

A blue semi-truck with a white trailer is driving on a multi-lane highway. The truck is in the left lane, moving towards the right. The sky is clear and blue. In the distance, other trucks and a car are visible on the road. The text "Understanding Freight Transportation & Research Opportunities" is overlaid in large white font with a black outline.

# Understanding Freight Transportation & Research Opportunities

**Dan Murray, American  
Transportation Research Institute**

**May 11, 2006**

# ATRI...

- 501(c)3 NFP
- Formerly ATA Foundation
- Government & Industry Sponsors
- Research Categories:
  - Safety & Human Factors
  - Technology & Training
  - Environmental Factors
  - Transportation Security
  - Economic Analyses

# Freight Industry Snapshot..

- 640,000 Trucking Companies
  - 10.1M employees; 3.2M truck drivers
  - 2.8 million large trucks; 20M commercial trucks
  - 4.9M trailers
- 6 Class 1 railroads; 550 Total
  - 1.2M freight cars
  - 200K employees
  - 170K miles of track
- 51 Deep Water Ports; 148 Total
  - 8000 ships
  - 12K miles of commercial waterways
- 12M – 20M Containers
  - Truck-Rail now fastest growing
- 75% air cargo moved by non-U.S. carriers
  - Fastest-growing sector over time
  - Expedited: Truck vs. airplane?

# Key Realities

- Air Cargo...
  - Fastest Growing
  - Most Stays on the Ground?
- Rail
  - More Energy Efficient
  - Lower Emissions
  - Lower Cost
  - Highly Unreliable
  - Max Capacity
  - Intermodal Growth High
  - Poor Replacement for Truck System

# Water/Maritime

- Barge Traffic Not Likely to Grow Substantially
- Maritime Relatively Insecure
- Labor Issues Problematic

# Key Realities

- Trucking
  - Heavily Regulated
  - Highly Competitive
  - Safety Issues Complex
  - 68% of Tonnage; 86% of Revenue

# Industry Snapshot: Freight Movement

- Total Tonnage Moved:

2002 - 8.88 Billion Tons

2008 - 10.1 Billion Tons

... A 13.7% increase in 6 years.

- Trucking revenue represents 86.5% of all freight revenue

# Top Industry Issues Survey

- Identify top concerns facing the industry over the next 5-10 years
- Based on 2000 responses
- Ongoing; allowing trend analyses
- Short- and long-term effects must be separately analyzed...



# Top 10 Issues

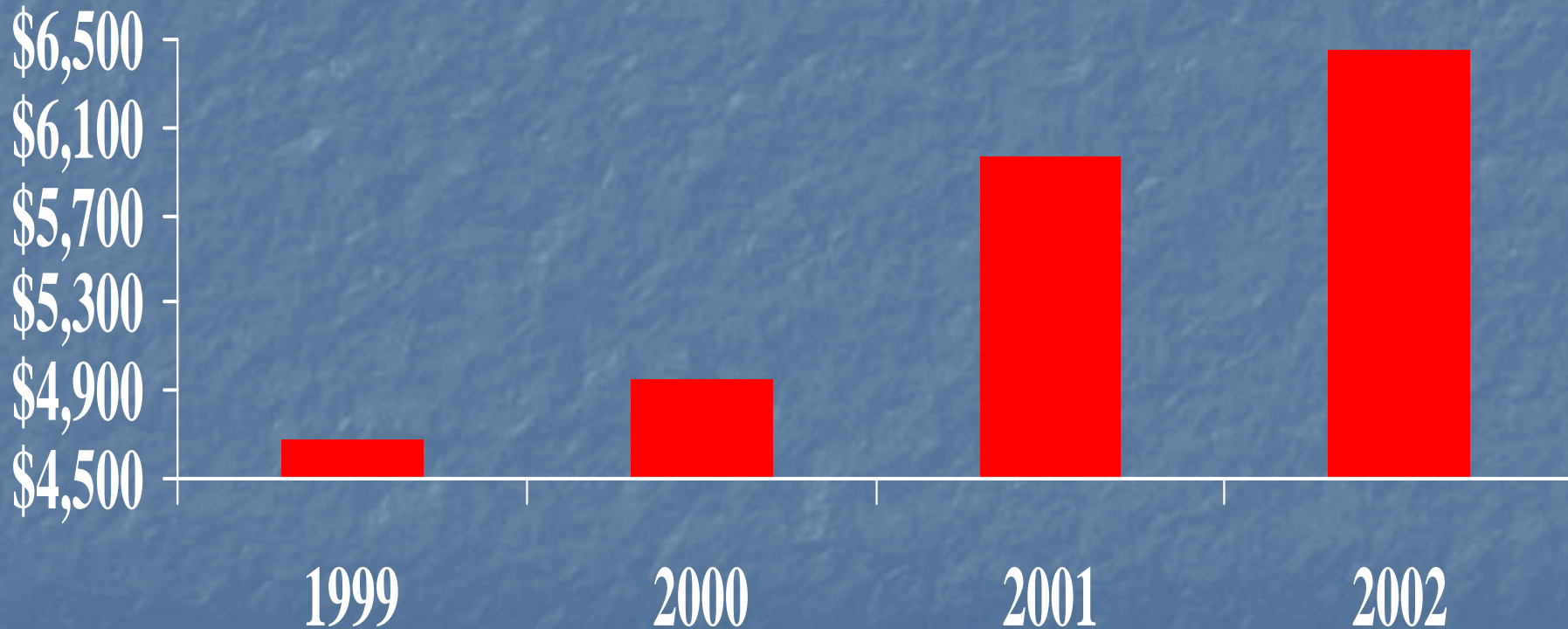
1. Driver Shortage
2. Congestion
3. Tolls/Highway Funding
4. Fuel Costs
5. Environmental Issues
6. Increasing Laws/Mandates
7. Tort Reform
8. Hours-of-Service
9. Security
10. Insurance

# Strategic Issues

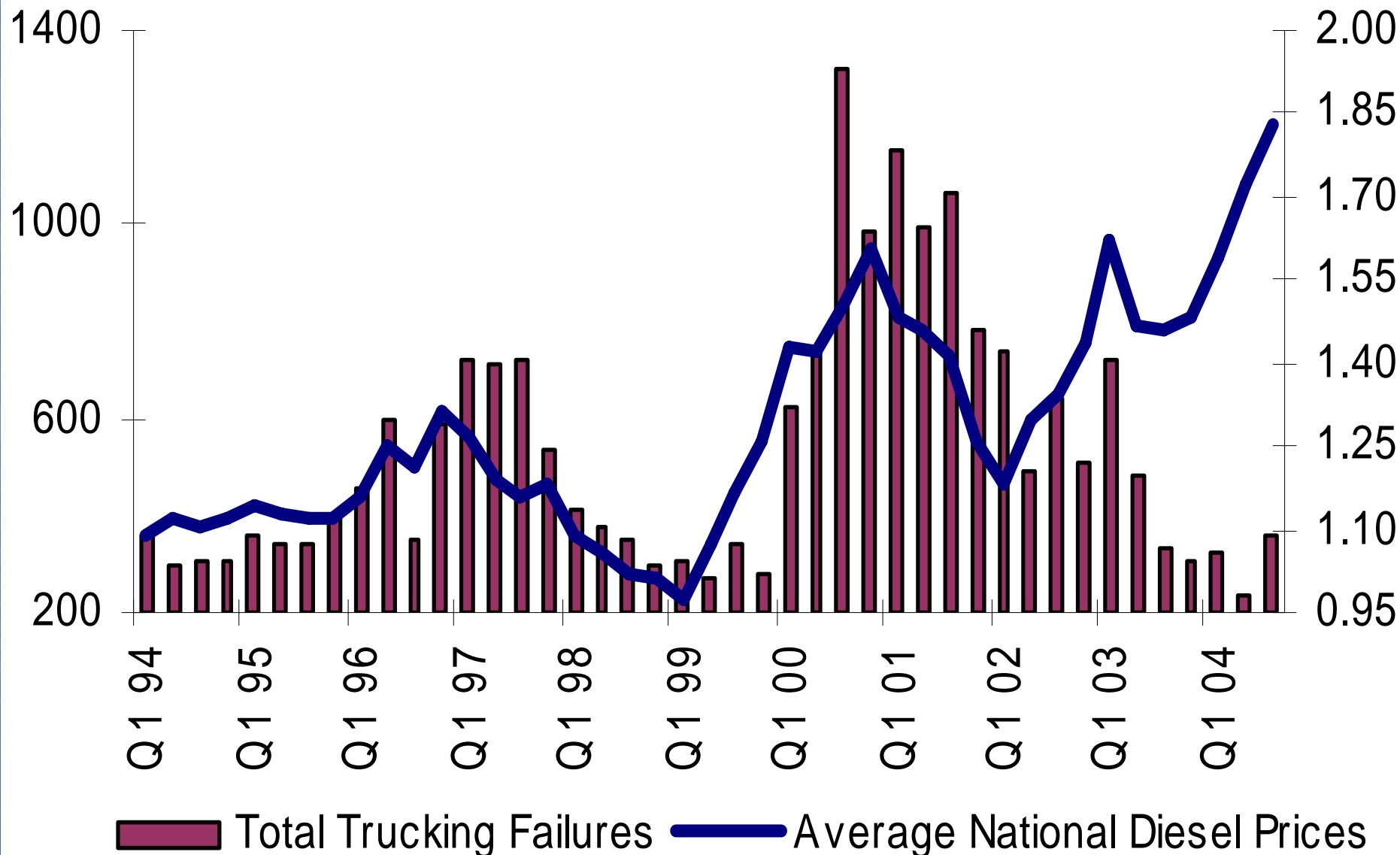
- Insurance Costs
  - 20% - 50% increases for “good” carriers
- New Regulations: HOS; HM Endorsements, etc.
- Fuel Cost Volatility
  - Jan. '02 - \$1.16/Gallon
  - Oct. '04 - \$2.20/Gallon
  - May '06 - \$2.89/Gallon

# Insurance Cost per Truck

Data based on publicly held truckload carriers which disclose this information.



