to do more with less.
    - Real Time Survey Capabilities
    - Post Processing with fewer field staff
  - Others can use network
  - Some Maintenance costs recovered

High Definition Scanning

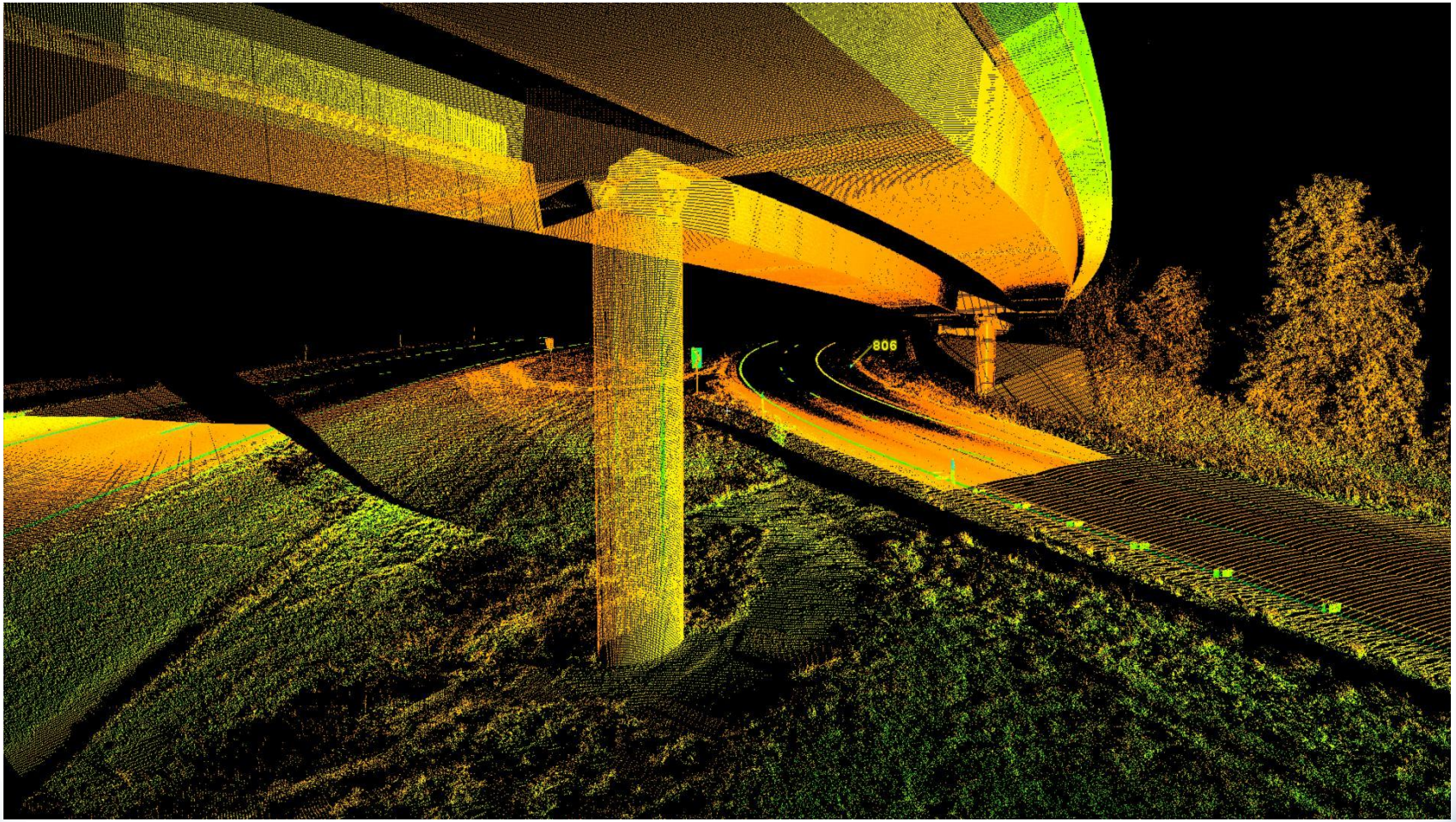


I-75 Slide in East Tennessee

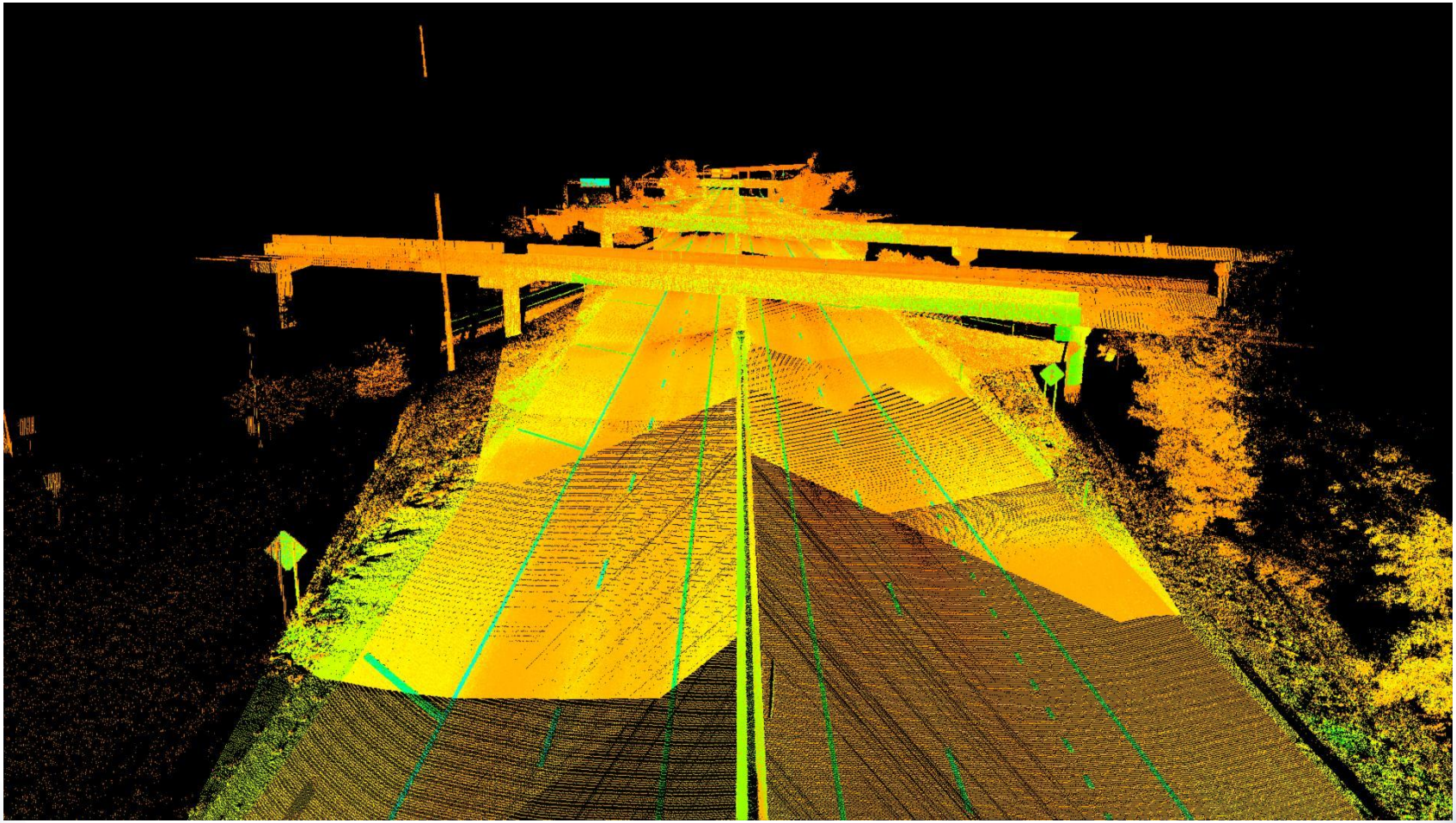
High Definition Scanning

- 3 – Leica Scan Station C10 Scanners Deployed
  - 2 In East TN
  - 1 in West TN
- Collects Up to 50,000 points per second
- Up to 300 mm range
- 360 degree Horizontal Field of View
- 270 degree Vertical Field of View

