Meet Your Moderator

• Director of Public Works – Calaveras County
• Registered Civil and Traffic Engineer in California
• Prior efforts with Nevada County
  (Principal Civil Engineer)
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Meet Your Presenters

• Kimley-Horn is a full-service consulting firm offering comprehensive and innovative engineering and planning services to public agencies nationwide.

Meet Your Presenters

Matt Weir, P.E., T.E., PTOE

Vice President
KIMLEY-HORN

• Experienced Transportation Professional with more than two decades of diverse civil and traffic engineering experience

• Matt has a deep resume of civil/traffic engineering and safety experience through the Sacramento Region and Northern California

• Has overseen the production of 7 RSSAs, including Nevada County Phases I and II, and Calaveras County
Meet Your Presenters

Robert Paderna, P.E.
Associate
KIMLEY-HORN

• Project Manager with over 13 years of experience in transportation and traffic engineering projects throughout Northern California.
• Diverse experience includes traffic safety, traffic operations, and traffic signal/ITS design
• Has led the production of 7 RSSAs cumulatively totaling over 1,200 miles and nearly 15,000 signs

Meet Your Presenters

• Mark Thomas provides civil engineering, planning, and surveying services throughout California
• We have extensive experience in:
  • Analyzing collision data
  • Sign audit & reporting
  • Developing safety countermeasures
  • Preparation of PS&E packages

93 years in business
12 office locations
250 staff members
Meet Your Presenters

**Matt Stringer, PLS**  
*Survey Division Manager*

**MARK THOMAS**

- Matt Stringer has more than 22 years experience managing all phases of survey and geospatial information in support of transportation and public works projects. His work includes the first RSSA and subsequent projects in California over the past 6 years. During these projects, he managed the curve and sign data collection, analysis, and reporting.

Presentation Goals

- Discuss reactive versus proactive roadway safety improvements
- Introduce the Roadway Safety Signing Audit (RSSA)
- The use of innovative technology to improve the RSSA
- Discuss the necessary steps to construct RSSA recommendations
- Other lessons learned in the RSSA process
**Presentation Takeaways**

- Potential reduction in traffic collision rates
- Use of Highway Safety Improvement Program- HSIP
- Data that can be used for other projects / programs
- How environmental clearance presented the biggest project hurdle
- PS&E package and project delivery alternatives
- Construction inspection and management

**National Safety Council Statistics**

- Fatality rate per 100 million miles traveled down from 3.35 in 1975 to 1.25 in 2016
- 40,000 people died in crashes in 2018 – a 1% decrease from 2017
- The US ranks 41st out of 52 high-income nations based on road traffic deaths
- 52% of people killed in rural areas (48% in urban areas) in 2016
- **MAJORITY OF ROAD CRASHES CAUSED BY HUMAN ERROR**
- What tools do we typically use to improve safety
  - Education, Enforcement, ENGINEERING, emergency response, emerging technologies
Reactive Roadway Safety Tools

- In response to prior events or actions or perceived safety issues
- Historic collision data ("hotspots")
- Resident complaints and concerns
- Direction from elected officials and management
- Engineering judgment

Concerns with Reactive Road Safety

- Insufficient data for low volume or rural locations
- Data interpretation - may not accurately correlate to roadway deficiencies
- Disproportionate focus on politically or socially motivated improvements
- Non-systemic isolated improvements
Roadway Safety Signing Audit (RSSA)

- Addressing roadway safety signing deficiencies is a cost effective approach to systemically addressing roadway safety

- Potential Benefits:
  - Improves signage consistency and users’ predictability
  - Reduces the likelihood of human error
  - May help produce designs that reduce the number and severity of crashes
  - Promotes awareness of safe design practices

RSSA Prior Successes

- Prior success in other agencies
  - NYDOT has seen crash reductions up to 40%
  - South Carolina DOT saw up to 60% reduction in fatalities and 23% reduction in overall crashes
  - Nationally, RSSAs can decrease collisions 10%-60% or more.
Highway Safety Improvement Program – Cycle 6

