

Testing and Evaluation of Guidelines for Disseminating Road Weather Information

Roemer M. Alfelor

Road Weather Management Program

FHWA, Washington DC

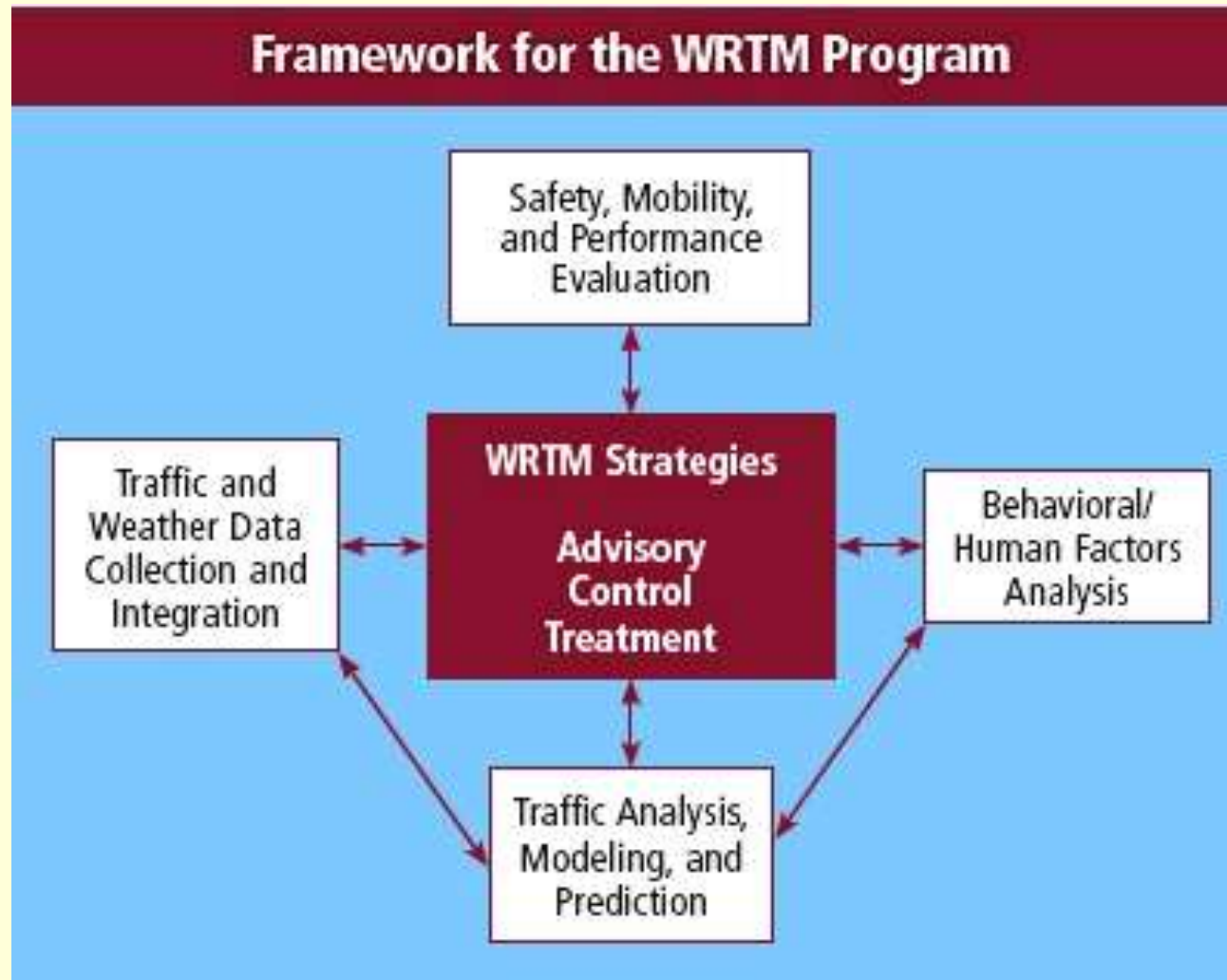
roemer.alfelor@dot.gov

**Road Weather Management
Stakeholder Meeting**

September 8, 2011 – Albuquerque, NM



WRTM Program



Human Factors Analysis for Road Weather Information

- Identify traveler requirements for Road Wx information
- Review and evaluate existing Road Wx messages and dissemination methods
- Recommend strategies for improving Road Wx information content and dissemination