HDS Example: I-640 Knoxville



HDS Example: I-640 Knoxville



Terrestrial LiDAR

- Traditional Workflow for 1 Mile of Interstate Survey, No ROW

Set Control
- GPS Static Control (1 Crew of 4, 1 Full Day)
- Process Data

Traffic Control
- Coordinate with TDOT Maintenance and THP for Traffic Control and Phasing Plan
- Publish to Media (2-3 working days)

Ground Survey
- 3 man crew surveying roadway line-work (2 days)

Office Work
- 1 person (1Day)
  - Process, Import to CAD, Build DTM, etc…

Terrestrial LiDAR

- HDS Workflow for 1 Mile of Interstate Survey, No ROW

200’ Radius per setup with 50’ of overlap yielding 300’ between setups.

Set Control
- Combine GPS Static Acquisition with LiDAR Targeting (No Extra Personnel or time required)
- Process Data

Traffic Control
- Minimum coordination with TDOT Maintenance for shoulder closure signage when applicable.

Lidar Survey
- 3 Person scan team collecting all data
- 10-15 minutes per setup on average (Traverse Method)

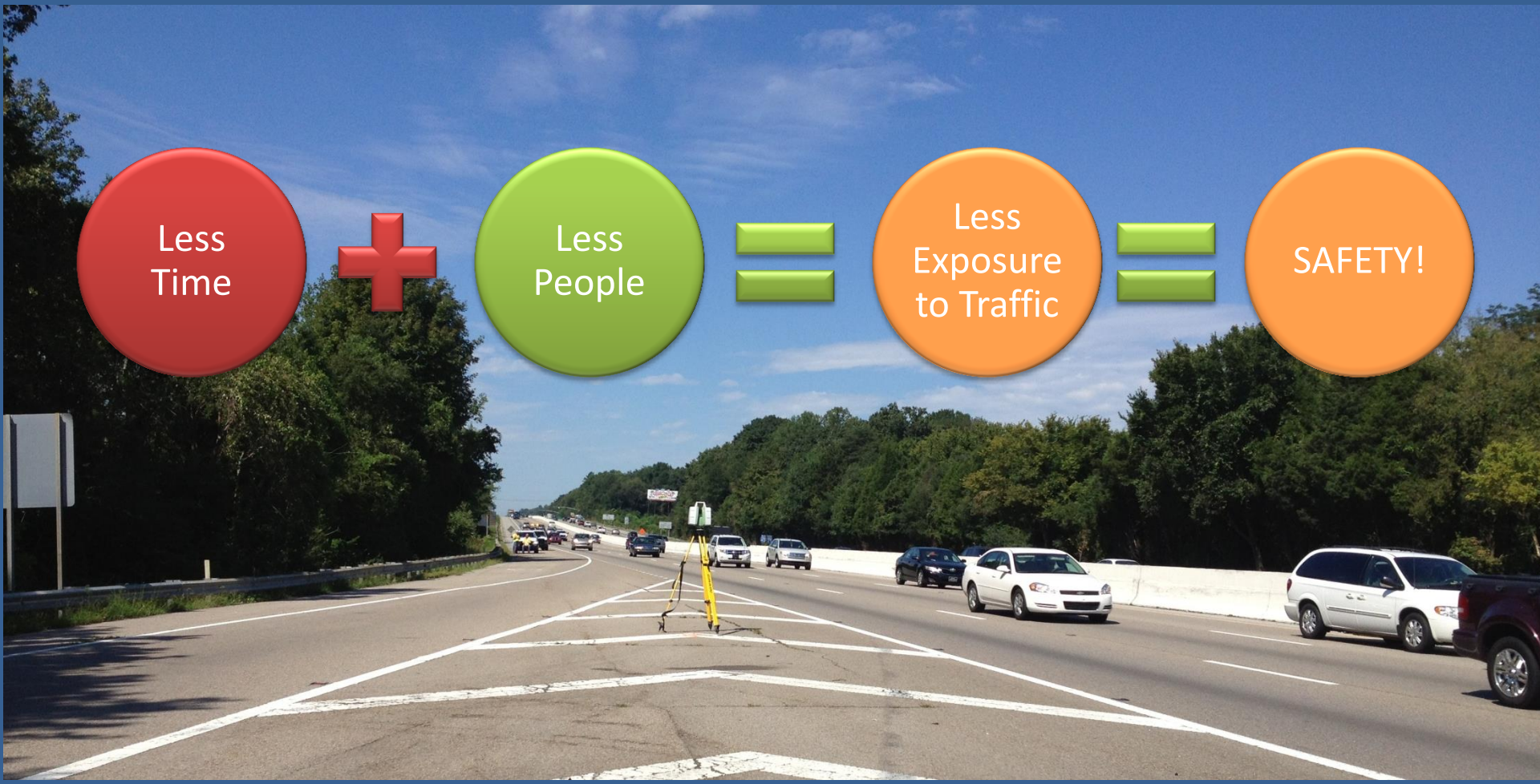
Office Work
- 1 person (1Day)
  - Process, Import to CAD, Build DTM, etc…

LiDAR Savings

64% Reduction in cost based on Man-Day estimates.

1 mile Interstate no ROW	Traditional	HDS
Time (Field) Time (Office)	3 Days 2 Day	1 Days 1 Day
Personnel Required (Field) Personnel Required (Office)	3* 1	3* 1
Man-Days (Required working time)	11	4
***Does not include maintenance personnel**		

LiDAR Savings: Safety



I-75 Slide

Project Description:

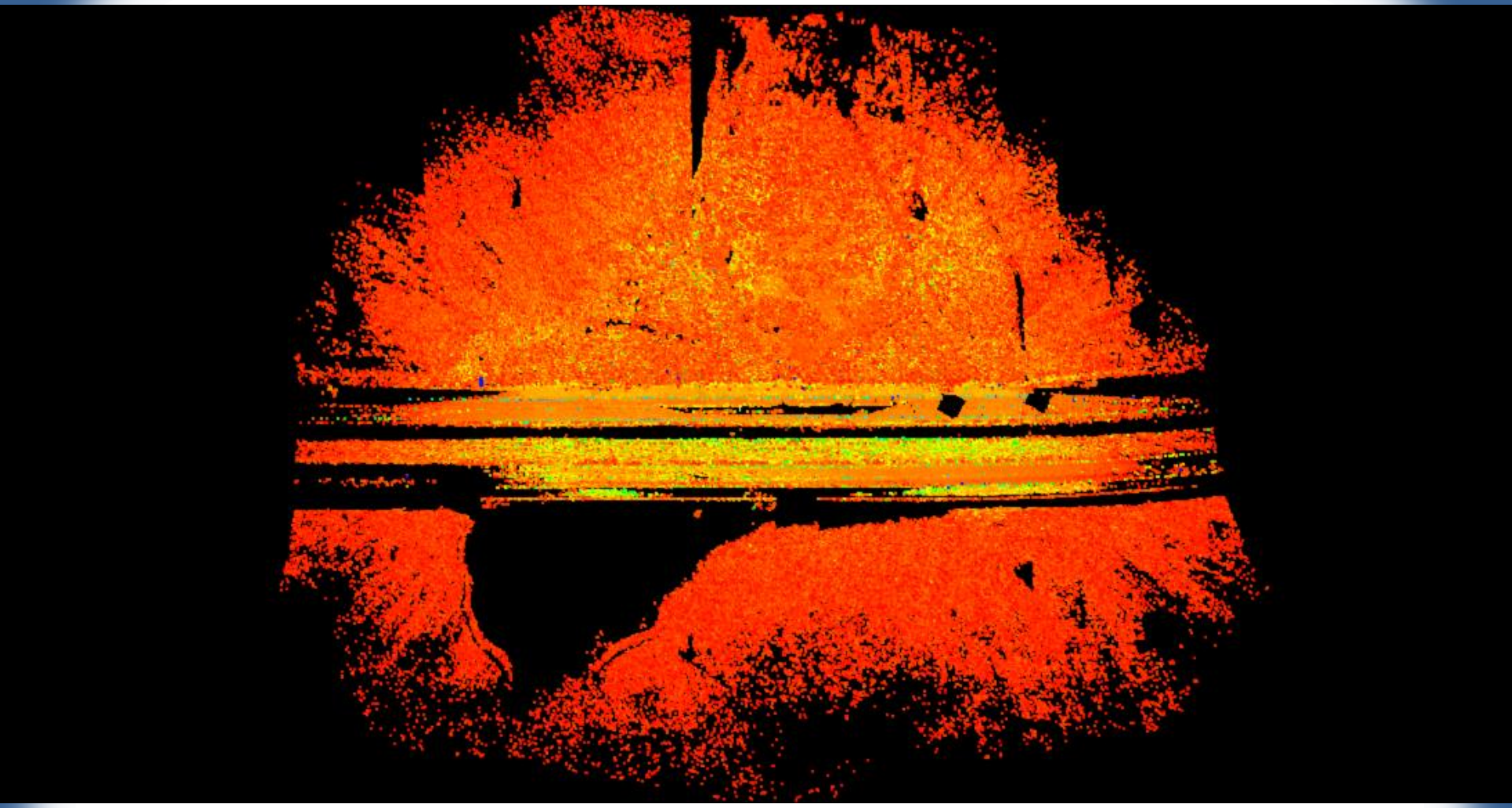
Campbell County, TN

Fill slope failure on I-75 S

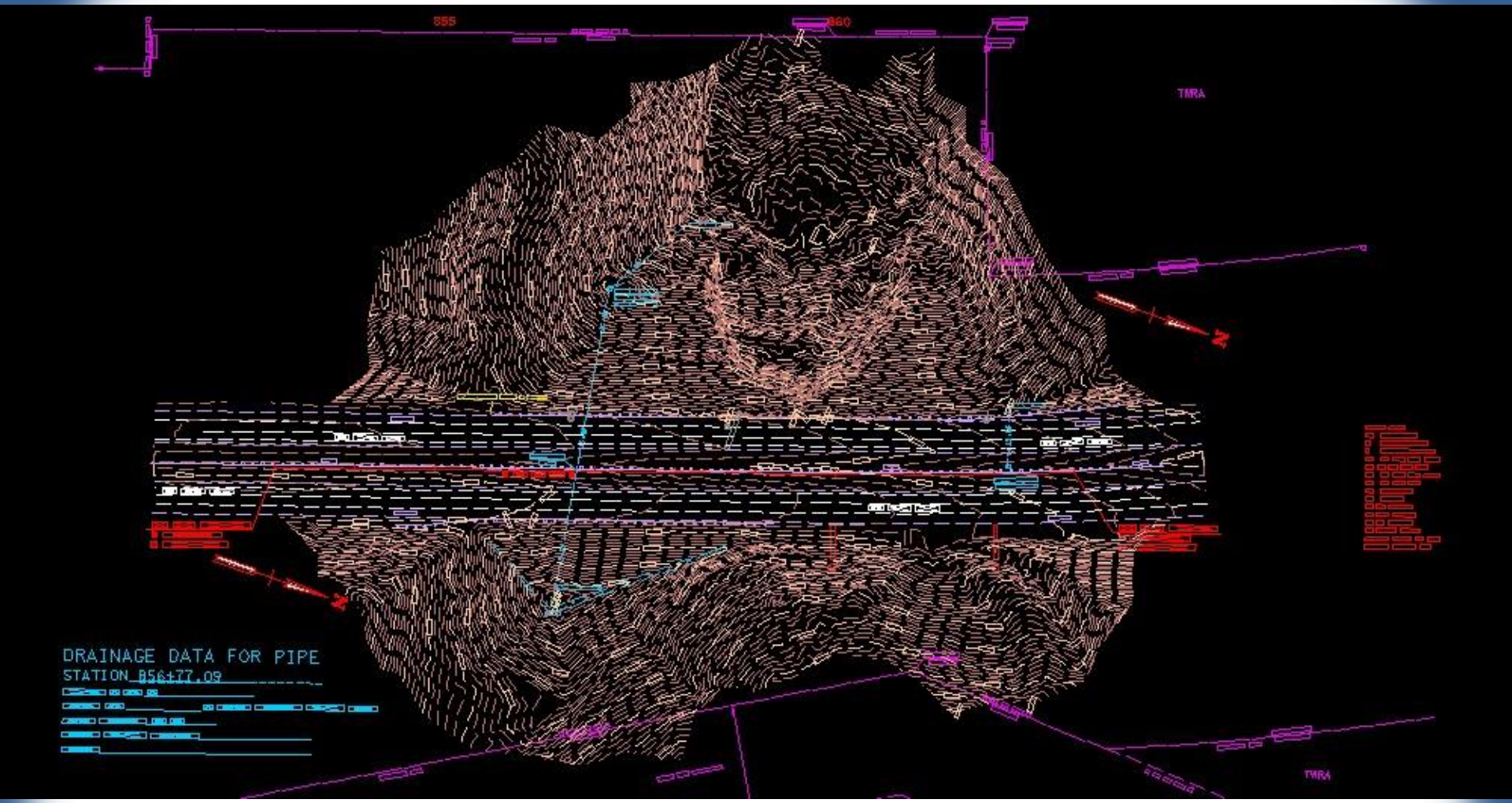
2 lanes of I-75 completely shut down

Left office: 7 a.m. **Turned in to Design: 6 p.m.**

I-75 Slide



I-75 Slide



I-75 Slide

I-75 Slide	Traditional	HDS
Time (Field) Time (Office)	5 Days 1 Days	1.5 Days .5 Days
Personnel Required (Field) Personnel Required (Office)	3 1	3 1
Man-Days (Required working time)	16	5.5

