

# ***SURVEY CHANGES IN CONSTRUCTION***

Dan Streett , PE & LS  
NYS Department of Transportation  
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# Cultural Changes - Past

## ❖ Past & Present Practices:

- ❖ Stakeout by Centerline Station, Offset & Grade Change (Grade Sheets)
- ❖ Points Staked Out are Many Times Interpolated from 2D Paper Plans
- ❖ Layouts are 2D Cross-Sectional Based with Some Estimation in Transition Areas
- ❖ Roadway String Lines & Grade Stakes Rely Heavily on Experienced Equipment Operators
- ❖ Stakeout Relies on Chorded Sections
- ❖ Intersections are Many Times *AOBE*.

# Cultural Changes - New

## ❖ **Newer Methods:**

- ❖ **Features Have Their Own Horizontal & Vertical Alignments**
- ❖ **Points Along Features are Precisely Calculated From Merged Horizontal & Vertical Alignments**
- ❖ **Location of any Point Can be Determined Instantly and Positioned in the Field**
- ❖ **Roadway Surfaces Graded by Machine Navigation – Less Reliance on Operator Experience**
- ❖ **Stakeout Relies on Curved Feature Alignments, Not on Chorded Segments**
- ❖ **Intersections/Roundabouts Are Staked Out Precisely from Combined Alignments – Independent of Centerline**

# Benefits of Electronic Data

- ❖ **Direct Conveyance of Alignment Data from Original Design:**
  - ❖ **Eliminate Reverse Engineering of Paper Based Data**
  - ❖ **Eliminate Interpolation of Elevations across Roadways**
  - ❖ **Eliminate Errors From Re-entering Engineering Data**
  - ❖ **Contractor & DOT Share the Same Engineering Data**
- ❖ **Real Time – On Demand Information:**
  - ❖ **Positional Location of Any Feature Available at Any Time and Anywhere Along Feature**
  - ❖ **Positioned by Use of GPS or RTS (Robotic Total Station)**
  - ❖ **Eliminates Irregularities Along Alignments, Between Set Section Stations**

# Challenges

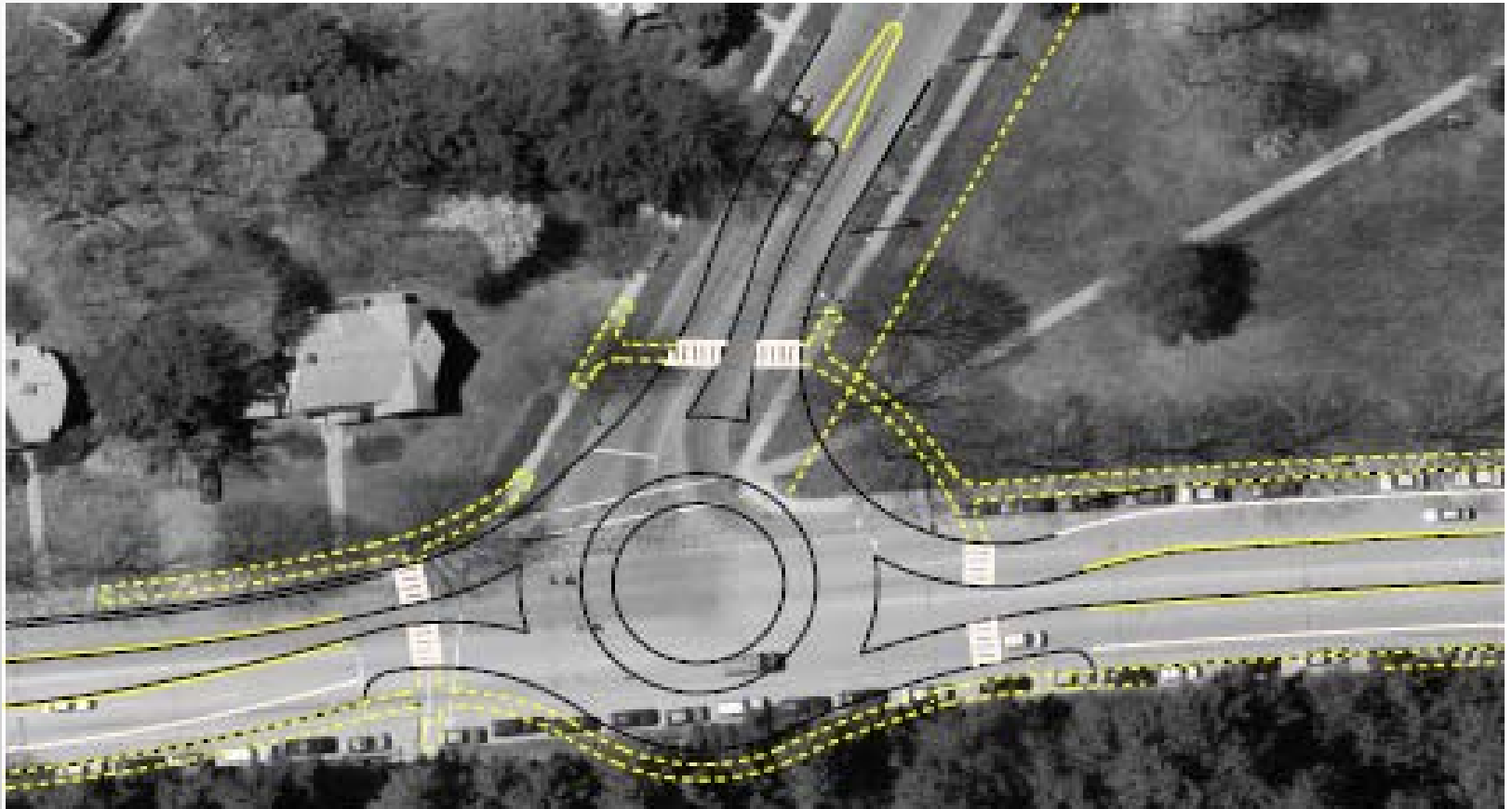
## ❖ Change In Accepted Practices:

- ❖ Higher Reliance on New Technology – Requires Confidence in the Results
- ❖ Need for Quality Control Measures
- ❖ Field Personnel Need New Skill Sets

## ❖ Changes by Survey Industry:

- ❖ Proprietary File Formats Do Not Allow For Simple Transfer of Data (CADD to Stakeout) Trying to Encourage Acceptance of XML Format
- ❖ 3<sup>rd</sup> Party Survey Software Do Not Merge Horizontal & Vertical Alignments for Stakeout Routines
- ❖ Strong Future Need to Share More Electronic Data

# Roundabout Design



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# Roundabout Alignment



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# Roundabout Completion



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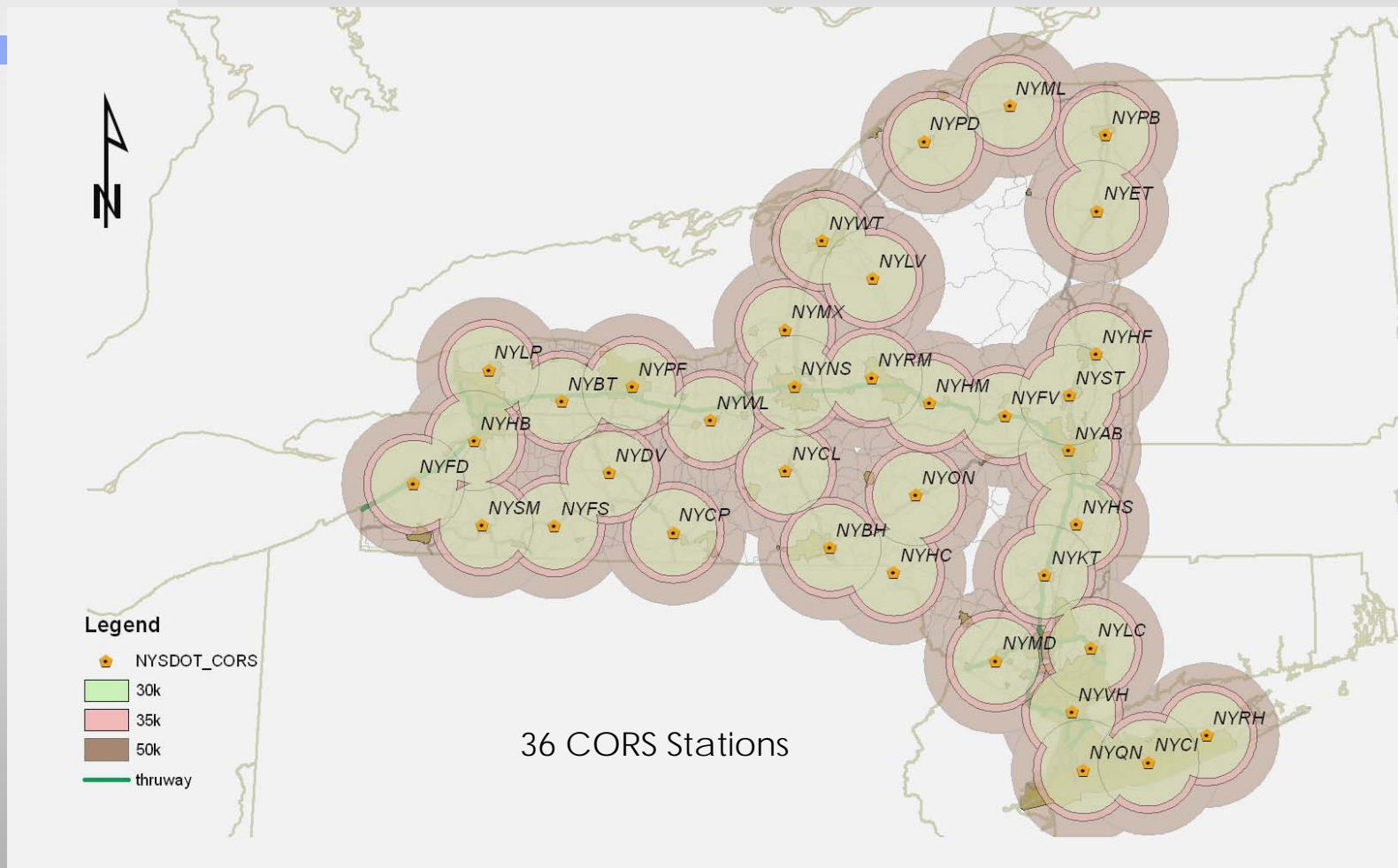
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# Continuously Operating Reference Stations (CORS)