Phase 1 Accomplishments

1. Identified and Evaluated Existing Messages and Dissemination Strategies
2. Incorporated Information into a Road Wx Message database
3. Developed Preliminary Guidelines for Disseminating Road Wx Information

Publication No. FHWA-JPO-10-053, NTL#33047



Existing Messages and Dissemination Strategies

- *Weather Messages:* Weather advisory and control messages on precipitation, visibility, wind and extreme weather events such as thunderstorms, hurricanes, tornadoes, floods, etc.
- *Dissemination Strategies:*
 - Kiosks
 - Variable/Dynamic Message Signs
 - 511/Highway Advisory Radio
 - Websites
 - Cellular Phones
 - In-Vehicle Navigation Systems
 - Other information portals



Road Weather Message Database

Source

Balke, K.N., Songchitruksa, P., Liu, H., Brydia, R.E., Jasek D.L., Benz, R.J. (2007). Concepts for Managing Freeway Operations During Weather Events. Research Report 0-5278-1. College Station, Texas Transportation Institute. Retrieved September 19, 2008 from <http://tti.tamu.edu/documents/0-5278-1.pdf>

Weather Event Messages

Winter Conditions

- Blizzard conditions
- Sleet or freezing rain
- Freezing drizzle
- Flurries or light snow
- Blowing snow
- Moderate to heavy snow
- Extreme cold
- Bridge or road frost
- Low roadway traction
- Rain**
- Flooding
- Moderate to heavy rain
- Dizzle or light rain

Convective Weather

- Severe thunderstorms
- High winds
- Hail
- Hurricanes
- Tornadoes
- Other**
- Extreme heat
- Blowing sand or dust
- Smoke, mist, fog, or haze
- Other

Dissemination Method

- TV
- Local AM/FM radio
- Satellite radio
- HAR
- 511
- Portable electronic device
- Cell phone text message
- GPS navigation device
- Dynamic message sign
- Kiosks
- Website
- Other

Message Modality

- Visual Component
- Auditory Component

Extra Information

- Driver Information Needs
- Geo-Specific/Regional Information
- Design Recommendations
- Contains Methodological Information

Message Type

- Advisory
- Control

Comments

Suggested messages to be used on DMS signs. Not tested in laboratory or field studies

Content

Suggested DMS Messages for:

LIMITED VISIBILITY CONDITIONS

Warning Messages

Roadway Name	Roadway Name	Roadway Name
Dense Fog	Dense Fog	Blowing Sand
Use Caution	Reduce Speed	Reduce Speed

Speed Advisory Messages

Roadway Name	Roadway Name	Roadway Name
Dense Fog	Dense Smoke	Blowing Sand
Advise XX MPH	Advise XX MPH	Advise XX MPH

End of Queue Warning (Two Panel Message)

Panel 1	Panel 2	Panel 1	Panel 2
Roadway Name	Watch For	Roadway Name	Watch For
Dense Fog	Stopped	Dense Fog	Stopped
Ahead	Vehicles	Next X Miles	Vehicles

Truck Lane Restriction (Two Panel Message)

Panel 1	Panel 2
Roadway Name	Trucks
Dense Fog	Right Lane
Ahead	Only

Roadway Closed

Roadway Name
Closed
Exit at Voss

Diversion Message (Two Panel Message)

