ITS Planning and Implementation on Rural Freeway Corridors
(TIM and Emergency Response Focus)

Brian Scott, P.E., Principal
SRF Consulting Group, Inc.
Minneapolis, MN  55447
bscott@srfconsulting.com

Tuesday, August 27th  2013
Overview

- Rural Corridor Planning – Challenges
- Planning Techniques and Tools
  - Traffic Operations Infrastructure Plan (TOIP)
  - Benefit/Cost
  - Communications Systems
- Current Efforts
- Other TIM Strategies
Rural Corridors – Planning Challenges

• Rural Highways – Over-represented with crashes
• Traveling Public expectations continue to rise – (Safety, mobility, access = key to QOL)
• Emergency Response to Crashes
• Provide alternate routes to Interstate traffic
Rural Corridors – Planning Challenges

• Large areas with variable land use
• Needs, issues and priorities vary from region to region
• System operation has different needs compared to an urban traffic management center
• Deployment cost can be higher than urban areas (especially communications & power)
• Marketing of ITS (Benefits, ROI, B/C, etc.)
Rural Corridors – Planning Efforts

• Wisconsin addressed these challenges through:
  – Using corridors to group roadway segments (Vision 2030 plan as a basis)
  – Data-intensive planning methodology
  – Benefit/cost analysis to select deployments
  – Geospatial, rules-based approach to communications planning
Traffic Operations Infrastructure Plan

- Based on WisDOT 2030 Priority Corridors
- First completed in 2007, updated in 2009
- Used data such as AADT, Accident rates, etc. to create a score for each segment.
- Scores then defined deployment “densities”
Traffic Operations Infrastructure Plan

Density Example: Rural Expressway/Freeway

Low

- Mobile Probes
- Negotiate for use of private or other public agency cameras
- Reference Markers
- Portable DMS and/or HAR for major incidents or closures
- Portable DMS and/or HAR used for construction, major incidents and special events

Medium

- Supply cameras at site specific locations based on data
- Enhanced Reference Markers
- Coordination with local PSAP’s to identify closest resource
- Ramp Closure (or gates)
- Pre-trip information (i.e. web based or kiosk)

High

- Detection at site specific locations based on data
- Cameras at interchanges and site specific locations based on data
- Preplanned closure and detour plans
- Incident Management resources available on-demand for major incidents
- Trailblazer signs on freeway and alternate routes activated for emergency detours
- Fixed DMS and/or HAR at major interchanges/decision points
- Fixed DMS at major interchanges and every 10-15 miles along freeway - DMS report travel times to major decision points
Traffic Operations Infrastructure Plan

Densities Determine Locations and Types of Devices
# Traffic Operations Infrastructure Plan

## Locations and Types then Determine Costs (Capitol and O&M)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Detection</td>
<td>ATR Station Upgrade</td>
<td>2</td>
<td>$20,000</td>
<td>$600</td>
<td>$600</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mainline Detector Station</td>
<td>5</td>
<td>$125,000</td>
<td>$2,000</td>
<td>$2,000</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service Interchange Detector Station</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>System Interchange Detector Station</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surveillance</td>
<td>CCTV Camera</td>
<td>5</td>
<td>$200,000</td>
<td>$5,000</td>
<td>$6,500</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Traffic Flow Management</td>
<td>Ramp Gate</td>
<td>14</td>
<td>$266,000</td>
<td>$12,600</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ramp Meter</td>
<td>5</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Traffic Signal Systems</td>
<td>Interchange Upgrade</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corridor Upgrade</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Fiber Optic Line</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1 Line</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cellular Modem</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Traveler Information</td>
<td>Overhead DMS</td>
<td>2</td>
<td>$166,000</td>
<td>$9,400</td>
<td>$9,400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roadside DMS</td>
<td>2</td>
<td>$166,000</td>
<td>$9,400</td>
<td>$9,400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCMS pad</td>
<td>6</td>
<td>$42,000</td>
<td>$0</td>
<td>$0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Non-ITS Devices</td>
<td>Crash Investigation Site</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Law Enforcement Pad</td>
<td>1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total ITS Devices</td>
<td></td>
<td>34</td>
<td>$819,000</td>
<td>$17,000</td>
<td>$31,100</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Total Communication Lines (miles)</td>
<td></td>
<td>0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Non-ITS Devices</td>
<td></td>
<td>0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FIGURE</td>
<td></td>
<td>34</td>
<td>$819,000</td>
<td>$17,000</td>
<td>$31,100</td>
<td>35</td>
</tr>
</tbody>
</table>
Traffic Operations Infrastructure Plan