- Nevada County investigated projects with systemic benefits
- Neighboring county received RSSA funding in previous HSIP cycle
- Caltrans assisted in development of HSIP application
- Resulting Benefit/Cost ratio was 48!
- Signing evaluation focused on warning signage
- Awarded HSIP grant in late 2013. Receive authorization in early 2014

Request for Proposals – Feb 2014

- Received 4 proposals
- Short listed and interviewed 3 consultant teams
- County ultimately selected a Kimley-Horn and Mark Thomas team as preferred consultants
Project Approach

1. Data collection
2. Data analysis
3. Audit documentation
4. Plan preparation
5. Environmental clearance
6. Construction

Data Collection Methods Approach

• Mobile LiDAR and 360-degree field of view photos
• Curve Advisory Reporting System (CARS)
• Manual Retroreflectivity Analysis using Road Vista 922
Mobile LiDAR / Street Level Imagery

- Accuracy within 2 inches
- Myriad of useful data
  - Sign Type and Classification
  - Size
  - GPS coordinates
  - Location in relation to adjacent roadway
  - Post type
  - Sign height
  - Sign condition
  - Sign visibility
  - Photo at any angle of the roadway
- Data collected every 26 feet (8 meters)

Mobile LiDAR

- Mounted in bed of pickup truck and travel at or near posted speed limits
- Reduces time of field staff on roadways
- Improves safety during data collection
- Decreases inconveniences to traffic
- Provides significant data that can be used for other purposes
  - Pavement conditions
  - Lane widths
  - Cross slope
  - Utility locations
  - Pedestrian and bicycle facilities
Curve Advisory Reporting System (CARS)

- Rieker Inc.
- Electric, integrated ball bank indicator system
- Drive at prevailing speeds
- GPS enabled to correlate data with mobile LiDAR
- Improves safety during data collection
- Decreases inconveniences to traffic

Manual Retroreflectivity Analysis

Multiple methods of retroreflectivity data collection per Section 2A.08 of CA Manual on uniform Traffic Control Devices (MUTCD)

- Manually visiting signs and collecting measurements with Road Vista 922
- Nighttime visual assessments for sign retroreflectivity
  - Nighttime method allows for Pass/Fail values for each sign assessed
  - Can result in cost-saving measures while allowing for immediate replacement of failing signs
Manual Retroreflectivity Analysis

• Final sign inventory database will be checked and finalized
• A decision can then be made whether a sign needs to be replaced, relocated, or can remain in its current condition
• Missing signs are also identified during this time and recorded in the report as installations
• The RSSA report summarizes findings and dictates the recommended actions needed for each sign
• A PS&E package can then be prepared based on report findings

Data Collection

• County provided external hard drive for all data collected
• Almost 1 TB of data collected
• Data can be used for a myriad of other projects!
Sign Evaluation

- Evaluation of sign (and post) conditions, including:
  - Sign retroreflectivity
  - Sign size
  - Vertical clearance (sign height)
  - Horizontal clearance (distance from travel way)

- Evaluation of sign applicability and location per CA MUTCD
  - Use of horizontal alignment (curve warning) and chevron/large arrow signs based on speed differential between posted speed limit and curve advisory speed
  - Advanced placement distance for intersection warning (W2 series) and horizontal alignment (W1 series) warning signage
  - New signs
Nevada County RSSA Phase 1 Outcomes

- Reviewed 10 corridors, ~50 miles
- 898 existing signs (20 signs per mile!)
- 403 new signs to be installed (over 60% were new chevron signs, 27% were new curve advisory signs)
- Construction cost of $281k
Additional RSSA Outcomes

• Challenging initial opportunity, both sides took chances
  • Financial
  • Technology applications
  • An investment in future opportunities

• Required enhanced internal processes
  • Amount of data, transfer between firms and County
  • Processing and tracking procedures

• An eye toward “bid-ability” was effective

• Retro-reflectivity strategy
• Reliance on robust data collected
NEVADA COUNTY
Year: 2014
# of Miles: 50
# of Signs: 898