Panel 1	Panel 2
Roadway Name	Use
Closed	Other
Dense Fog	Routes

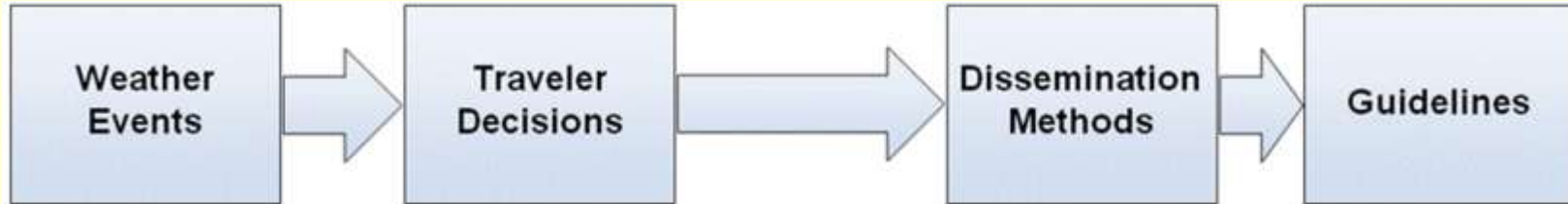
PONDING OR FLASH FLOODING CONDITIONS

Main Lanes Passable

Water on Road Water on Road Water on Road Water on Road



Preliminary Design Guidelines



What are the Key Mobility impacts?

For Example:
*reduced traction
congestion
poor visibility
road closures*

What are the Traveler Decisions to be made?

For Example:
*expect & plan for delays
use alternative route
change travel modes
drive with greater caution
change their driving behavior
make safety-related preparations
cancel their trip*

What are the appropriate Dissemination Methods?

For Example:
*DMS
HAR
511
In-vehicle devices
Cell phones
Kiosks
Websites*



Preliminary Design Guidelines

- **30 guidelines and 4 tutorials for road weather advisory and control information for:**
 - Message content, length, and structure
 - Design of fonts, colors, icons, and alerts
 - Display of map, weather, and traffic information
 - How to communicate timeframe, urgency, likelihood
- **Specific guidelines are provided for the range of dissemination methods (DMS, HAR, 511, etc.) associated with road weather information.**
- **The guidelines are organized around traveler information needs and driving decisions.**



Preliminary Design Guidelines

Section Title:

General topic area that is addressed by the guideline

Introduction:

Brief definition of the scope of the guideline

Figure, Table, or Graphic:

Visual representation or example of the information presented in the guideline

Key References:

List of references used to write the design guideline


GENERAL MESSAGE PRESENTATION & LAYOUT

GUIDELINE 15. USE OF VISUAL ICONS - SHORT TEXT/VISUAL & OPEN-FORMAT


Introduction
Message icons for open-format text/visual displays refers to the selection or design of icons and their labels.

Design Guidelines	
Icon Property	Guidelines (from Campbell, Nickman, Corney, & Lee (1))
Border	<ul style="list-style-type: none">Use a border to show the icon area.
Background	<ul style="list-style-type: none">Don't cover more than half of the available area with objects.Avoid patterns in the background.Put the image clearly in front of the background.Place objects in the center and the background around the periphery.Use unsaturated, cool colors for the background, and saturated, warm colors for the foreground image.Keep the background static; if anything blinks or moves, the viewer perceives it as a foreground image.Limit the background image to a simple rendition of a recognizable, concrete object.
Element	<ul style="list-style-type: none">Use commonly accepted or standardized elements when possible.
Symbol	<ul style="list-style-type: none">Use circles to present prohibition or mandatory information.Triangles to present warning or cautionary information.Squares to present general information, instructions, or safe condition information.
Text Label	<ul style="list-style-type: none">Use only when necessary, especially when the icon is concept-related or arbitrary.Limit to two or three words.