# Higher Diesel Prices Lead To More Trucking Failures

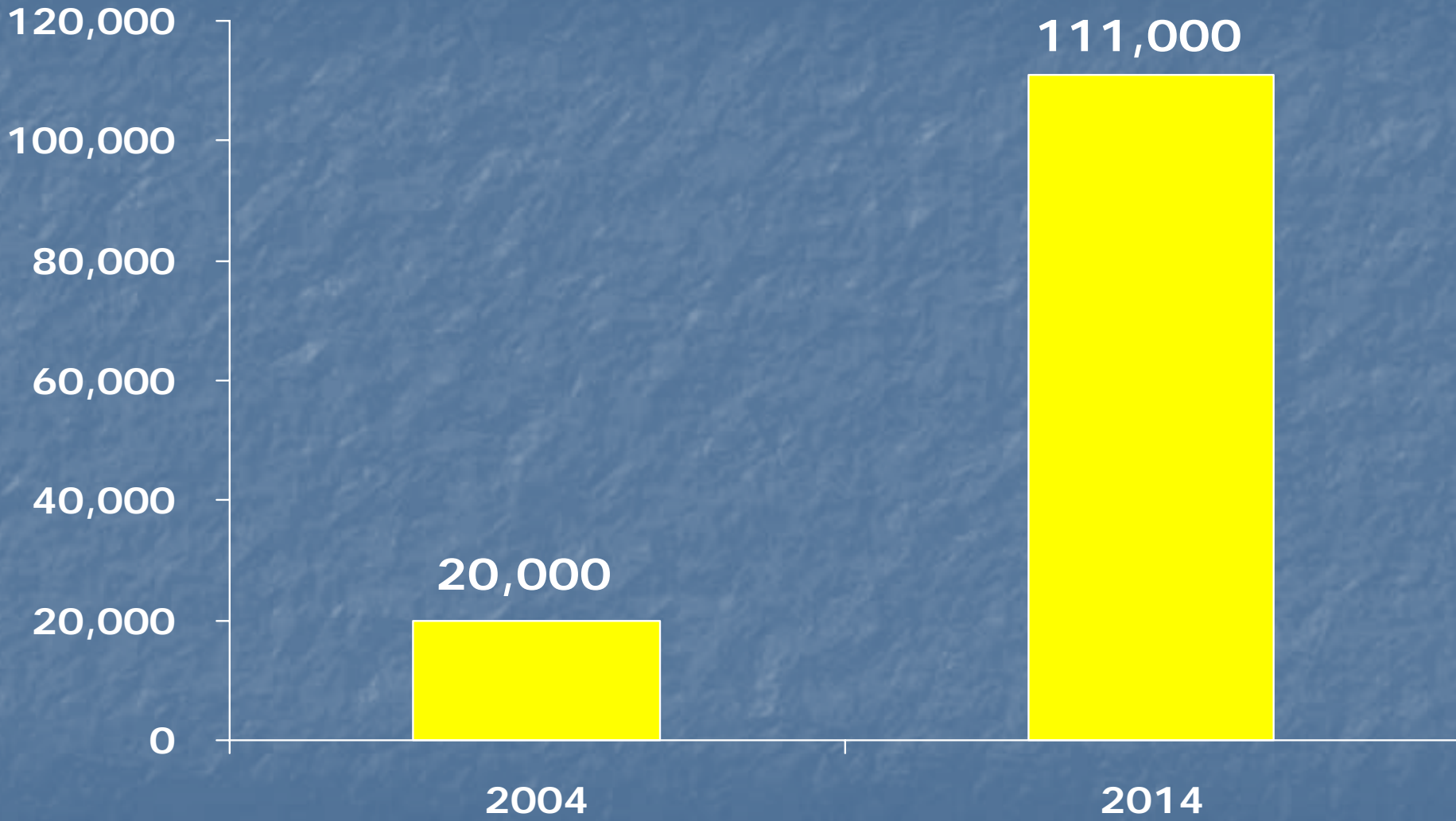


# Strategic Issues

- Driver Issues
  - Shortage (140%)
    - Turn-over vs. Churning
  - HOS
  - Heated Economy & Wage Increases
  - Looming Retirements
- Technology Utilization
  - Haves vs. Have-Nots
    - Growing; Faster Among Large Carriers

# Driver Shortage

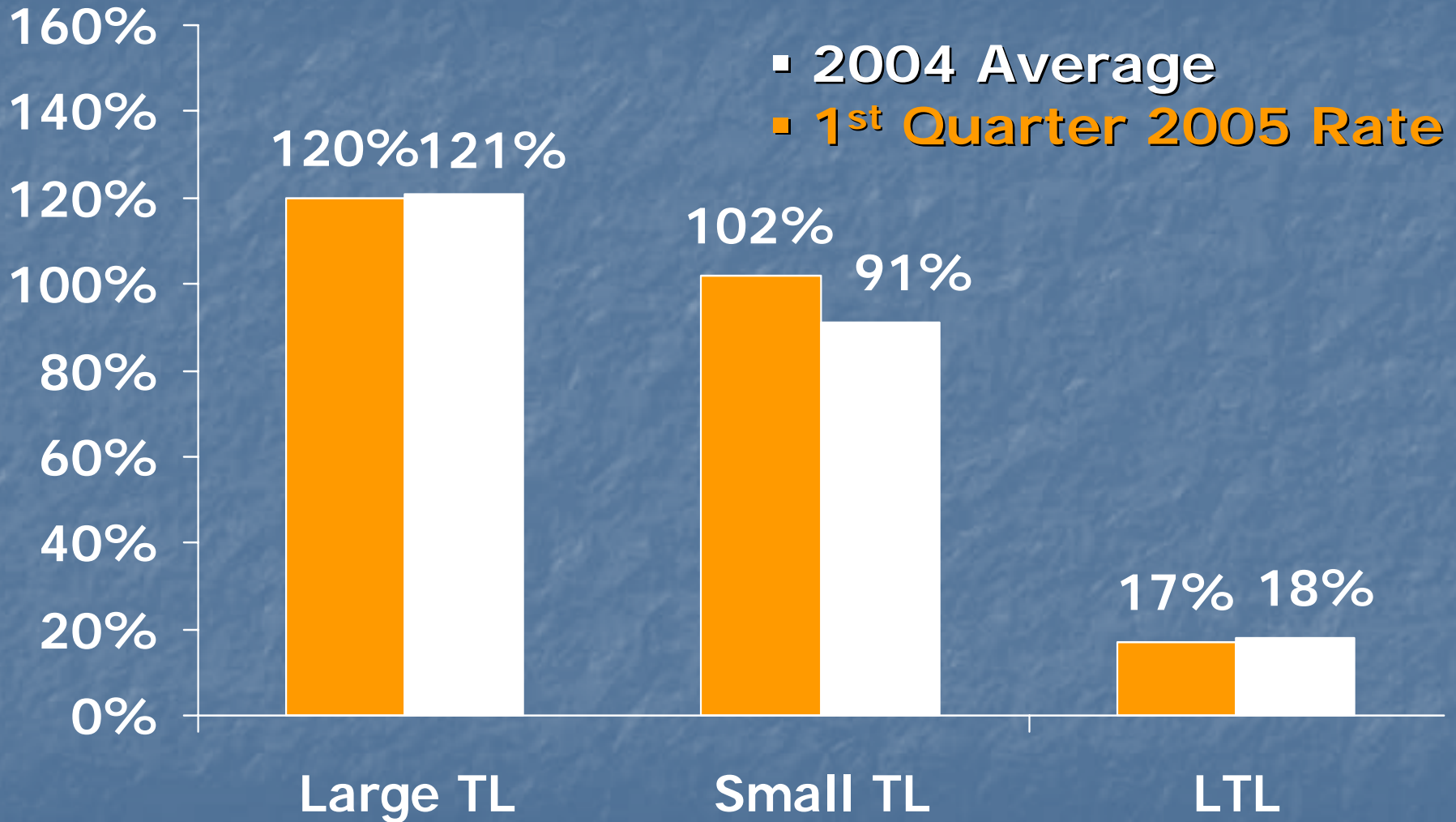
## Long-haul TL Drivers



Source: Global Insight, Inc. for ATA

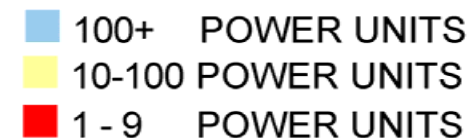
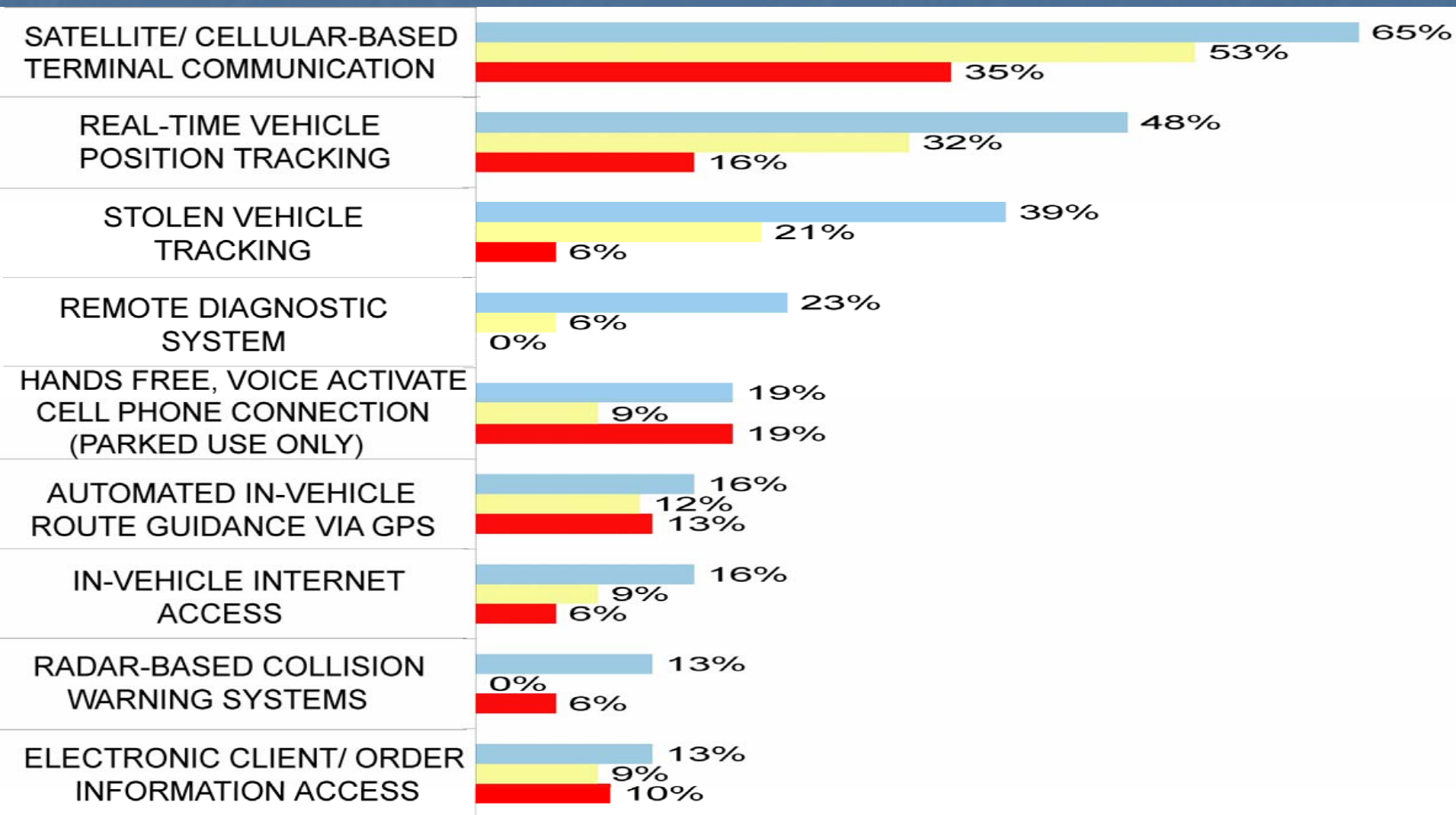
# Truckload Driver Turnover

(Quarterly Annualized Rates )