Time is Based on a 7.5 Hr. Day

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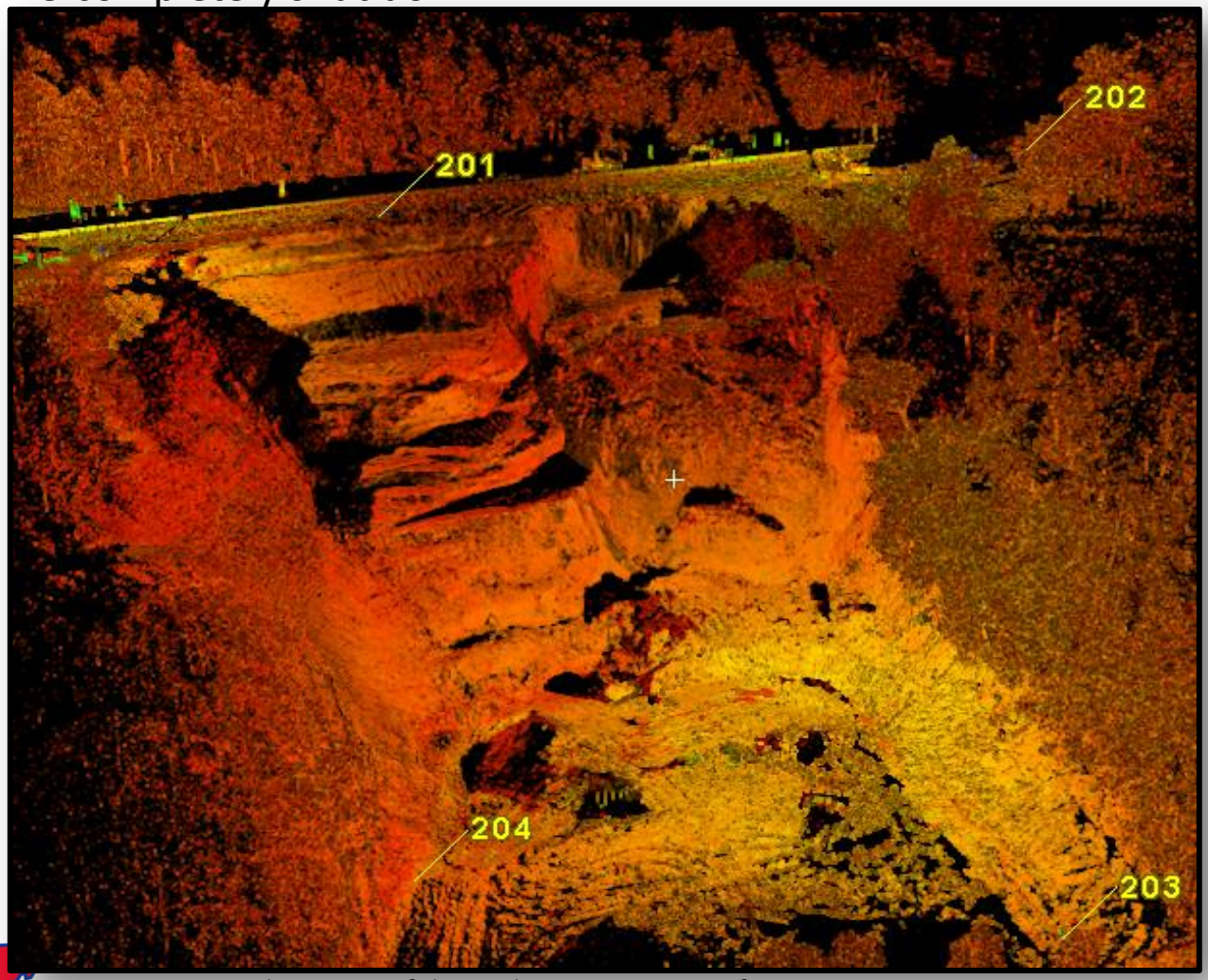
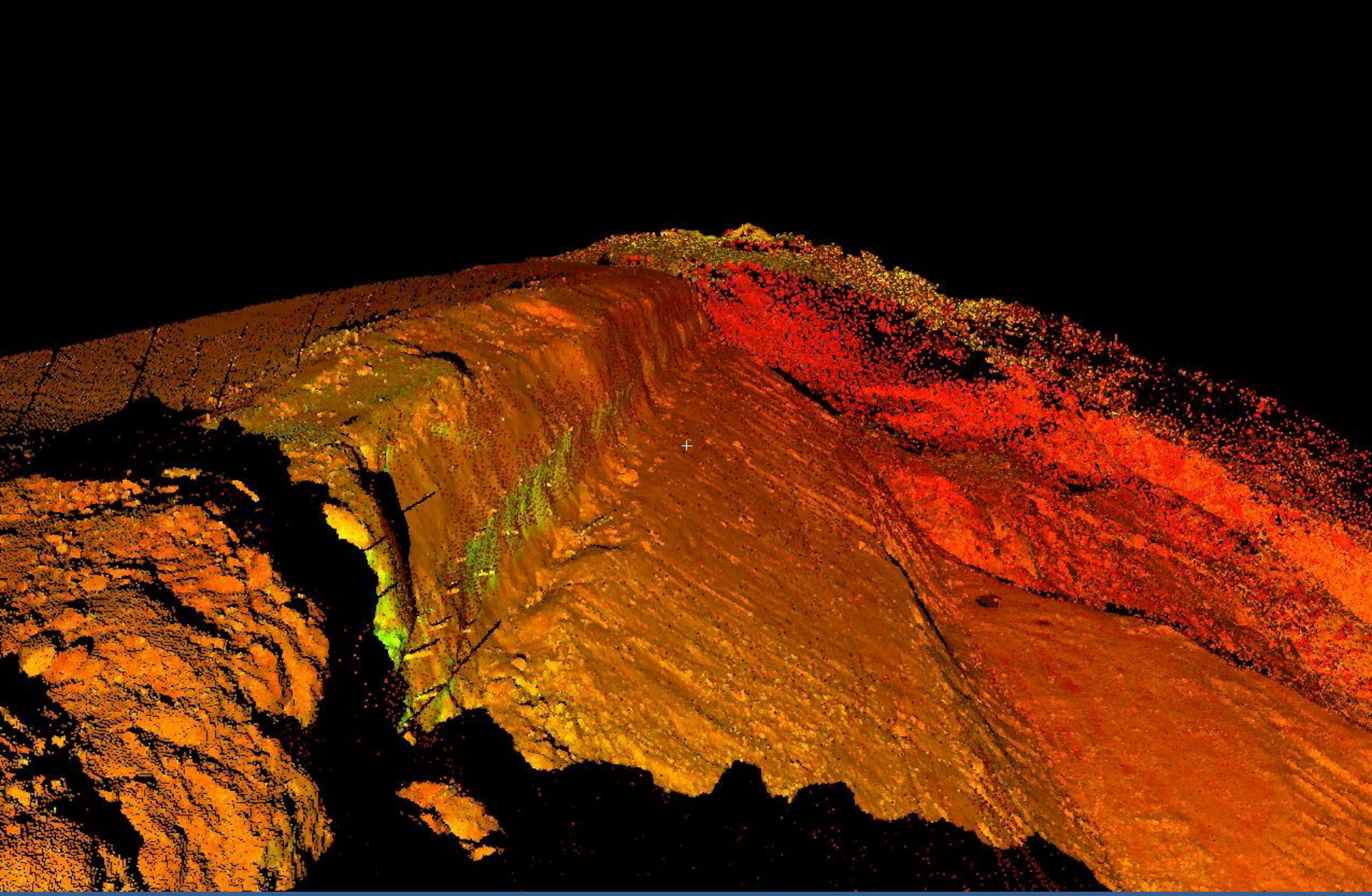