Components of an Icon (from Campbell et al. (1))



Example of Weather-Related Icons (from Campbell et al. (1), originally from www.intellicast.com, not intended for use)



Discussion
Icon borders and backgrounds are useful to clearly show the user (traveler) which elements are part of the icon. They help define the icon area, show users (travelers) where to click if they are part of a control, and make the icon stand out from surrounding text. However, if the icon is going to be placed over another display element such as a map, borders and backgrounds may increase visual clutter and cover other display elements unnecessarily. This could be prevented by removing the border and background. The example icons above have thick symbol borders which would likely provide sufficient contrast against map elements without an additional colored border or background.

Key References:
1. Campbell, J. L., Nickman, J. B., Corney, C., and Lee, J. D. (2004). In-vehicle display icons and their information elements. *Final Report*. Guidelines (Report No. FHWA/RD-03-065). McLean, VA: Federal Highway Administration. Retrieved October 6, 2009, from <http://www.fhwa.gov/ohp/ohp/04065.pdf>

Human Factors Analysis of ... A-19 February 26, 2010

Guideline Title:

Contains the guideline number, specific topic addressed by the guideline, and the applicable Dissemination Method types

Design Guideline:

Message design guidance, always presented in a blue box

Discussion:

Further explanation and rationale for the design guideline

Page Number

Phase 2 - Testing and Evaluation of Design Guidelines

1. Develop and implement a plan to test and evaluate the design guidelines.
 - On-line survey/questionnaire
<http://www.surveymonkey.com/s/X72ZSZ5>
 - On-site testing/evaluation
2. Revise the guidelines based on the survey/test results and recommendations from operators and travelers.
3. Implement a set of outreach activities in order to attract, engage, and involve the user community.



Criteria for On-Site Testing/Evaluation

1. Geographical/weather variation
2. Transportation network coverage
3. Dissemination methods
4. Types of messages
5. Willingness to evaluate or improve existing dissemination methods
6. Agency responsible for posting messages



Testing/Evaluation Sites

A Agency	B Operational Network Coverage	C Weather Events	D Dissemination Methods for Weather	E Road Wx Messages	F Responsible for Posting Messages	G Approach to Messages
Kansas City Scout, MO	Urban freeway; bi-state	Snow, ice, flooding, wind	DMS, 511, website		TMC operators	Approved message sets
Wyoming Statewide TMC	Rural freeway and arterials	Snow, ice, wind	DMS, VSL, 511, website, HAR, "511 notify" that pushes weather messages to subscribers	Closures; variable speed limit control		
Colorado Springs, CO TMC	Urban arterials	Snow, ice		Traffic signal control		
CDOT, Colorado	Freeways	Snow, ice, other	VMS, VSL		Op Program Mgr; Supervisor	Both preset and ad hoc messaging
WA State DOT and NW Regional TMC	Urban freeways and arterials	Snow, ice, heavy rain, flooding, wind, fog	DMS/VMS, website, 511, HAR		TMC supervisors, operations staff, regional and state-wide	



Testing/Evaluation Sites (cont)

A Agency	B Operational Network Coverage	C Weather Events	D Dissemination Methods for Weather	E Road Wx Messages	F Responsible for Posting Messages	G Approach to Messages
Maryland CHART	Urban freeways and arterials	Snow, ice, heavy rain,	DMS, HAR, 511 recently activated	Closures, advisories, icy conditions, anti-icing	Operations staff	Standardized set. SOP already for winter events
Indiana DOT	Urban freeways on IN side of Chicago area	Focus on road conditions, winter weather effects	DMS; a CARS state, just getting into 511	Advanced warning of lake snow effects	Dispatchers; “super users” can create custom messages	Both fixed message sets and ad hoc messaging
Meridian	Manages statewide 511 systems (for GA, KS, NE, SD, ND, MT, WY, and NV.	Full range (emphasis on winter weather conditions)	511 phone and websites	Wide range	Varies by states	Varies by state
Castle Rock, Inc.	CARS system	Covers 12 states and several other entities	Focus on 511	Wide range	Varies by state; CRC guidance	Varies by state



Traveler Evaluation Methods

1. Focus Groups
2. Comment Forms
3. Intercept Surveys
4. Social Media