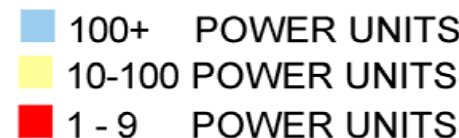
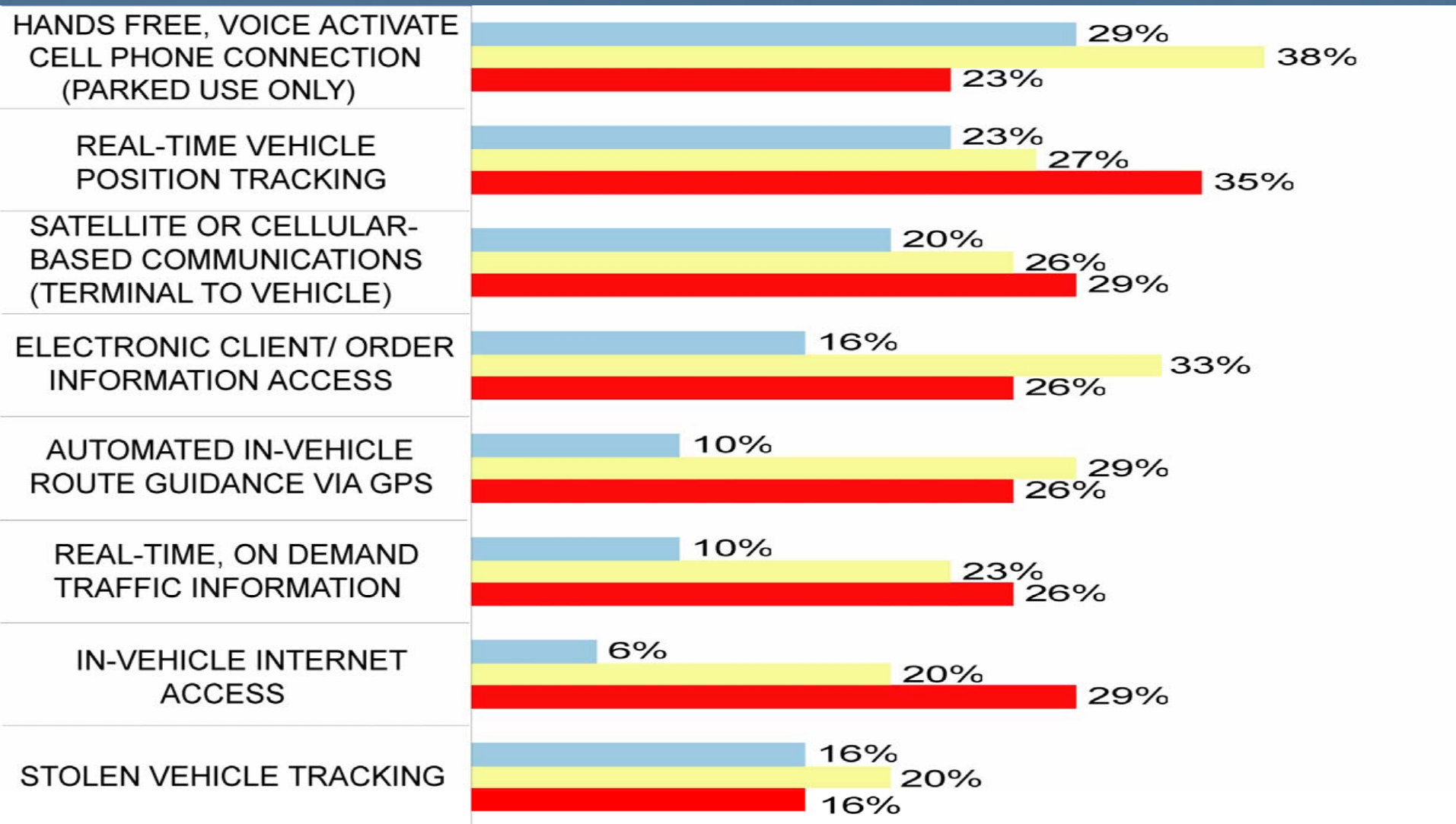
Source: ATA's *Trucking Activity Report*

# Most Common In-Vehicle Technologies by Fleet Size...





# In-Vehicle Technologies Most Likely to be Deployed by Fleet Size...



# Strategic Issues

- Congestion
  - Driving trucks to alternative routes
  - Impairing economic growth
  - No new capacity
- Shipper-Carrier Relationships
  - Root of many problems
  - Contract requirement issues
  - Competition hurts
- Security Costs??

# Research Landscape

- Basic vs. Applied
  - Role of Academia
  - Partnerships allow for Applied Knowledge Gap
- Data Privacy
  - FOIA/CIPSEA/HIPAA
  - Tight NDAs Needed
- Academic Costs Relatively High

# Research Landscape Cont'd

- Federal Funding Substantial
- Funding Sources & Requirements Complex
- Earmarks Large
- Consultants are Everywhere
  - GSA et al

# Environmental Issues

- Fuel Efficiency
- Boutique Fuels
- Emissions
- Idling
- Alternative Fuels
- Policy: Efficiency vs. E-Friendly Conflicts

Sponsors: DOE; EPA; ??

# Labor Issues

- Driver Shortages
- Driver Sources/Resources
- Compensation Issues
- Human Factor Research

Interested Sponsors: DOL, NIOSH, DOC,  
FMCSA

# Safety Issues

- HOS
- Safety Technologies
  - Roles, Costs, Mandates, Efficacy
- Health & Wellness Issues
- Safe Driver Attributes
- Policy Issues (DP, Mgmt., etc.)
- Regulatory Effectiveness

Interested Sponsors: FMCSA, FHWA, NHTSA, CDC, OSHA

# Productivity/Economics

- Competitive Environment Issues
  - S&D, Gov't Intervention
- External Factors
- Managing Distribution Systems
- SCM Inefficiencies
  - Tech vs. Processes
- Truck Size & Weight

Interested Sponsors: FHWA, DOC, DOL, Assns,  
SAE



# Technology Issues

- Lack of Interoperability
- Lack of Standards
- Data Privacy/Control
- Financial Issues
  - Depreciation/Obsolescence/Innovator Effect
- Bandwidth

Interested Sponsors: FMCSA, FHWA, NHTSA, CDC, OSHA, NIST, SAE

# Security Issues

- Complex
  - Deterrence/Detection/Defense/Recovery
- Poorly Defined
  - TRB Report
- Too Many Widgets
- Lack of Operational Knowledge
- Areas of Interest: HM; Containers, Air Cargo, Borders

Interested Sponsors: DHS; TSA; CBP; U.S. DOT

# Other Issues

- Institutional/Legal
- Vehicle Design/Configuration
- Transportation Planning & Funding
  - Jurisdictions

# Current Research

## Safety and Human Factors

ENS Pilot Test

Driving Simulator  
Evaluation

CMV Enforcement  
Effectiveness

Safety and Productivity  
of New HOS

Work Zone Safety

## Safety and Human Factors

Fatigue Management  
Technologies

Traffic Incident  
Management Focus  
States Initiative

Traffic Incident  
Management Self-  
Assessment

# Current Research

## Technology and Innovation

Data Privacy

Freight Performance Measures

Freight Information Highway

EAD Safety Technologies

## Technology and Innovation

Integrated Vehicle-Based Safety Systems

Safety Technology Survey Synthesis

Brake Maintenance Certification

# Current Research

## Environmental Factors

Idling Preferences  
Survey

Idling Regulations  
Compendium

Idle Reduction  
Technologies

## Economic Analysis

Highway Funding  
Analysis

Capacity Crisis

Freight Capacity Model

## Transportation Security

ITS Security Curriculum  
Development

Homeland Security and  
The Trucking Industry

National HazMat Ops  
Test

ACE Border

Analysis/Cross-Border  
Programs Assessment

# CMV Enforcement

## *Predicting Truck Crash Involvement – A Commercial Driver Behavior-Based Indicator*

- Prior research, including LTCCS, points to driver-related factors as critical reason for crashes
- Focusing on driver behaviors will have most profound impact on crash reduction

# CMV Enforcement

Research uses data from MCMIS and CDLIS to look at roadside inspections, crashes and convictions

Analyses focus on whether there is a significant difference in future crash rates for drivers based on past roadside inspection, violations, conviction and/or crash information



# CMV Enforcement

## Preliminary Findings...

- Percent increase in crash likelihood from citations related to:
  - Reckless driving- 325%
  - Improper turns- 105%
  - Improper lane changes- 78%
  - Failure to yield ROW- 70%
  - Following too closely- 40%
  - Speeding- 35%

# CMV Enforcement

## Preliminary Findings...

- Percent increase in crash likelihood from convictions related to:
  - Improper or erratic lane change- 100%
  - Speeding- 97%
  - Following too closely- 50%
- Percent increase in likelihood of future crash by drivers who had a past crash- 87%

# CMV Enforcement

## Additional Analysis:

- States with greater enforcement activity and lower crash rates have been identified statistically as “Top Tier States”
- Enforcement actions from those states being analyzed as best practices to mitigate the driver events/behaviors identified

# Hours-of-Service

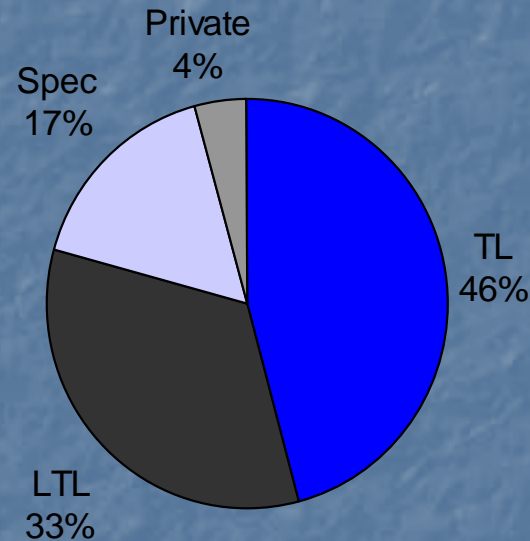
## *The Safety and Productivity Impacts of the New HOS*

- Compares 2003 impacts to 2004 (pre- and post-new HOS)
- Includes survey of 1,000 TL & LTL drivers

# Hours-of-Service

## DATASET:

- Over 100,000 drivers
- Over 97,000 trucks
- Over 10.5 billion fuel tax miles



# Hours-of-Service

## Preliminary Findings 2004 over 2003:

- Reduction in collision rate per million miles of 3.7%
- Reduction in preventable collision rate per million miles of 4.8%

# Hours-of-Service

## Preliminary Findings 2004 over 2003:

- Reduction in injury rate per million miles of 12.6%
- Reduction in collision-related injury rate per million miles of 7.6%

# Hours-of-Service

## Driver Survey Results:

Are you more or less fatigued under new rules?

- 46% Less
- 23% No change
- 31% More

Have the new rules made your driving job easier or harder?

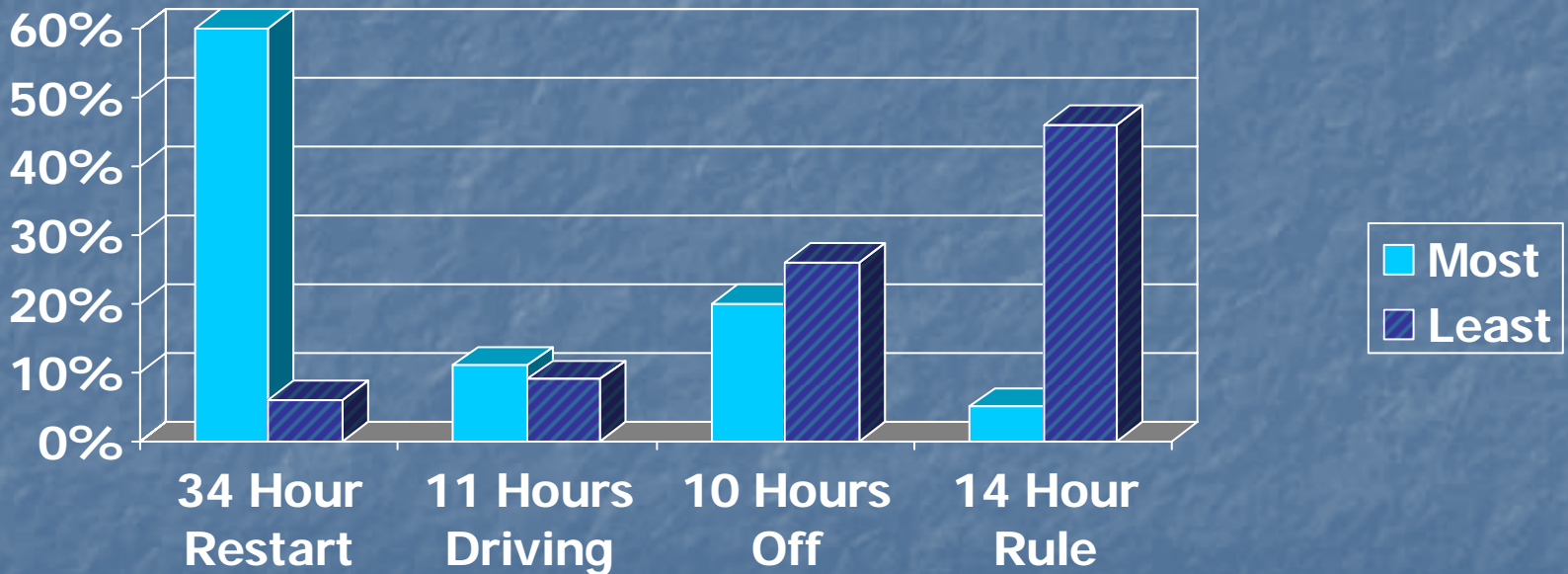
- 45% Easier
- 17% No change
- 38% Harder



# Hours of Service

## Driver Survey Results

Which provision do you like the most? least?



