





Canadian Institute of Transportation Engineers 2016 Conference

Innovative Approaches to Assessing Risk Exposure on Rural Road Networks: Clarington Ontario's Experience

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Clarington, Ontario

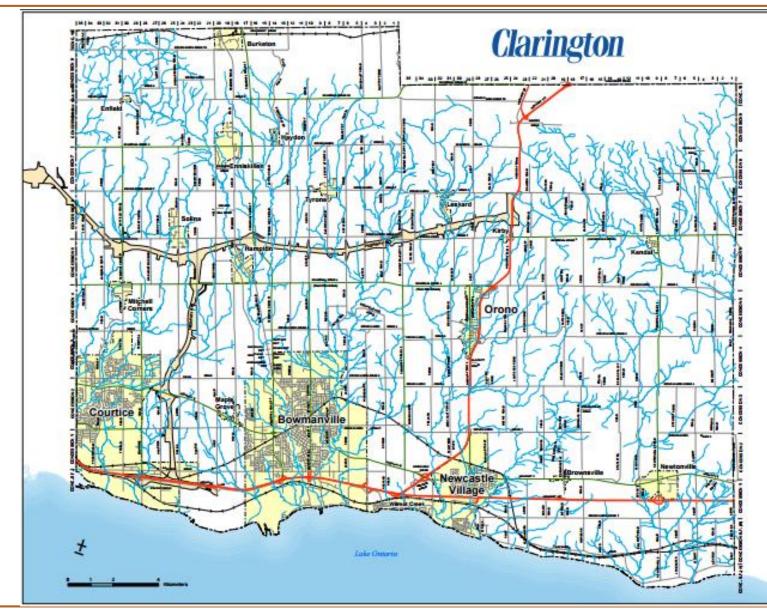




+ Clarington, Ontario

- + Population 90,000
 - Growing rapidly '905' community
- +612 Sq. Km.
 - Primarily rural
 - 4 Major Urban Centres
 - 13 Hamlets
- + Features
 - Lake Ontario
 - Ontario "Greenbelt"
 - Oak Ridges Moraine

Clarington



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+ The Challenge

- + Diverse, rural road network
- Traffic installations 'evolved' over time
- Missing standards-driven design processes

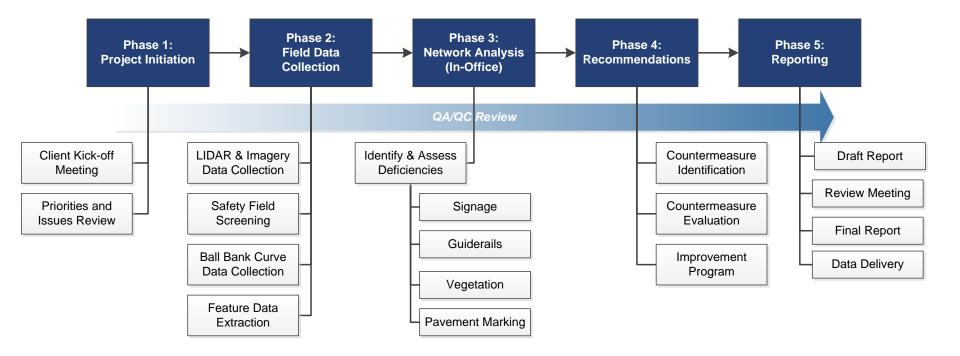
+ The Goal

- + Reduce risk exposure, achieve liability reduction
- + Complete comprehensive review
- Document issues identified
- Develop remedial action plan
- + Use innovative approaches

+ The Real Challenge

- + Long distances
 - 448km of Rural Road
 - 442km of Urban Road
- + Information challenges
 - Uncertain sign inventory
 - Limited roadside safety details
 - No curve ball-bank records
- + No system plan
- + Cost and time constraints