PLACER COUNTY
Year: 2015
# of Miles: 175
# of Signs: 3,040
NEVADA COUNTY II
Year: 2017
# of Miles: 130
# of Signs: 2,816

MONTEREY COUNTY
Year: 2017
# of Miles: 265
# of Signs: 2,933
MARIN COUNTY
Year: 2018
# of Miles: 163
# of Signs: 1,776

STANISLAUS COUNTY
Year: 2019
# of Miles: 177
# of Signs: 1,801
CALAVERAS COUNTY
Year: 2020
# of Miles: 223
# of Signs: 2,200
Example – Replace Sign (Reflectivity)
Example – Remove Sign

Example – Remove and Replace Curve Sign

Remove and replace with a single right curve closer to the actual curve.
Example – Add Chevrons

Project Report Takeaways

- Report identified key safety improvements through improved signing
- County received an electronic sign inventory, street level imagery, and LiDAR data
- Report met or exceeded MUTCD requirements
- From HSIP award to report completion – 1 year

- The project was completed........or so we though?!?!?!
Caltrans Interest

- Submitted draft report to Caltrans and HSIP committee
- Caltrans and committee expressed interest in project approach
- **Caltrans modified project scope to include full project funding**
  - Environmental
  - Right of Way (N/A)
  - Construction
  - Construction Management
- Remaining Steps – environmental approval, PS&E package, construction

Environmental Clearance

- CEQA process simple – categorically exempt
- NEPA had no similar exemption
- Caltrans had no past practice for NEPA clearance
- NEPA clearance took 15 months
Environmental Clearance

• How to you scope a 50-mile long project with 10 road segments and nearly 1,000 signs?
• Phase I required no new posts – no impact assumed
• Phase II (409 signs) required construction activity

Environmental Clearance – Phase II

• Biological Resources
• Cultural Resources
• Hazardous Waste
  • Aerially deposited lead (ADL)
  • Naturally occurring asbestos
Environmental Clearance – Phase II

• Work with our environmental consultant and Caltrans
• Utilized existing information (electronic format whenever available)
  • California Natural Diversity Database (CNDDB)
  • California Native Plant Society (NCPS)
  • California and National Register Property Information
  • Nevada County Environmental Health Inventory
• Overlaid sign GPS data with existing information to confirm resource probability levels
• Phase II analysis for ADL – agreed upon intervals and locations

Preliminary Screening Report

• Supported NEPA Categorical Exclusion
• Included 4 biological, 1 hazardous waste, and 1 cultural resources mitigation measures
• NEPA Clearance on October 6, 2015
Bid Package

• Two Bid Package Approaches

• Full PS&E Package
  • Most accurate and least risk during construction
  • Time Consuming
  • Costly
  • Questionable benefit during construction

• Streamlined PS&E Package (repackaged RSSA Report)
  • Minimal additional effort
  • Lowest Cost
  • Potential risk during construction (change orders)
  • Increased specialized construction inspection efforts? (MUTCD familiarity)

County utilized streamlined PS&E Package

Project constructed in late 2016 / early 2017

Winter storms affected construction

Minimal change orders (support use of streamlined PS&E package)

Less than 5 signs were incorrect (out of nearly 1,000)

Three resident complaints

Takeaway - inspection services were not CA MUTCD savvy
Epilogue

- Nevada County RSSA Phase 2 Project (construction in 2020)
- Numerous counties and cities received HSIP funding for RSSA in Cycles 7-9
  - Counties (Calaveras, Imperial, Marin, Monterey, Nevada, Riverside, Stanislaus, Tuolumne)
  - Cities (Angels Camp, Eureka, Manteca, Moreno Valley, Reedley, Wasco)
- Continued struggles with environmental clearance
- HSIP Cycle 10 approaching – GREAT PROJECT!

Final Thoughts and Conclusions

- RSSA is a promising approach to systemic and proactive road safety
- Innovative data collection provides a myriad of benefits
- Environmental clearance a significant hurdle in the process
- Different approaches for PS&E preparation
- Construction – agency oversight
End of Presentation

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