I75 Slide: Campbell County



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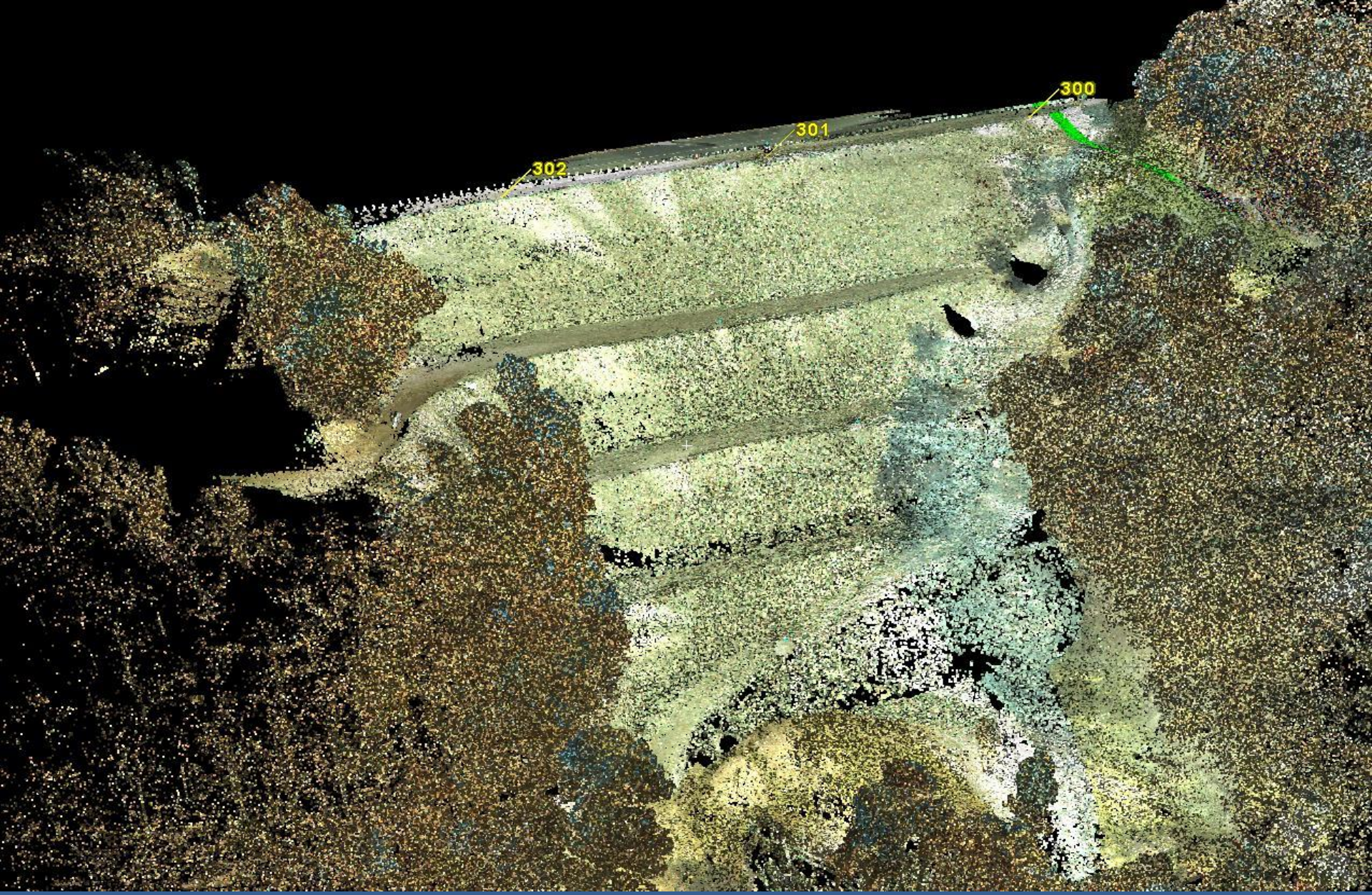
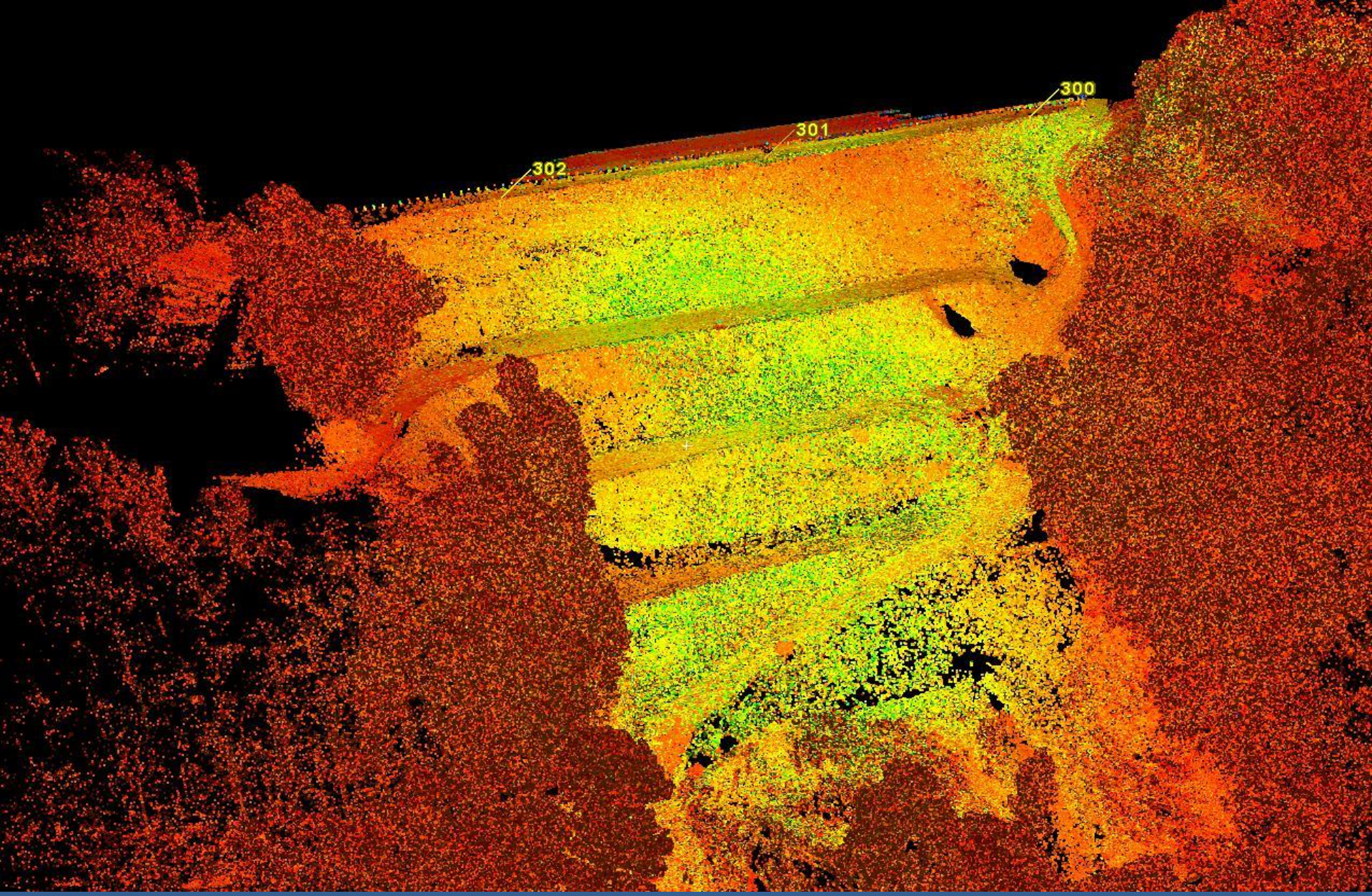