Project Approach Overview



7

+ Innovative Approaches

- + LiDAR
 - Light Detection And Ranging
 - Surveying technology, measure distance by illuminating a target with a laser light
- Automated Curve Ball Bank Measurements
 - CARS™ Curve Advisory Reporting Service
 - Capture road curve "ball-bank" data in one pass
- + Quantitative Prioritization
 - Treatment plan

+ LiDAR Survey

- + Used on all roads
- Both directions
- + 3-D point cloud
 - 25mm accuracy

+ Video Data

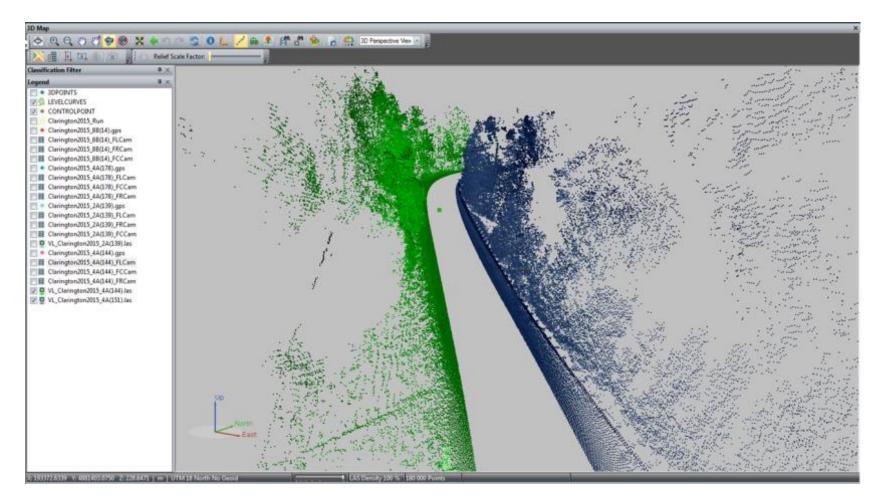
- + AVI HD Video
 - 3 m interval

+ Observer notes

- + Geo-reference
- + Audio log



+ LiDAR Survey



Video

+ Video Geo-reference Survey

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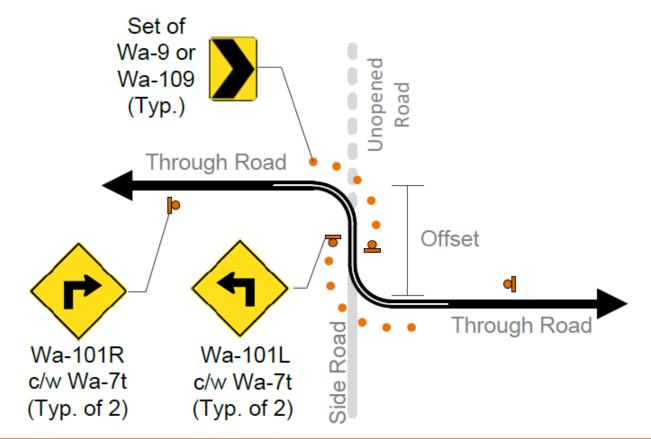
+ Sign Inventory

- + LiDAR GIS / Mapping
 - 6598 Signs
- + Correlation to existing inventory
 - Geo-location verification
 - Correction & adjustment
- + Video check
- Retro-reflectivity analysis
 - Multi-point measurement
 - Aged / Damage / Alignment / Obstruction



+ Sign Inventory

- + System consideration
 - Comprehensive route treatment





+ Sign Inventory

Non-standard applications



WA-7T Augmenting Regulatory Speed Sign on William Allin Court



WA-7T Augmenting Narrow Structure Sign on Conc. Road 1 at CPR



WA-7T Augmenting Intersection Warning Sign and Regulatory Speed Sign Conc. Road 10 east of RR57