TOIP resulted in a comprehensive plan that defined type, location and priority for over 850 ITS devices covering all major corridors in Wisconsin.

WisDOT Adopted TOIP and began the planning and design of ITS.

But...

Communications to the devices was specifically excluded from planning and estimates.
Communication System Layer (CSL)

• Following the 2009 TOIP update, work began on developing the CSL
• Goal was to define a communication method and cost estimate for each ITS device
• Scope was expanded to cover additional users (PSAPs, U of W campuses, Rest Areas, etc.) for over 1400 total connections
CSL Scope

TOIP Devices

Additional Potential Connections

1,456 Potential Connections – 12,000 Possible Connection Points
CSL Process and Approach Innovation

Top-down approach would have been too time consuming

Scale and schedule demanded a data-driven, semi-automated bottom up approach

- Extendable
- Repeatable
- Traceable
- Maintainable
CSL Tools and Process

ArcGIS was the “engine” for data entry and analysis

ArcEdit was used to digitize data from more than 2,000 plan sheets to create the infrastructure data

Network Analyst automated the process of identifying, measuring, and estimating fiber optic connections
A. Determine bandwidth requirement for each device
B. Estimate costs for possible communication methods for planning purposes (per foot, per link, etc.)
C. Make fiber optic is the preferred method
D. Set maximum allowable cost for fiber connection to a device is $50,000 in this model
E. If costs exceed the maximum for a fiber link, the least expensive alternative available that provides sufficient bandwidth is used (given geographic/availability constraints)
F. Assign the incremental cost to each device, aggregate as needed for planning purposes
How TOIP and CSL are Used

• Planning documents established locations where devices will be installed during construction.

• CSL is used both for planning new connections to ITS devices, and for cost comparisons when evaluating leased fiber services.
I39-90 ITS deployments

TOIP Planned Deployment

ITS Design Locations
Using CSL

CSL Visualization – Illustrates Device Locations and Costs
TOIP Today

Methodology is being adapted for arterial-level roadways

Two test corridors have been selected:

• US 18 and STH 59 from 25th to 70th Streets in Milwaukee (I-94 alternates)

• Port Washington Road north of Milwaukee from Silver Spring Drive to County Line Road (I-43 alternate)
Arterial TOIP

Port Washington Road Silver Spring Drive to County Line Road

US 18 and STH 59 from 25th to 70th Streets
Arterial TOIP

• Data-driven techniques from TOIP and CSL will be adapted and tested
• Once satisfactory results are achieved, the process can be applied to other arterial corridors
• Consistent ITS planning methodology will then be available for all major roadways in Wisconsin
Other TIM Strategies

• TIM Strategies
• Alternate Route Plans
I-35 Emergency Alternate Route Project
Freeborn, Steele, and Rice Counties
MnDOT District 6 - Owatonna
Final Deliverable #1: Operations Guide
Northbound Route

**NOTIFICATIONS**

INCIDENT COMMANDER ASSIGNS DISPATCH CENTER TO:
- Contact the following agencies and personnel:
  - Wisconsin State Patrol (Wausau)
    715-846-7667
  - Waushara County Dispatch Center
    920-292-3321
  - Portage County Dispatch Center
    715-346-1400
  - Statewide Traffic Operations Center (STOC)
    (800) 375-7362

*Note: Governmental use only – not for public distribution*
- Inform them of:
  - Incident location
  - Alternate Route being implemented
  - Any additional details
- Inform local media outlets of freeway closure