I75 Slide: Campbell County



I75 Slide: Campbell County

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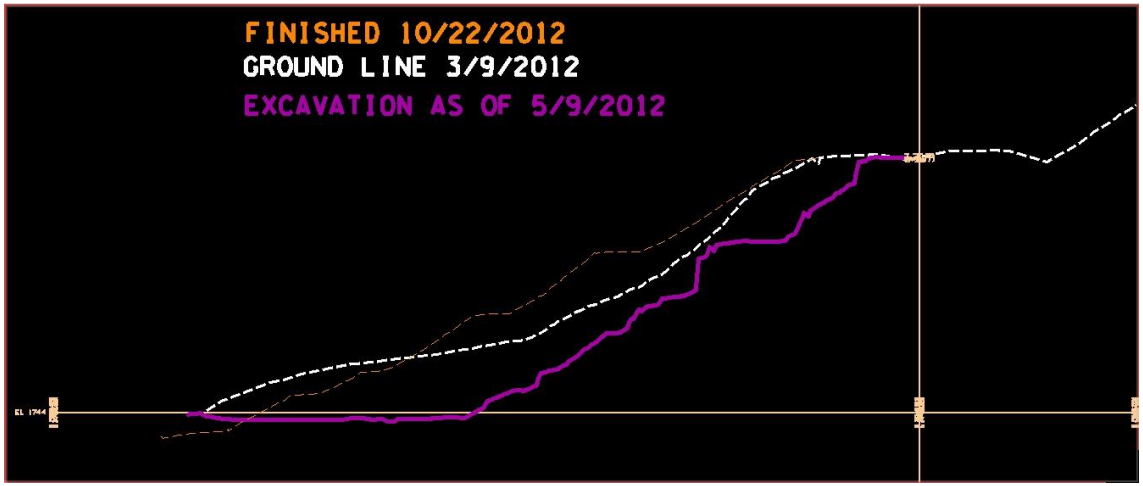
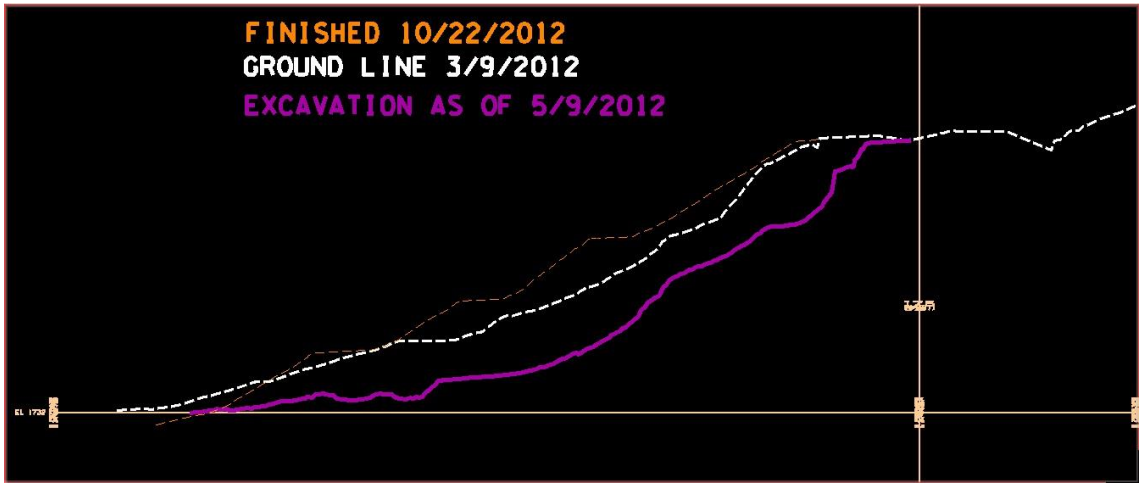
859+50



858+50



High Definition Scanning

- Benefits
  - Safety
  - Quick Collection
  - Ability to “Mine the Cloud”
  - Collects the Entire Existing Condition
  - As-Builts
  - Safety

Office of Aerial Surveys Initiatives

Office of Aerial Surveys

- Established in 1973
- Responsibilities
  - Collection of Aerial Imagery
  - Processing for Design Scale Mapping
  - Processing for Orthophotography
- Equipment
  - Cesna Grand Caravan (2004)
  - Microsoft Vexcel Ultracam X (2008)
  - Intergraph Photogrammetry Software

Office of Aerial Surveys

- Three Primary Services
  - Flight Acquisition Services
  - Photogrammetry Applications
  - Historical Imagery Support

Office of Aerial Surveys

- Digital Transition
  - Photogrammetry Staff has been using Soft Copy for years.
  - Imagery Acquisition has been film based since inception.
  - Imagery Acquisition began transition to digital in 2008.
- Digital benefits
  - Saves Time
    - Fly, Download, Begin Working (No film developing)
  - Saves Space
    - Large Photo Lab Equipment not required
  - Image Quality
    - Photogrammetrists can see in shadows
  - More Environmentally Friendly
    - Photo Lab Chemicals are eliminated

Office of Aerial Surveys

TDOT's 1st Image

Original Analog Image

2008 Orthophotography

Office of Aerial Surveys

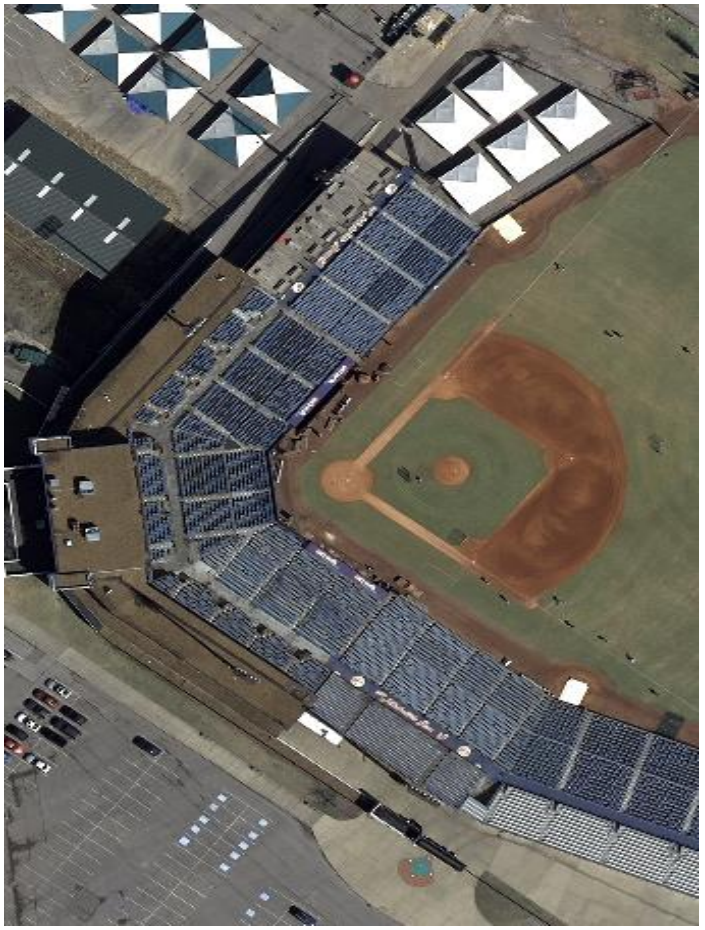
Black and White Film

(10,000 Feet AGL)

Digital Color

(10,000 Feet AGL)