# Capacity Crisis

- **Scoping Study Underway**
  - **Developing relationships, data/metrics and assumptions**
    - **Metrics will address truck size & quantities, VMTs, congestion, tonnage, emissions. Intermodal diversion?**
  - **Working with ARRB Transport Research**
  - **Steering Committee in development; includes FHWA**
  - **Issue: should final scoping study be converted to FHWA proposal?**

# Homeland Security and The Trucking Industry

- Study commissioned by OEM; managed by U of MN and authored by ATRI
- Large-scale analysis of industry factors and externalities and their relationship to security
- Documents Security ROIs
- Includes focus on biometrics, e-seals and smart cards
- Public distribution after July 7
- “Excellent study that will be broadly disseminated throughout International...”

# DP Concerns in the Freight Industries...

1. Civil Litigation/TL
2. Competitive Access
3. Gov't Sharing
  - FOIA
  - CIPSEA
  - Privacy Act of 1974

# Security: Data Privacy Issue

- Regulatory Costs
- Functional Solutions Needed
- Lack of Security ROI
- Lack of National Plan

# Data Privacy Issues in ITS

1. Technical Issues
  1. Engineers Don't Care about DP
2. Legal/I.I. Issues

# And its Getting Worse

- Sarbanes-Oxley Requirements
- ID Cards
- Airline-Gov't Cooperation
- DOJ: Microsoft/Yahoo vs. Google
- E-Mail Discovery

Impacts ALL Research!

# Phase 3 Wrapping Up

- 25 Corridors
- 2/3rds of IS
- 12 Months of Data Collected
- Border Collections underway
- Weather Analysis
- Automated Processing Capability
- State & MPO Reviews
- Web-based queries?