**ACTIONS**

WISCONSIN STATE PATROL (WAUSAU)
- Send out Traffic Incident Alert
- EXIT 136 - P1: Close NB I-39 / US 51
- EXIT 136 - P2: Close WS 73 on-ramp to NB I-39 / US 51

WAUSHARA COUNTY SHERIFF'S DEPARTMENT
- Provide traffic control at the following intersections:
  - EXIT 136 - I-39 / US 51 and WS 73
  - Other locations along Alternate Route as necessary

PORTAGE COUNTY SHERIFF'S DEPARTMENT
- Provide traffic control along Alternate Route as necessary

WAUSHARA COUNTY HIGHWAY DEPARTMENT
- Provide traffic control equipment to assist law enforcement at all closure points
- Deploy and activate 2 PCMS on NB I-39 / US 51
- Program PCMS as shown on map
- Distribute traffic control devices to relieve law enforcement directing traffic

**ROUTE DESCRIPTION**

If northbound I-39 / US 51 is closed between EXITS 136 and 139, all traffic should take EXIT 136 (WS 73). Turn RIGHT on WS 73 and proceed EAST to COUNTY BB. Turn LEFT on COUNTY BB and proceed NORTH to COUNTY DD. Turn LEFT on COUNTY DD and proceed WEST to northbound I-39 / US 51.
Southbound Route

SB SEGMENT EXIT 139 - 136
I-39 / US 51 EMERGENCY ALTERNATE ROUTE - PORTAGE COUNTY

NOTIFICATIONS
INCIDENT COMMANDER ASSIGN DISPATCH CENTER TO:
- Contact the following agencies and personnel:
  - Wisconsin State Patrol (Wausau) 715-546-7667
  - Portage County Dispatch Center 715-346-1000
  - Waushara County Dispatch Center 920-677-1222
  - Statewide Traffic Operations Center (STOC) 900-375-7302
Note: Governmental use only - not for public distribution
- Inform them of:
  - Incident location
  - Alternate route being implemented
  - Any additional details
- Inform local media outlets of freeway closure

ACCTIONS
WISCONSIN STATE PATROL (WAUSAU)
- Send out Traffic Incident Alert
  - EXIT 130 - P1: Close SB I-39 / US 51
  - EXIT 130 - P2: Close County D on-ramp to SB I-39 / US 51
PORTAGE COUNTY SHERIFF’S DEPARTMENT
- Provide traffic control at the following intersections:
  - EXIT 139 - I-39 / US 51 and County D
  - Other locations along Alternate Route as necessary
WAUSHARA COUNTY SHERIFF’S DEPARTMENT
- Provide traffic control along Alternate Route as necessary
PORTAGE COUNTY HIGHWAY DEPARTMENT
- Provide traffic control equipment to assist law enforcement
  - at all closure points
- Deploy and activate 2 PCMS on SB I-39 / US 51
- Program PCMS as shown on map
- Distribute traffic control devices to relieve law enforcement directing traffic

ROUTE DESCRIPTION
If southbound I-39 / US 51 is closed between EXITS 139 and 136, all traffic should take EXIT 139 (COUNTY D). Turn LEFT on
COUNTY D and proceed EAST to COUNTY BB. Turn RIGHT on COUNTY BB and proceed SOUTH to WIS 73. Turn RIGHT on
WIS 73 and proceed WEST to southbound I-39 / US 51.

May 2010
Other TIM Strategies

• Integrated Corridor Management Strategies on Selected Local Roads
• Enhanced Reference Markers
• Portable Cameras
• Crash Investigation Sites
• Law Enforcement Pads
• Temporary Glare Screens on Concrete Barriers
• Emergency Pull-Out Areas
Other TIM Strategies (cont’d)

• Incident Management Trailers
• Service Patrols
• Tow and Recovery
  – Freeway Service Truck
  – Contract Tow
• Emergency Vehicle Preemption (EVP) on Priority Alternate Routes
• Crash Reconstruction Equipment
• Advanced and Regional Alternate Routes Signing
Questions ?