Discussion Topics

- Organization
- Survey Initiatives
- Aerial Survey Initiatives
Headquarters

Design Division

Surveys & Contracts Unit

Field Survey Support
- TDOT GNSS Reference Network
- Geodetic Support
- Survey Manuals & Training
- Project Scheduling
- Continuing Contract Management
- Emerging Technology

Contracts Section
- Consultant Contracts
- Advertisements
- Invoice Processing
- Pre-qualification
- Historical Contract Records and Database

Office of Aerial Surveys
- Imagery Planning, Acquisition, Processing
- Mapping & Orthophotography Development
- Continuing Contract Management
- Emerging Technology
Field Staff Organization

Region Office

Roadway Design

Field Survey Staff
- Field Survey Staff
- GPS Field Crews
- Location Field Crews
- R.O.W. Staking
- Terrestrial LiDAR
- Office Processing of Field Survey Data

Regional Design Staff
- Roadway Design Activities
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

- **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...

53rd Meeting of the Civil GPS Service Interface Committee  September 16, 2013

TDOT
• 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.

<table>
<thead>
<tr>
<th></th>
<th>1 mile Interstate no ROW</th>
<th>Traditional</th>
<th>HDS</th>
</tr>
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<tbody>
<tr>
<td>Time (Field)</td>
<td></td>
<td>3 Days</td>
<td>1 Day</td>
</tr>
<tr>
<td>Time (Office)</td>
<td></td>
<td>2 Day</td>
<td>1 Day</td>
</tr>
<tr>
<td>Personnel Required (Field)</td>
<td></td>
<td>3*</td>
<td>3*</td>
</tr>
<tr>
<td>Personnel Required (Office)</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>Man-Days (Required working time)</td>
<td></td>
<td>11</td>
<td>4</td>
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</table>

*Does not include maintenance personnel
LiDAR Savings: Safety

- Less Time
- Less People

= Less Exposure to Traffic

= 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.
<table>
<thead>
<tr>
<th>I-75 Slide</th>
<th>Traditional</th>
<th>HDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (Field)</td>
<td>5 Days</td>
<td>1.5 Days</td>
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<tr>
<td>Time (Office)</td>
<td>1 Days</td>
<td>.5 Days</td>
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<tr>
<td>Personnel Required (Field)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Personnel Required (Office)</td>
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<td>1</td>
</tr>
<tr>
<td>Man-Days (Required working time)</td>
<td>16</td>
<td>5.5</td>
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</tbody>
</table>

Time is Based on a 7.5 Hr. Day
I-75 Slide

Project Description:
Campbell County, TN
Fill slope failure on I-75 S
2 lanes of I-75 completely shut down
I-75 Slide

Project Description:
Campbell County, TN
Fill slope failure on I-75 S
2 lanes of I-75 completely shut down
175 Slide: Campbell County
Project Description:
Campbell County, TN
Fill slope failure on I-75 S
2 lanes of I-75 completely shut down
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
  – 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.

• 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 1\textsuperscript{st} Image

Original Analog Image

2008 Orthophotography
Black and White Film
(10,000 Feet AGL)

Digital Color
(10,000 Feet AGL)
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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.
TNBMP Schedules

REGION 4
Acquisition 2007-2008 & 2011-2012
Orthophotography Delivered in 2009 & Update Delivered in 2012-2013

REGION 3
Acquisition 2008-2009 & 2012-2013
Orthophotography Delivered in 2010 & Planned Update in 2014

REGION 2
Acquisition 2009-2010
Orthophotography Delivered in 2012

REGION 1
Acquisition 2010-2011
Orthophotography Delivered in 2012
TNBMP Example Image
Questions

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