# Average Travel Rate for Trucks July 2005, 10 Mile Segments

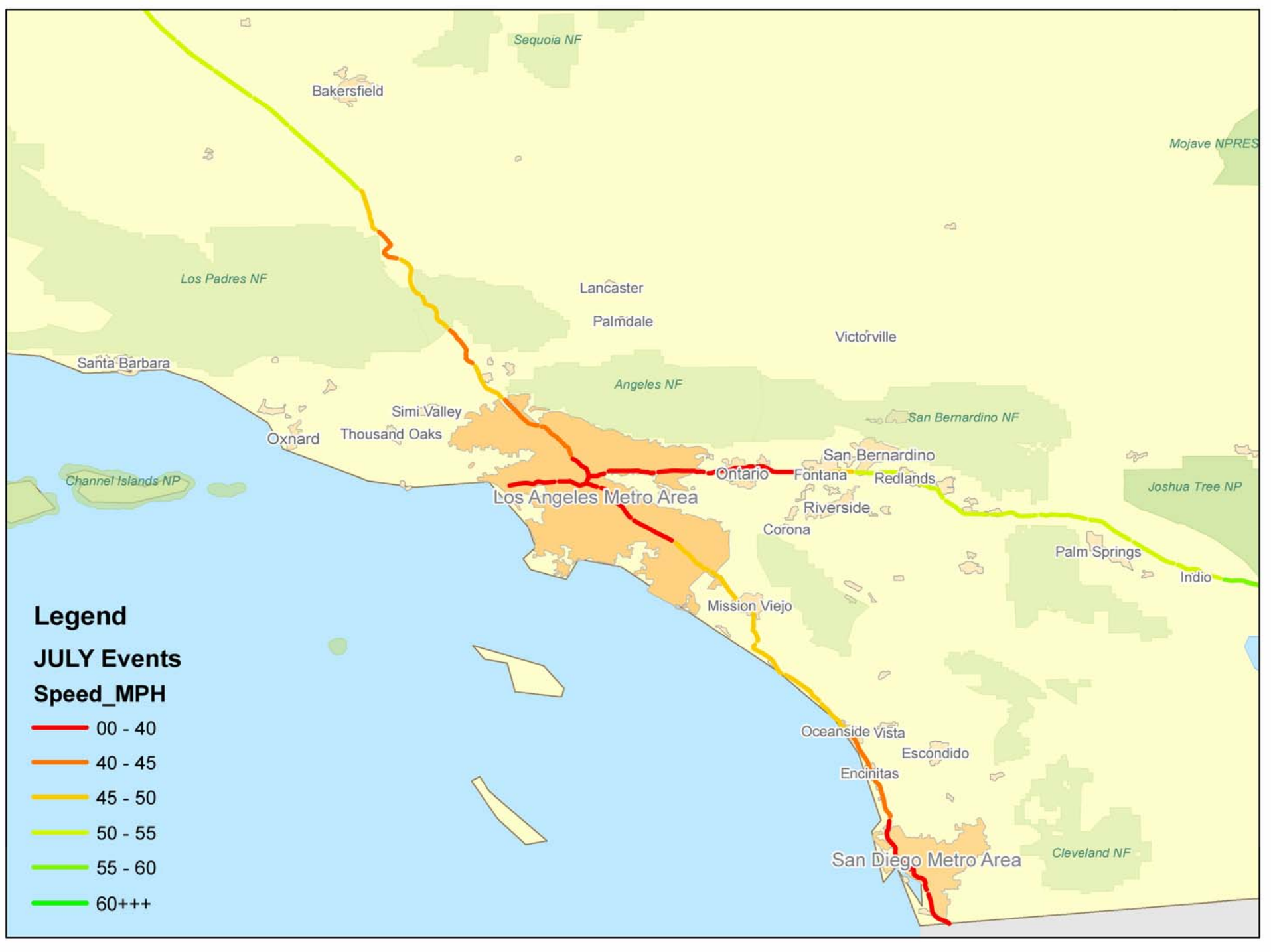


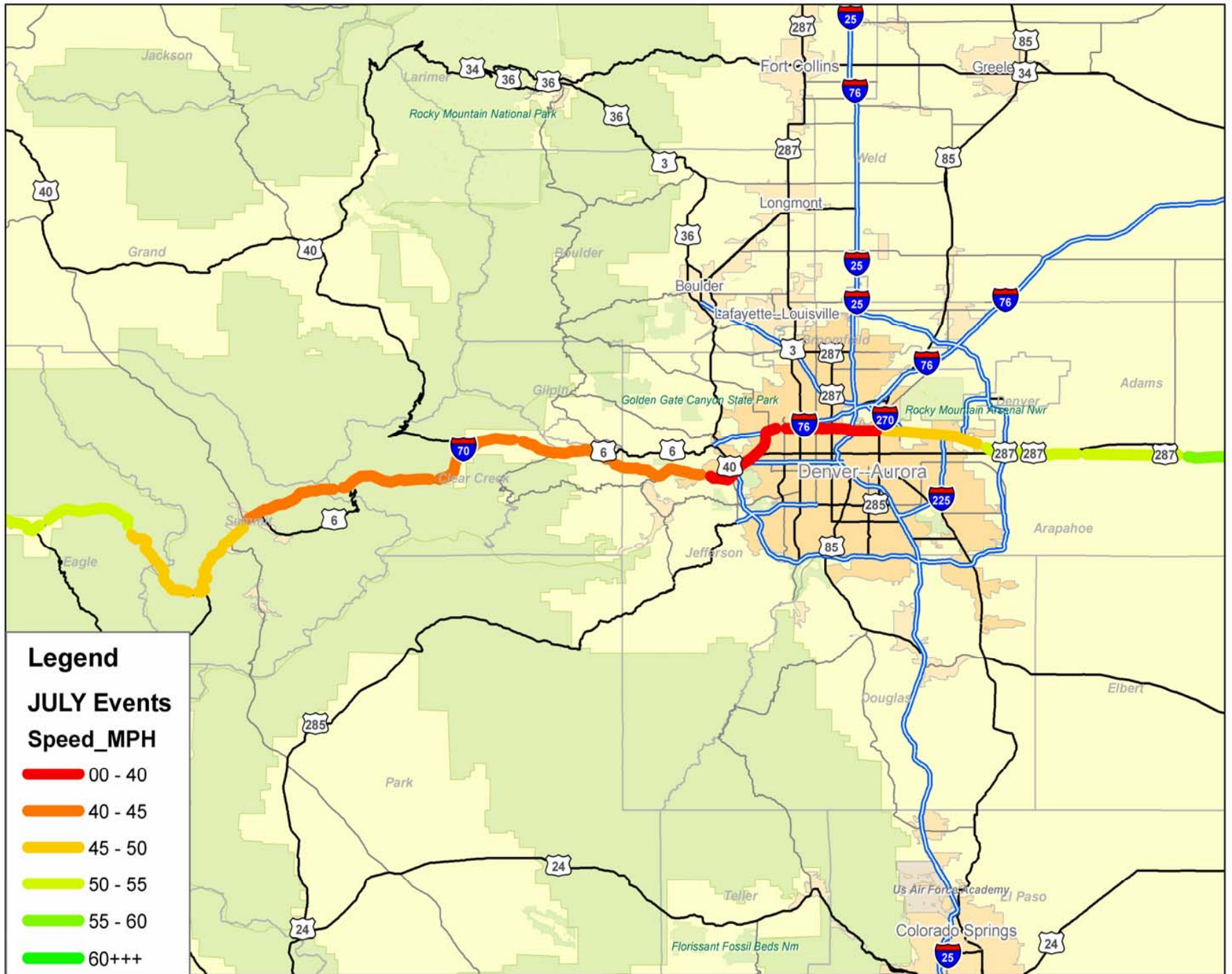
## Legend

JULY Events

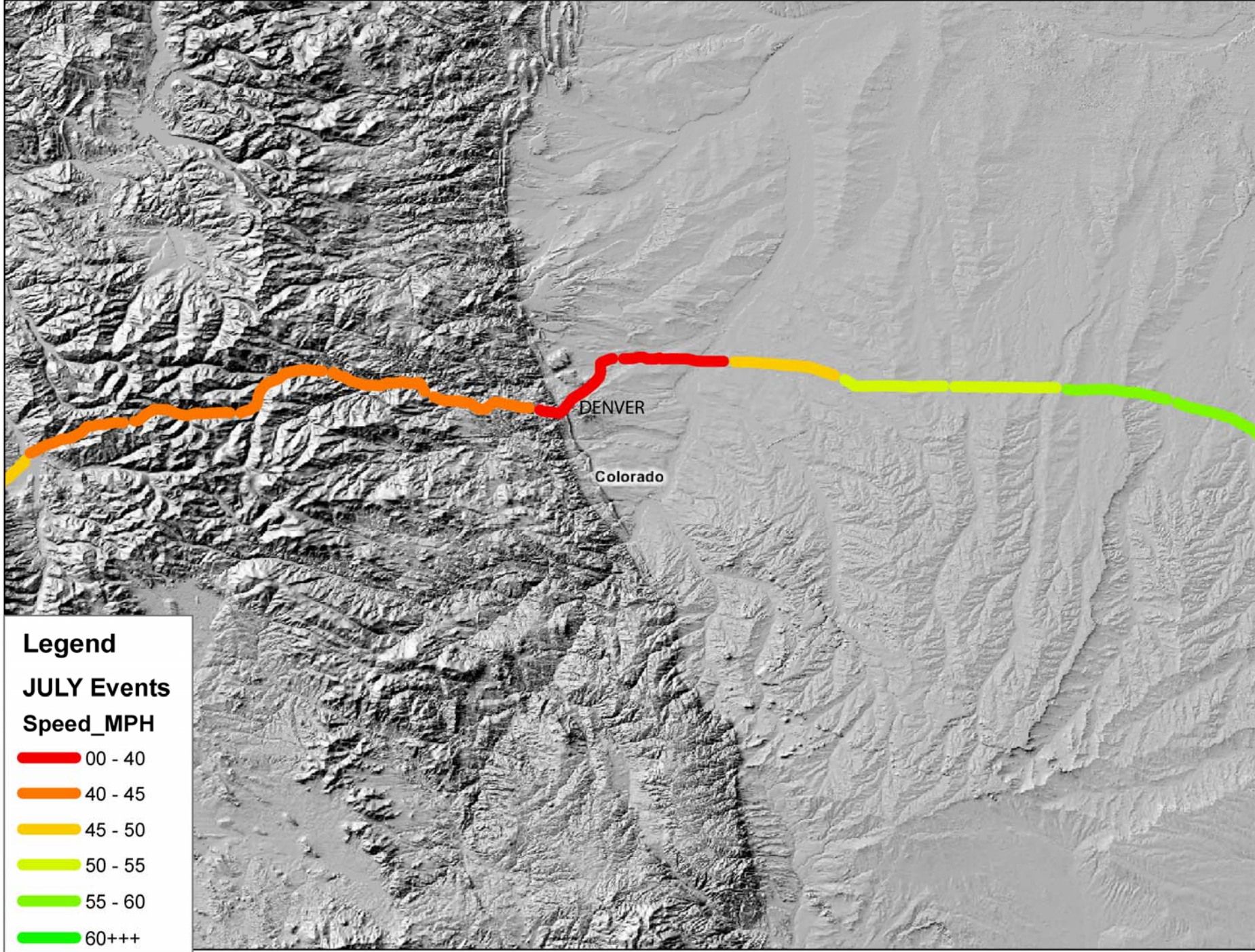
Speed\_MPH

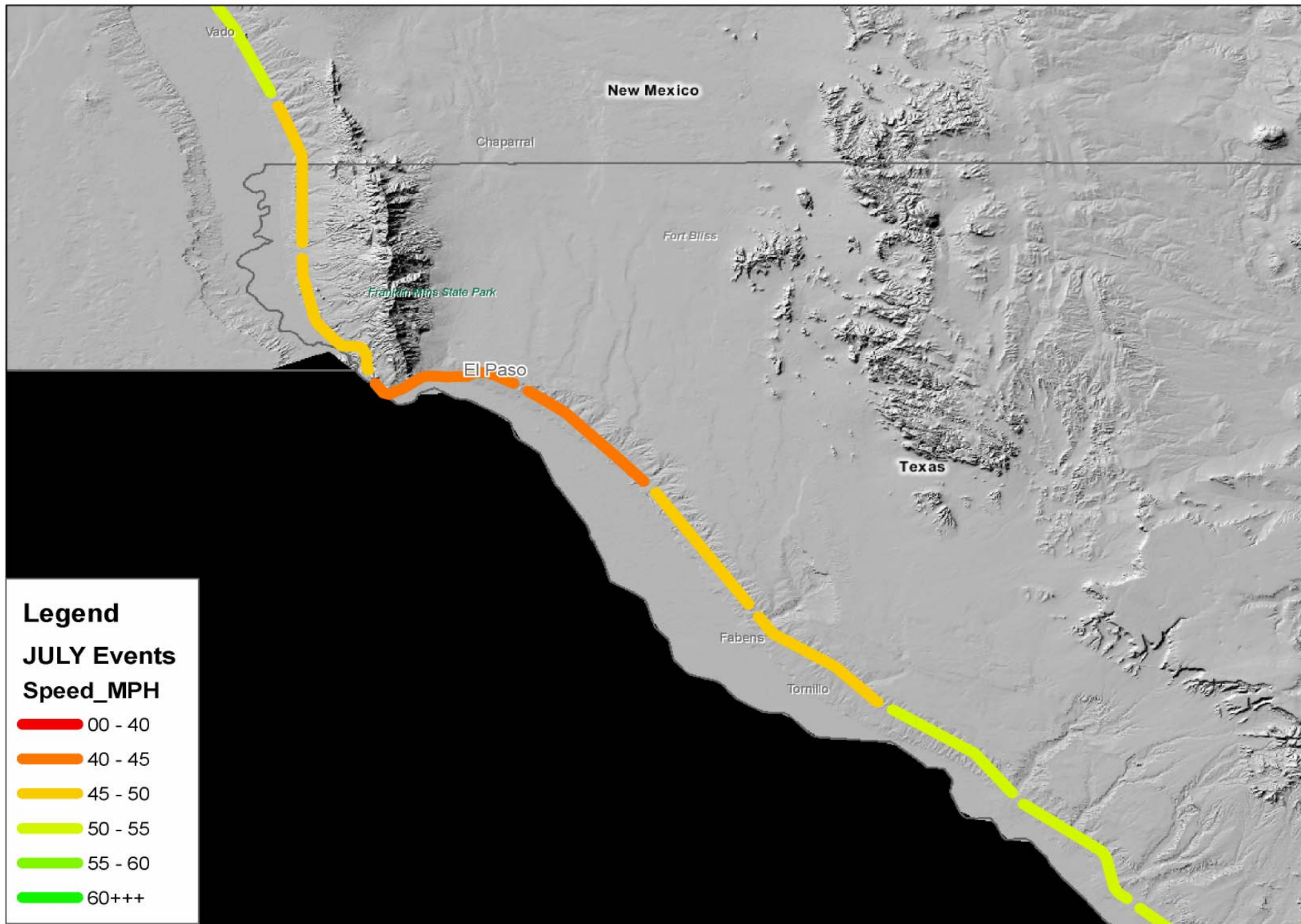
- 00 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60+++