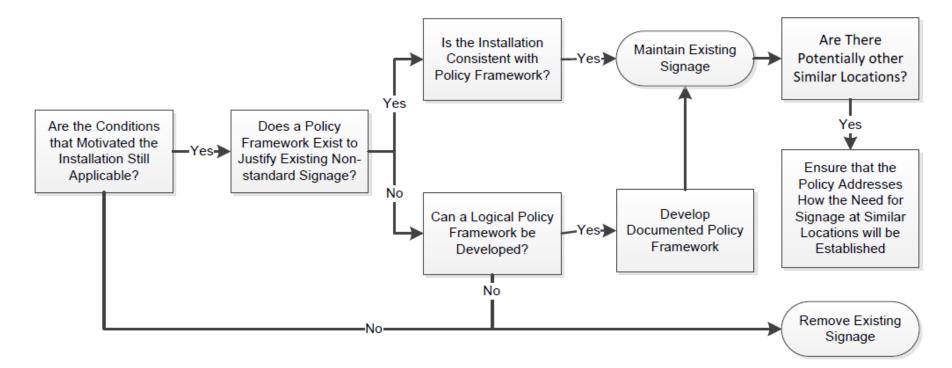
WA-7T Augmenting Nonstandard Hidden Int. Sign Conc. Road 6 West of Jewell Road





+ Non-standard review process

Figure 2-4: Non-standard Warning Sign Review Process



CIMA+ Advantage: Recognized Safety Expertise

+ Road Safety Evaluation

- In-Service Road Safety Review Process
 - Application of Standards
 - Ontario Traffic Manual
 - OTM Books 6, 7, 11...
 - Liability risk consideration









+ Roadside Safety Evaluation

- + Embankments
- + Bridge Structure
- + Headwalls
- + Guiderail
- + Trees
- + Utility poles

Location	Road Name	Structure No.	Hazard Type	Ex. Sys. Type	Countermeasure			Detection
ID	Road Name				Туре	Description	Cost (2015 \$)	Priority
RH120	Best Rd		Slope, Trees		Linear Delineation	Provide linear delineation (pavement markings and PMDs)	24,200.00	м
RH123	Bragg Rd	99017	Fixed Object, Structure		Linear Delineation	Install WB Narrow Structure Sign with One-way tab; Improve delineation for narrowing on approaches (edge markings/PDMs)	550.00	н
RH130	Lockhart Rd	98065	Slope, Creek Crossing		Point Hazard Marker	Adjust existing hazard markers to lower sign position and correct rotation	1,100.00	L
RH131	Squair Rd		Slope, Trees		Linear Delineation	Consider providing edge line pavement markings	13,200.00	м
RH132	Ochonski Rd		Fixed Object, Post, Pole, etc.		Point Hazard Marker	Install hazard markers at 1 driveway culvert on east side	550.00	L
RH133	Ochonski Rd		Slope, Trees		Linear Delineation	Consider providing edge line pavement markings at southern end	3,850.00	L
RH135	Jewel Rd		Slope, Trees		Point Hazard Marker	Install hazard markers at slope location	550.00	м
RH138	Conc Rd 5		Slope, Trees		Linear Delineation	Provide linear delineation (pavement markings and PMDs)	8,250.00	L
RH139	Conc Rd 5		Slope, Trees		Linear Delineation	None: Slope is borderline, guiderail not warranted. Linear delineation included in horz. curve recommendations.		L
RH140	Conc Rd 5		Slope, Trees	Р	Remove	Guiderail not required remove posts.	3,850.00	L
RH142	Conc Rd 5	98085	Drop, Culvert		Point Hazard Marker	Adjust hazard markers heights ASAP	1,100.00	L
RH143	Conc Rd 4	98067	Drop, Culvert		Point Hazard Marker	Install hazard markers at all quadrants ASAP	1,100.00	н
RH144	Conc Rd 4	98069	Drop, Culvert		Point Hazard Marker	Install hazard markers at all quadrants ASAP	1,100.00	н