Office of Aerial Surveys



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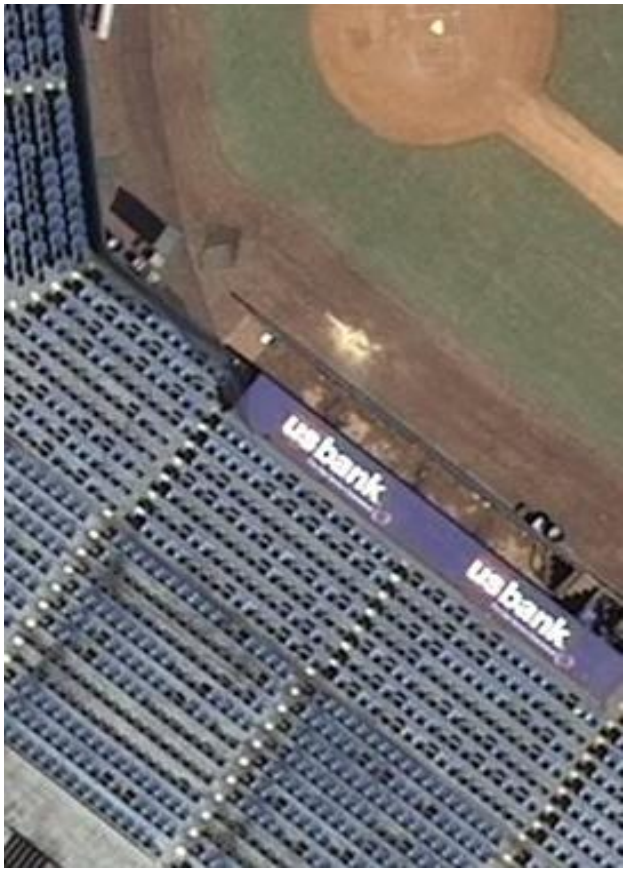

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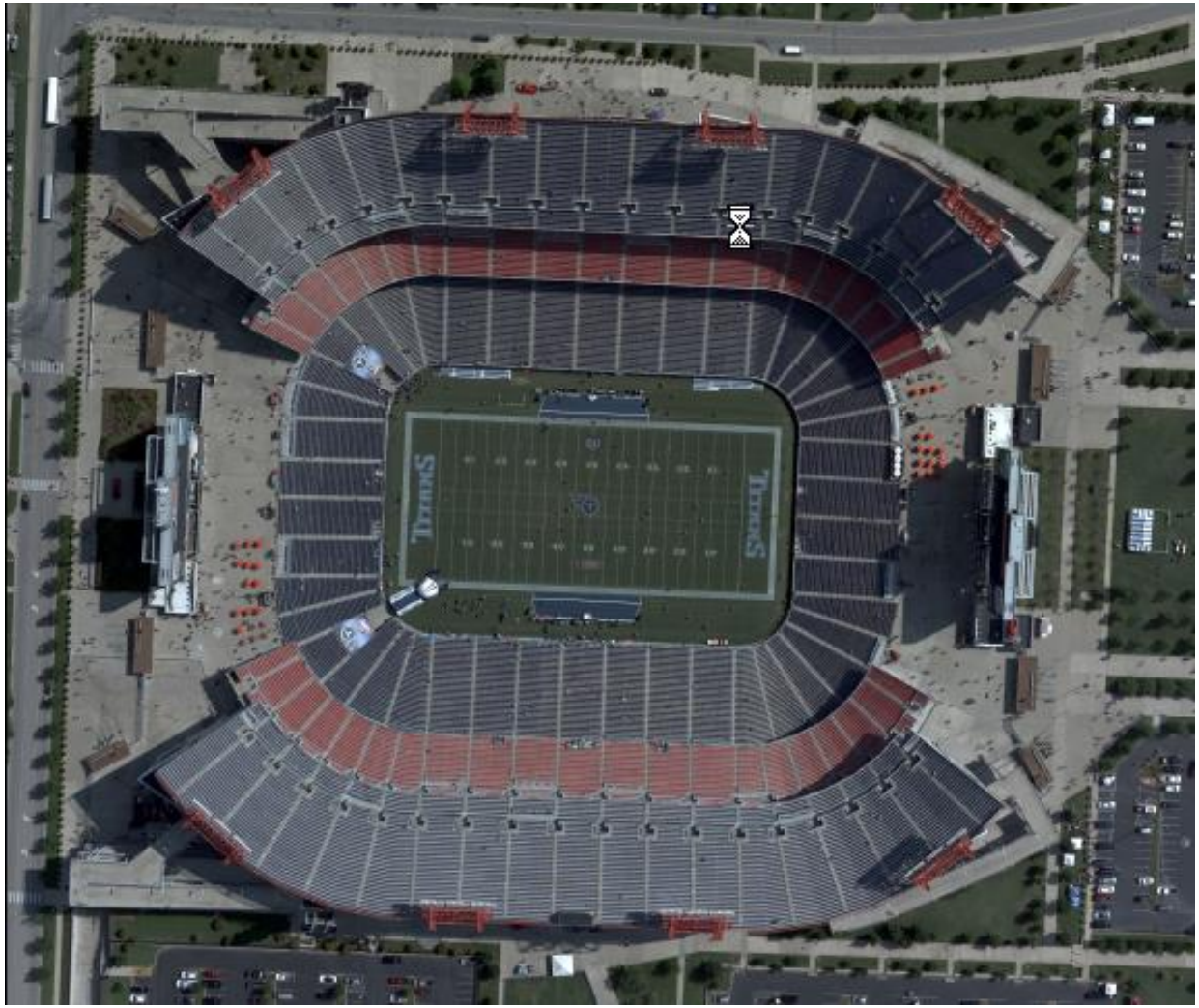
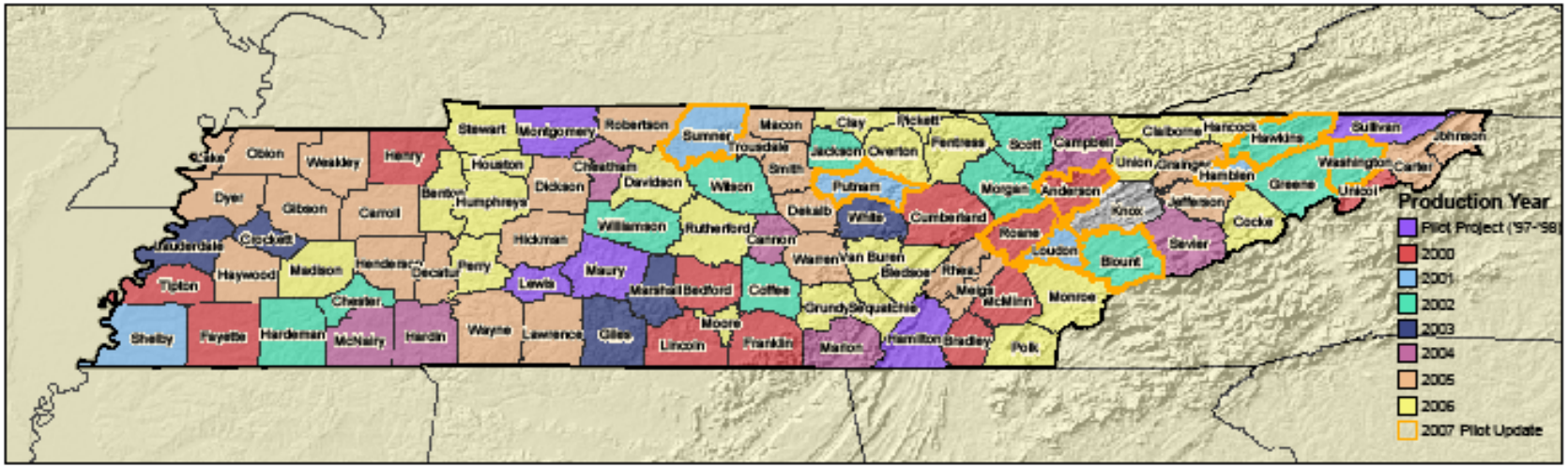


Office of Aerial Surveys

- Tennessee Base Mapping Project (TNBMP)
  - Statewide Imagery managed by the TN Department of Finance & Administration (F&A)
  - Historical Imagery Acquired on a county by county basis since 1997, with no plan for maintenance.
  - In 2007, TDOT and F&A developed an agreement where TDOT provides maintenance of TNBMP imagery.
  - One TDOT Administrative Region is collected Annually and processed by TDOT.