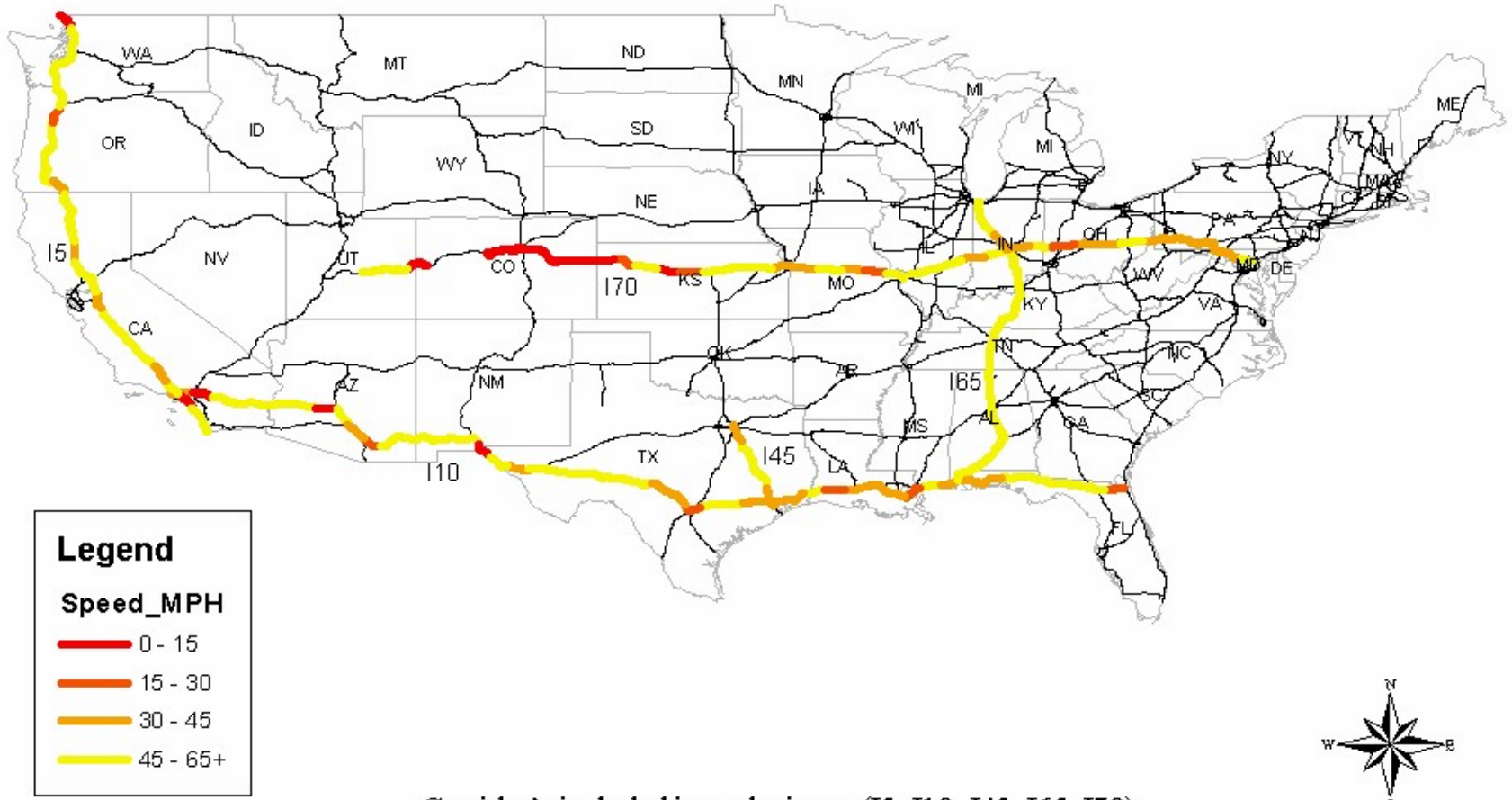
# Geographic Impediments





# Weather Documentation

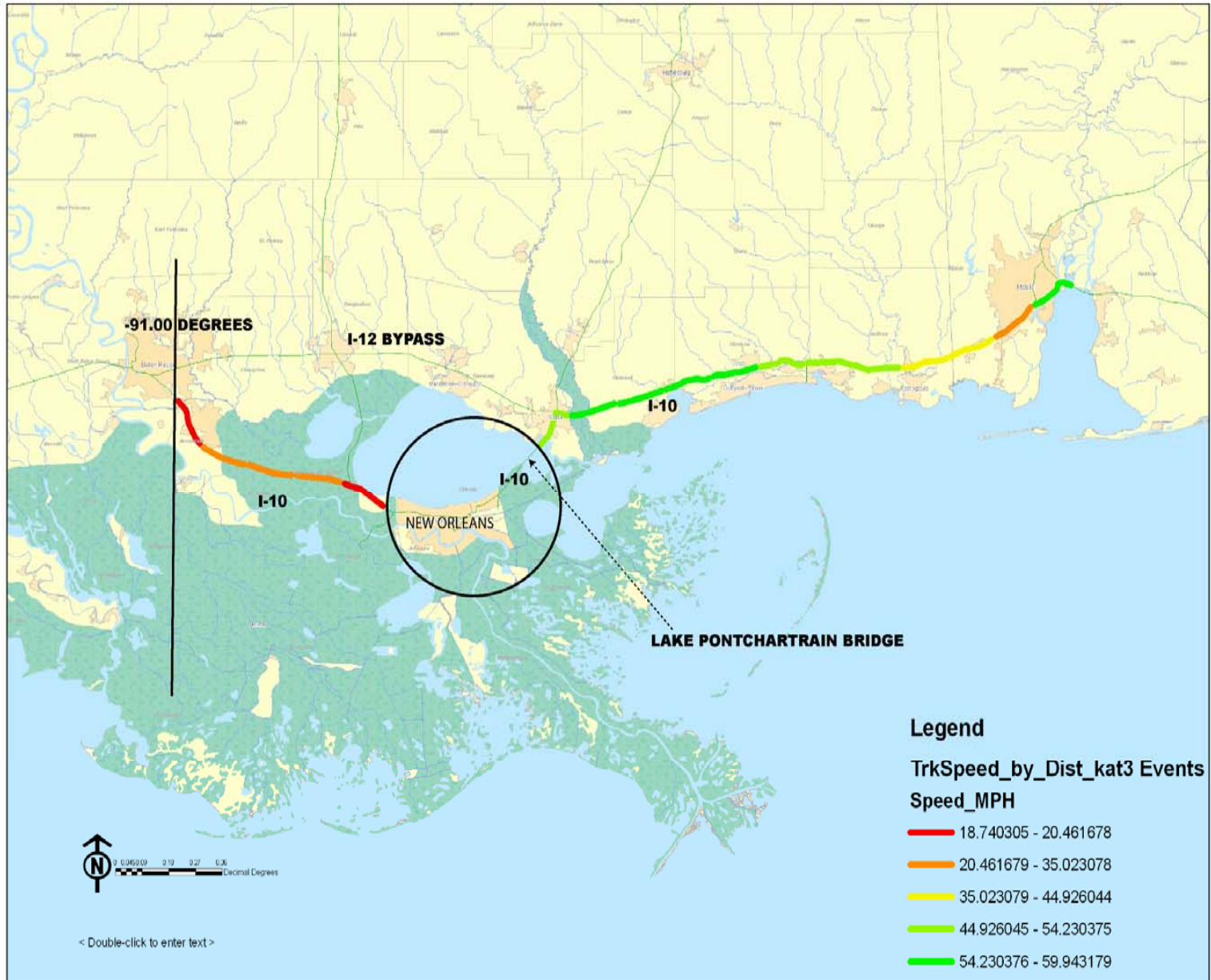
**Corridor Data Based on March 19, 2003**  
From 12:00pm - 4:00pm PST  
Truck Speed Calculation Based on 50-mile increments



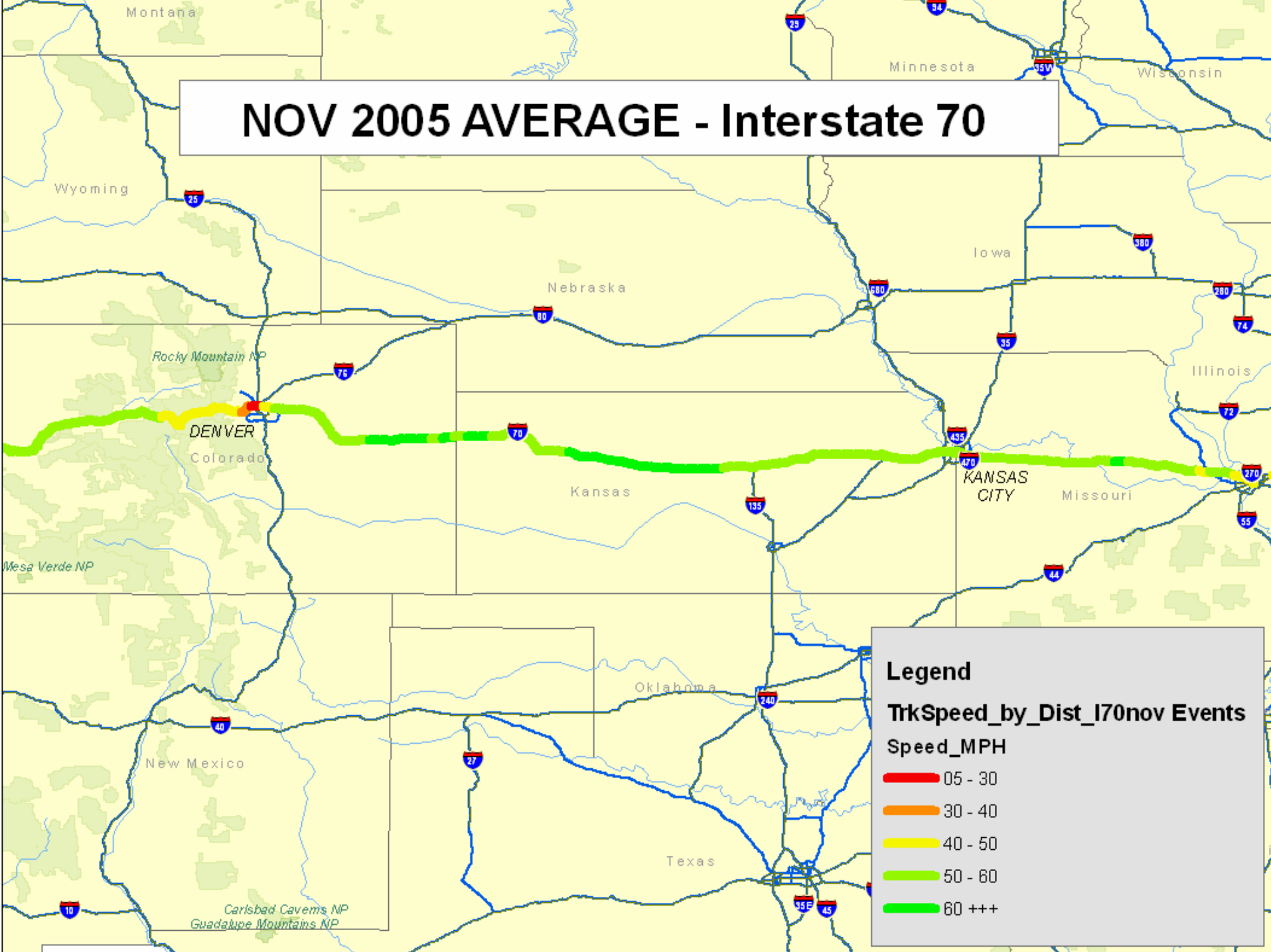
Corridor's included in analysis are (I5, I10, I45, I65, I70)