- ❖ **36 Stations = GPS Receivers Which Constantly Collect GPS Data**
- ❖ **Similar to GPS Base Stations**
- ❖ **Automated Network Publishes Static GPS Data, and Real Time Corrections**
- ❖ **System Monitors Network & Sends Alerts When Problems Occur**
- ❖ **Data Published Free Over the Internet and Through Cell Modems**

# CORS Network




# Installations




# DOT Website:

[www.dot.state.ny.us/design/dsb/landsurvey/landsurvey.html](http://www.dot.state.ny.us/design/dsb/landsurvey/landsurvey.html)




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**LAND SURVEYING SECTION**  
(UNDER DIRECTION OF DESIGN SERVICES BUREAU)

## ABOUT US:

THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION LAND SURVEYING SECTION'S PRIMARY ROLE INCLUDES THE SUPPORT AND ADVANCEMENT OF THE SURVEY AND RIGHT OF WAY (ROW) MAPPING ACTIVITIES NECESSARY TO DESIGN THE CAPITAL PROGRAM. SECTION RESPONSIBILITIES INCLUDE:

- DEVELOP AND UPDATE ROW MAPPING AND FIELD SURVEY STANDARDS, POLICIES & PROCEDURES
- INVESTIGATE AND PROCURE NECESSARY SURVEY EQUIPMENT AND SOFTWARE
- PROVIDE SUPPORT AND TRAINING OF SURVEY AND MAPPING HARDWARE AND SOFTWARE
- PROVIDE GEODETIC SURVEY SUPPORT INCLUDING MAINTENANCE OF THE HORIZONTAL AND VERTICAL CONTROL NETWORKS
- PROVIDE GPS SUPPORT TO OTHER PROGRAM AREAS
- EVALUATION OF NEW OR UPGRADED CADD SOFTWARE AS WELL AS CADD SUPPORT

## WHERE DO YOU WANT TO GO:

<a href="#">Geodetic Control Viewer</a> <small>NEW! (web based GIS map)</small>	<a href="#">Spatial Reference Network CORS/Real Time Network</a>	<a href="#">NYSDOT Survey Standards and Procedures</a>	<a href="#">Survey Resources and Publications</a>	<a href="#">Helpful Survey Links</a>
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**CONTACT US:**  
NYSDOT LAND SURVEY SECTION  
50 WOLF ROAD  
POD 2-4  
ALBANY, NY 12232

# Benefits or Advantages

- ❖ **CORS Eliminates Need for GPS Base Stations at Project Sites**
- ❖ **Usable Almost Anywhere Cell Phones Have Reception**
- ❖ **Testing Shows 2 cm Horizontal Accuracy Within 30K of Stations w/Leica GPS**
- ❖ **Used for Both RTK Stakeout and Machine Navigation**
- ❖ **Continuous Data Publication, at No Cost to User**
- ❖ **CORS Should Not be Used for Vertical Elevations Yet, GPS Can Be Localized to Project Benchmarks**

# Conclusions

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- **Questions**
- **Comments**
- **Suggestions**

**Email to:**  
**[dstreett@dot.state.ny.us](mailto:dstreett@dot.state.ny.us)**