Tennessee Base Mapping Program

By Production Year

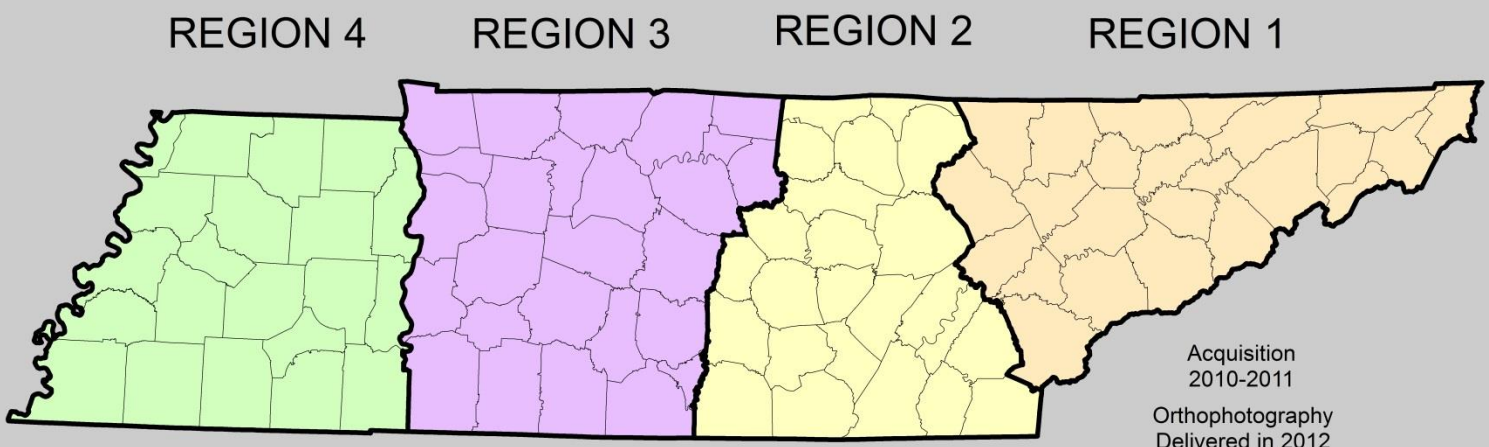


Tennessee Counties

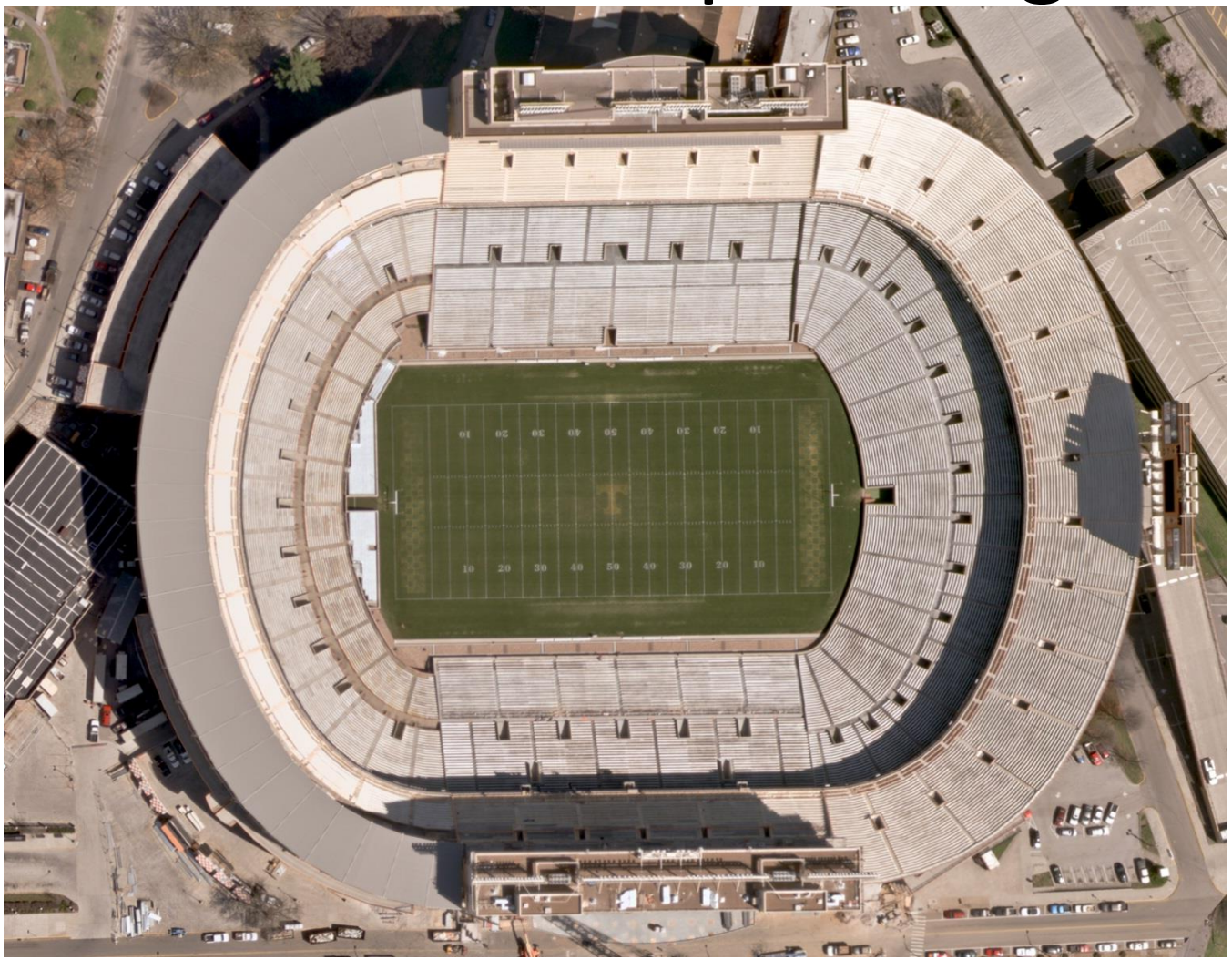
By Production Year

Pilot Project: ('97-'98)	2000:	2001:	2002:	2003:	2004:	2005: (*Fall '04 flying)		2006: (*Fall '05 flying)		2007 Pilot Update:
Hamilton	Anderson	Sumner	Blount	Crockett	Hardin	*Haywood	Weakley	*Madison	Clay	Anderson
Lewis	Bedford	Putnam	Chester	Giles	Cheatham	*Henderson	Gibson	*Benton	Overton	Blount
Maury	Bradley	Loudon	Hardeman	Lauderdale	Campbell	*Decatur	Carroll	*Stewart	Pickett	Hamblen
Montgomery	Cumberland	Hamblen	Hawkins	Marshall	Sevier	*Wayne	Warren	*Perry	Fentress	Hawkins
Sullivan	Fayette	Shelby	Morgan	White	McNairy	*Lawrence	Obion	*Houston	Polk	Loudon
	Franklin		Scott		Cannon	Dyer	Trousdale	*Humphreys	Monroe	Putnam
	Henry		Coffee		Marion	Lake	DeKalb	Rutherford	Union	Roane
	Lincoln		Greene			Robertson	Macon	Moore	Claiborne	Sumner
	McMinn		Jackson			Jefferson	Rhea	Grundy	Hancock	Washington
	Roane		Williamson			Meigs	Smith	Davidson	Cocke	
	Tipton		Wilson			Hickman	Dickson	Sequatchie		
	Unicoi		Washington			Grainger	Johnson	Van Buren		
						Carter		Bledsoe		

TNBMP Schedules



TNBMP Example Image



Questions

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