# September 1 - September 7, 2005



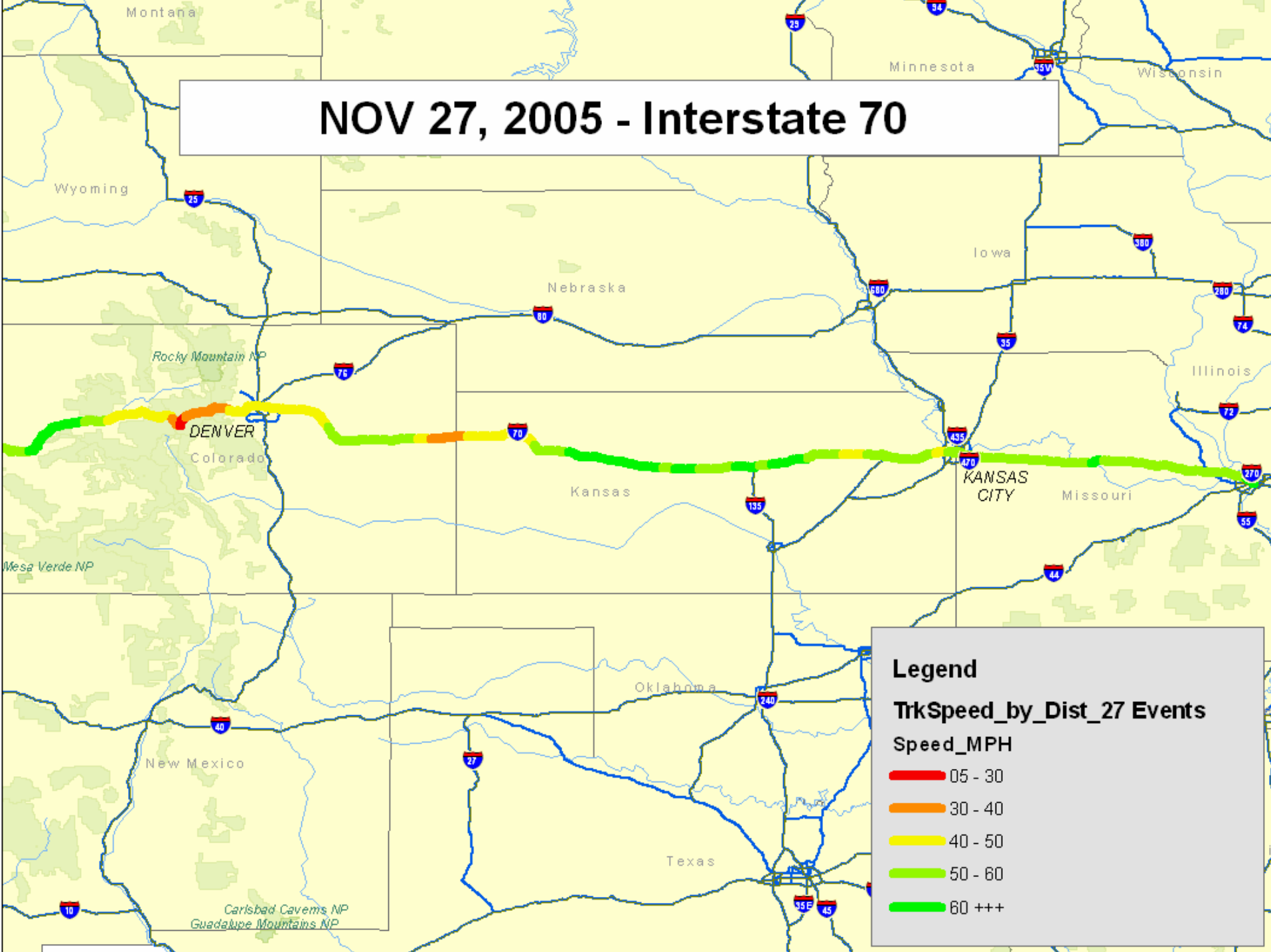
# NOV 2005 AVERAGE - Interstate 70



**Legend**  
**TrkSpeed\_by\_Dist\_I70nov Events**  
**Speed\_MPH**

- 05 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 +++

# NOV 27, 2005 - Interstate 70



## Legend

### TrkSpeed\_by\_Dist\_27 Events

Speed\_MPH

05 - 30

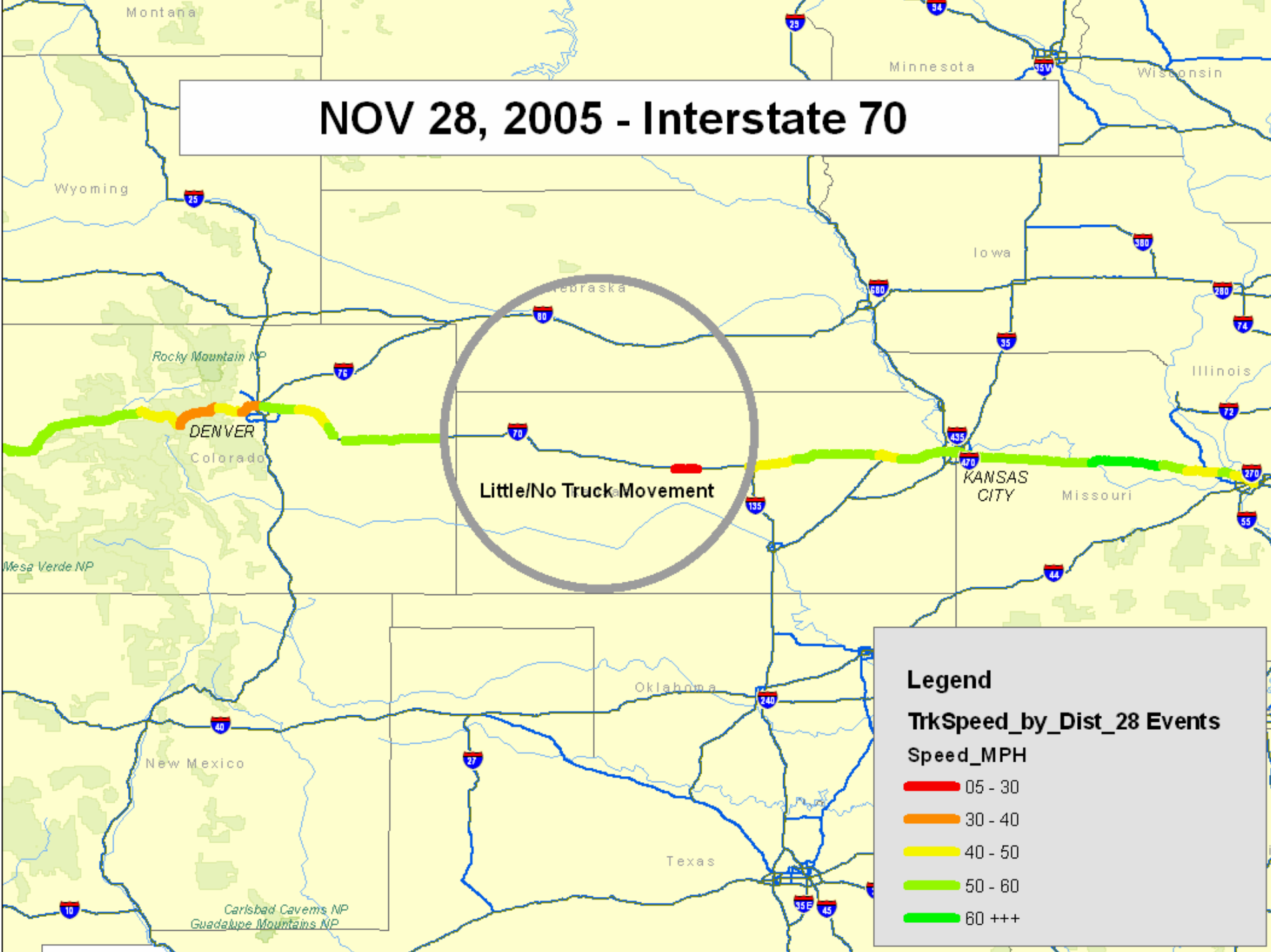
30 - 40

40 - 50

50 - 60

60 +++

# NOV 28, 2005 - Interstate 70



Little/No Truck Movement

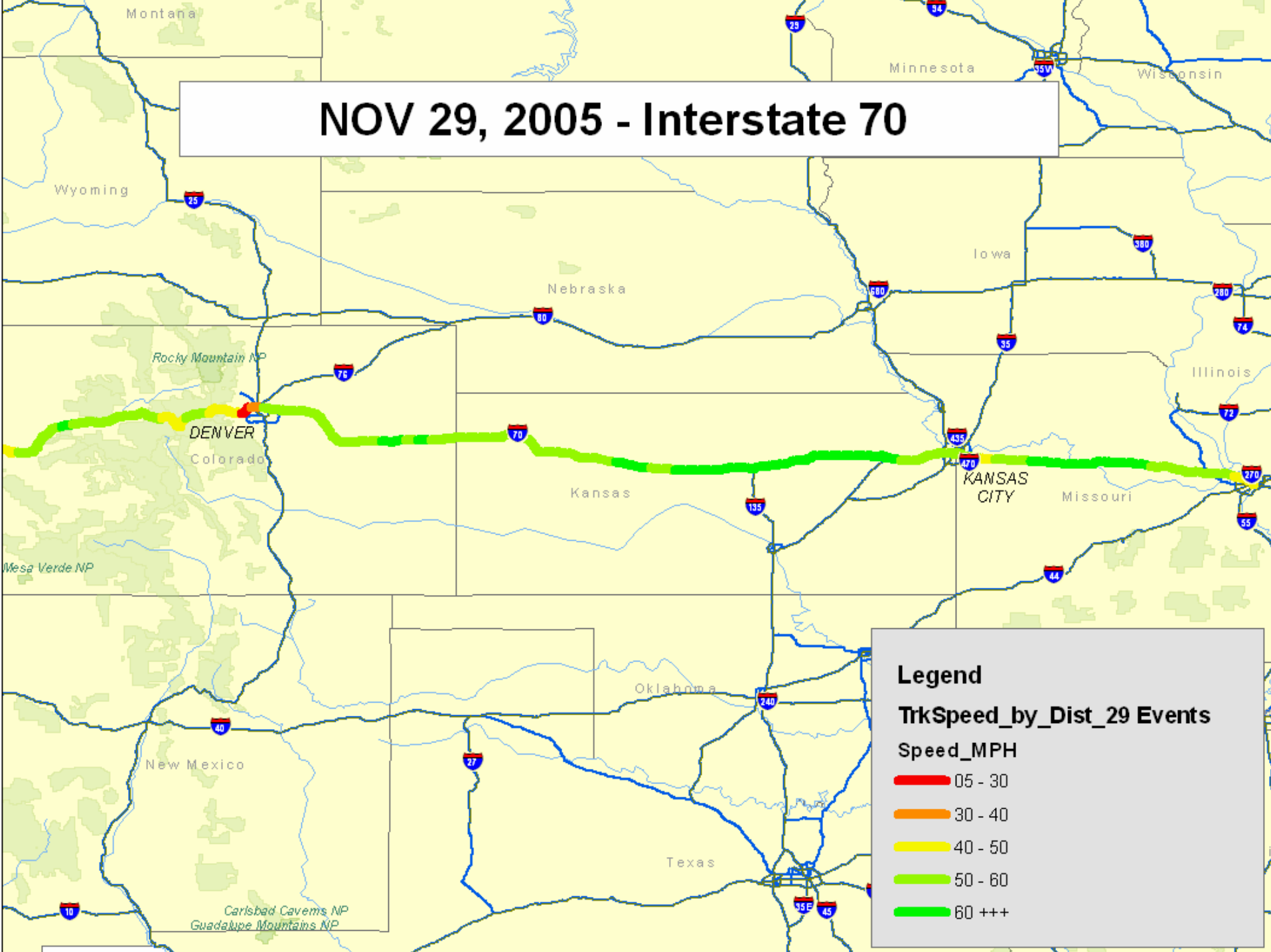
## Legend

### TrkSpeed\_by\_Dist\_28 Events

Speed\_MPH

- 05 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 +++

# NOV 29, 2005 - Interstate 70



## Legend

### TrkSpeed\_by\_Dist\_29 Events

Speed\_MPH

05 - 30

30 - 40

40 - 50

50 - 60

60 +++

# September 20, 2005 : 7am-7pm



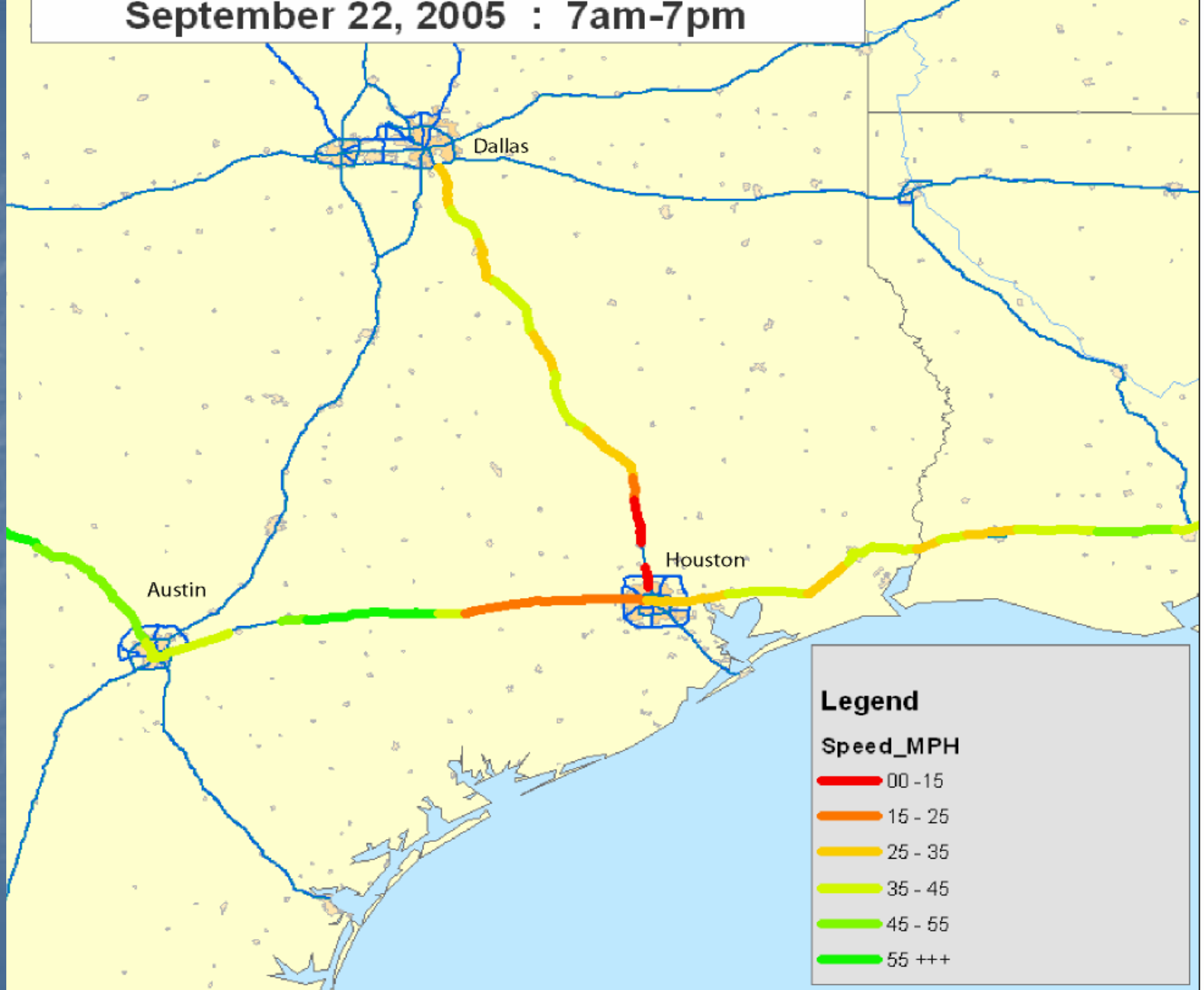
September 21, 2005 : 7am-7pm







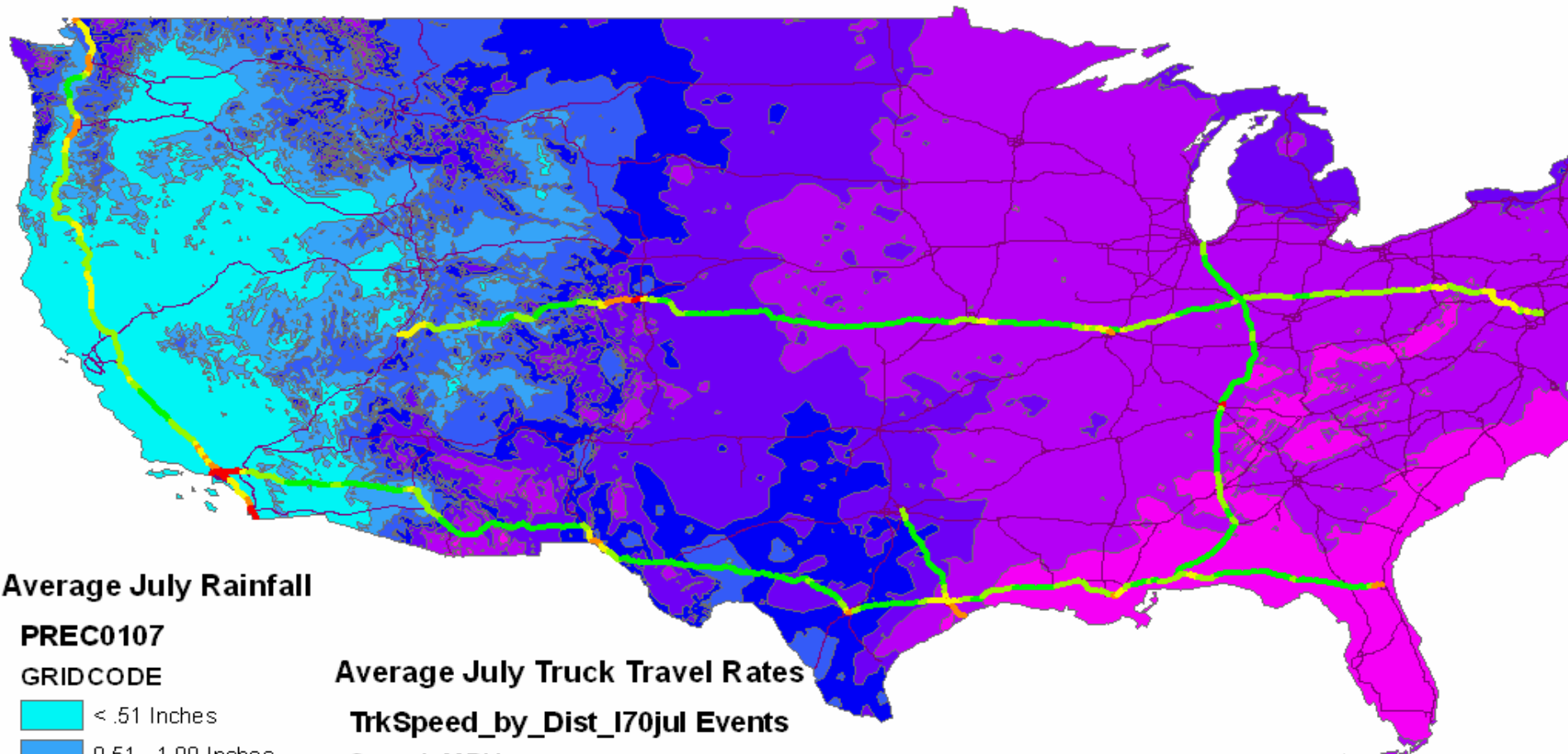
September 22, 2005 : 7am-7pm



September 23, 2005 : 7am-7pm



# July 2005 Average Travel Rates with Average Annual July Rainfall Totals



## Average July Rainfall

PREC0107

GRIDCODE

- < .51 Inches
- 0.51 - 1.00 Inches
- 1.01 - 1.50 Inches
- 1.51 - 2.00 Inches
- 2.01 - 3.00 Inches
- 3.01 - 5.00 Inches
- 5.01 - 10.00 Inches

## Average July Truck Travel Rates

TrkSpeed\_by\_Dist\_I70jul Events

- Speed\_MPH