Curve Speed Evaluation

+ Curve Advisory Speed – Ball-Bank

- Manual - Slope Meter

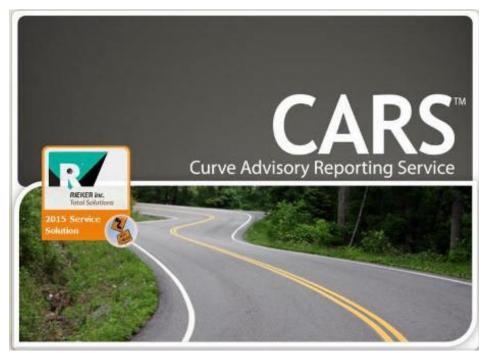


Electronic Ball Bank



+ Automatic Ball-Banking

- + Reiker Inc.
 - Proprietary System
 - Sold as a service
- + Rapid data collection
- + Large area review
- + Single Pass
- + One Operator
 - GPS Curve geometry
 - Acceleration measure

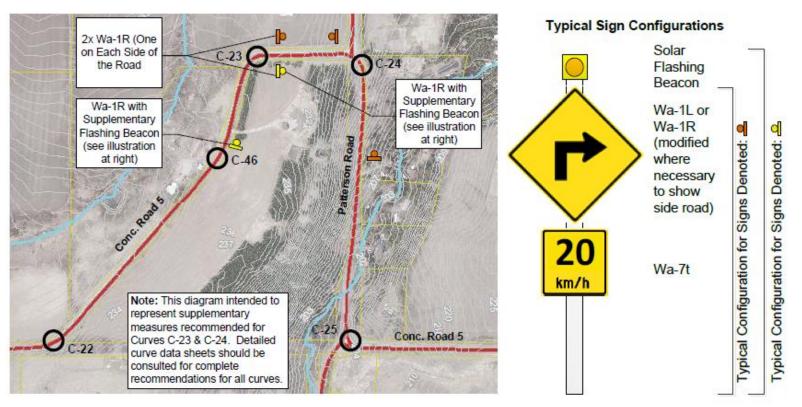




+ Curve analysis

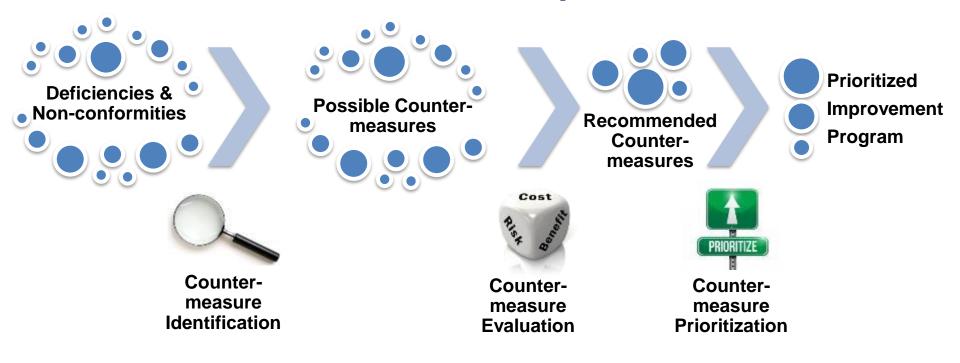
Complex system integration

+ Quick data collection



Optimization

Recommendations Development Process



+ Standards-based

+ Cost-benefit analysis driven+ Integrated with capital programs

+ Prioritized Improvement program

- + Maximize safety improvement
- + Optimize budget

+ Challenges

- Budget constraints
- Risk determination

+ Risk

- + Expert priority index
- + AADT
- + Speed
- + Improvement Potential

+ Cost / Budget

- + Treatment cost
- + Life cycle cost
- + Budget scenarios

+ Conclusions

- + LiDAR
 - Rapid data collection
 - Massive data quantity / management key
 - Some automation, not all
- + Curve Analysis
 - Accurate, rapid
 - Proprietary system
 - Not cost effective in this instance

+ Conclusions

- + Innovative approach
 - Quick data collection
 - Network wide information gathering
 - Comprehensive records
 - Potential future data analysis
- + System rationalization
 - Full compliance check
 - Development of complete plan for needed system improvements