- 0 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 +++

# Global Connectivity: are we up against?

- Major increase in passenger and freight demand.
- Freight increase of 70% by 2020.
- Current planning and financing methods do not adequately address freight's unique concerns.
- Intermodal linkages not seamless.
- Increased focus on safety and environmental issues.
- US economic competitiveness at stake.
- Security needs continue to challenge productivity.
- Reliability & visibility of shipments

# Shipper Perspectives on Air Cargo

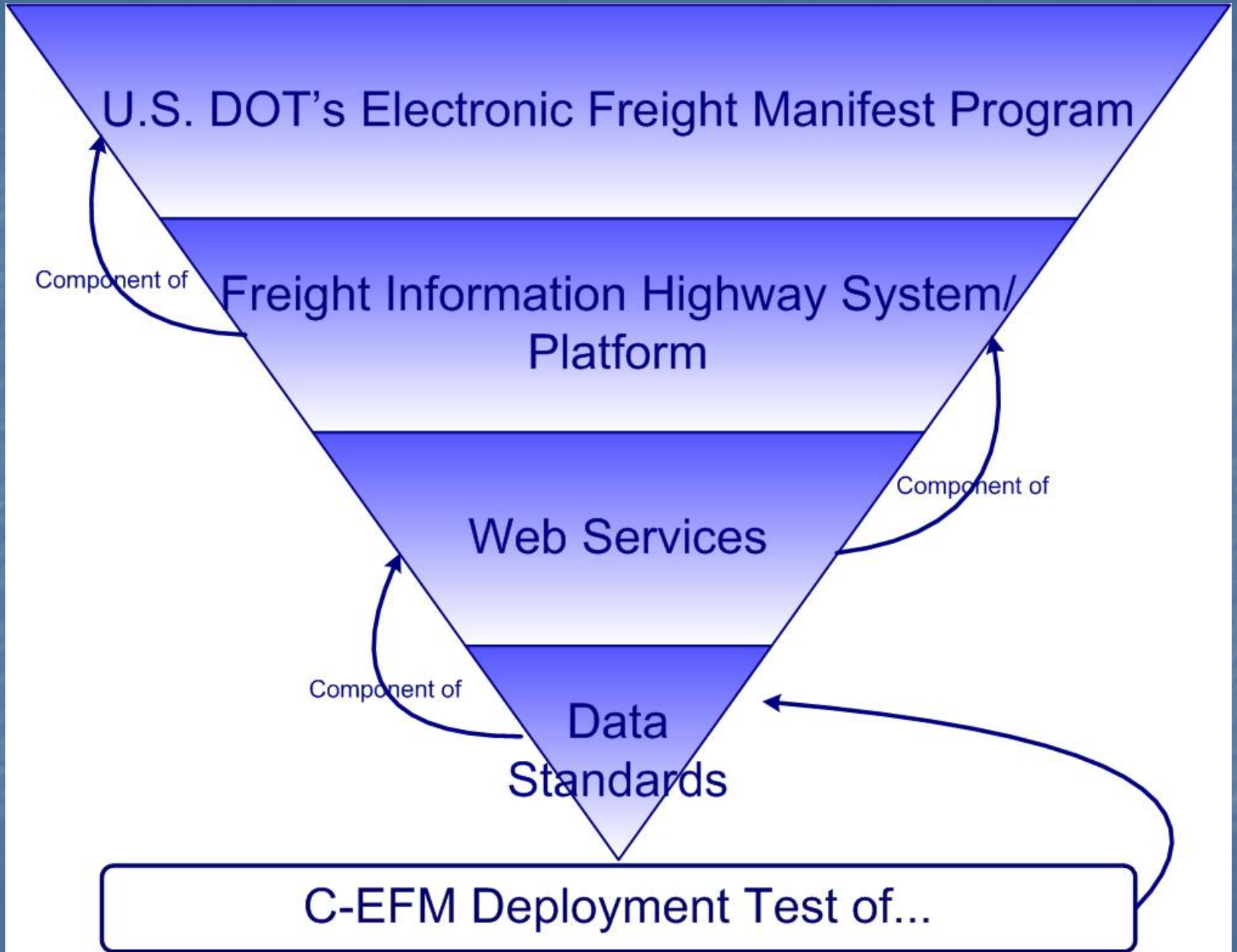
Most important provider attribute:

- Service reliability: 43%
- Rates: 27%
- Transit Times: 19%

International Logistics Quality Institute, 2003 Survey of 820 Shippers

# UEFM History...

- Chicago O'Hare Air Cargo Security System
- Electronic Supply Chain Manifest Initiative
- IFTWG Projects
  - Freight Information Highway Phase 1
  - Intermodal Data Systems



# Freight Information Highway

What is it?

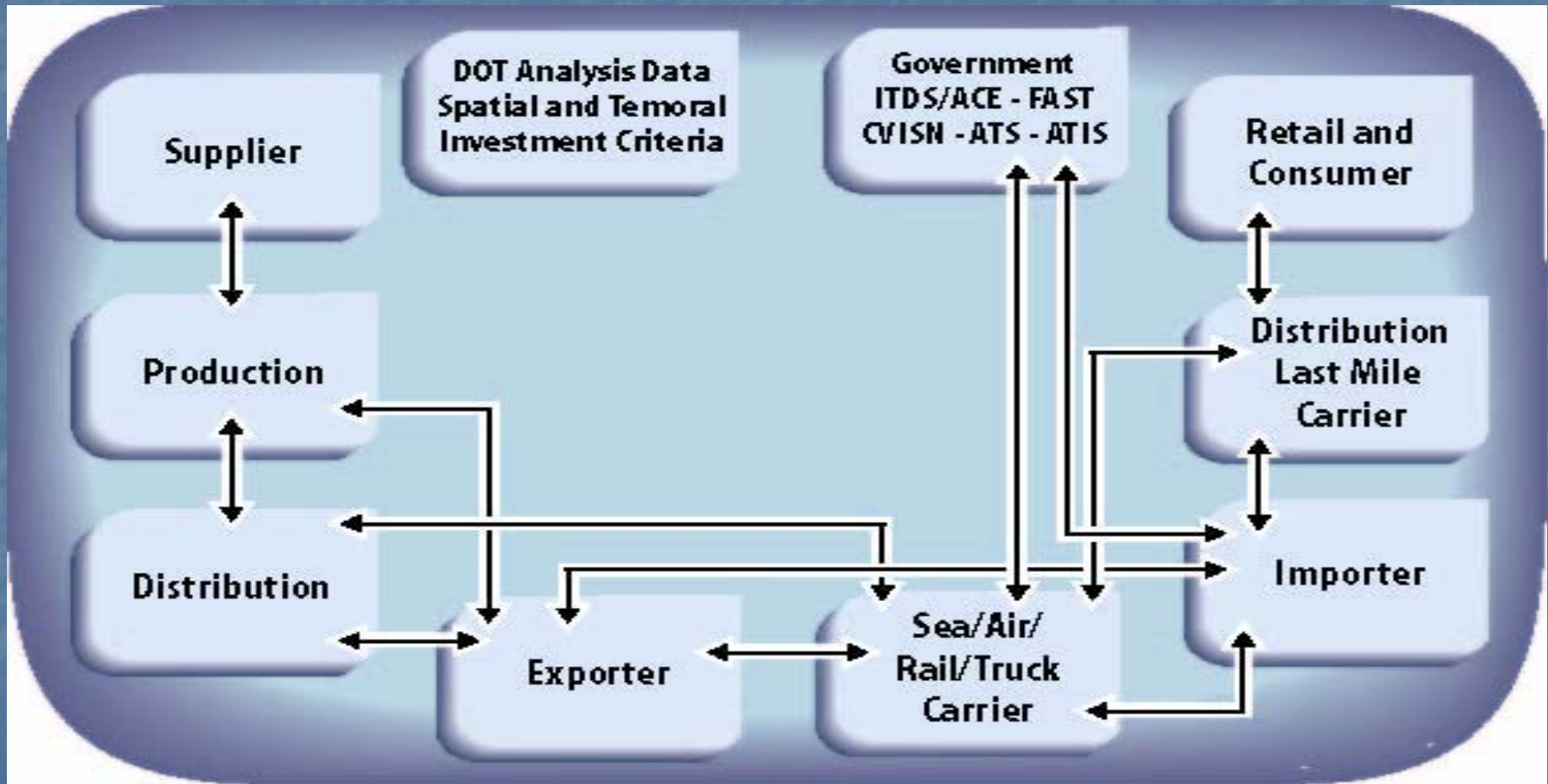
- An information pipeline linking supply chain participants through secure authentication.
- Provides a mechanism for all trading partners in the supply chain to communicate interactively.
- Not a **DATA REPOSITORY** but a conduit to exchange vital information.



# Typical Supply Chain Data Scenario

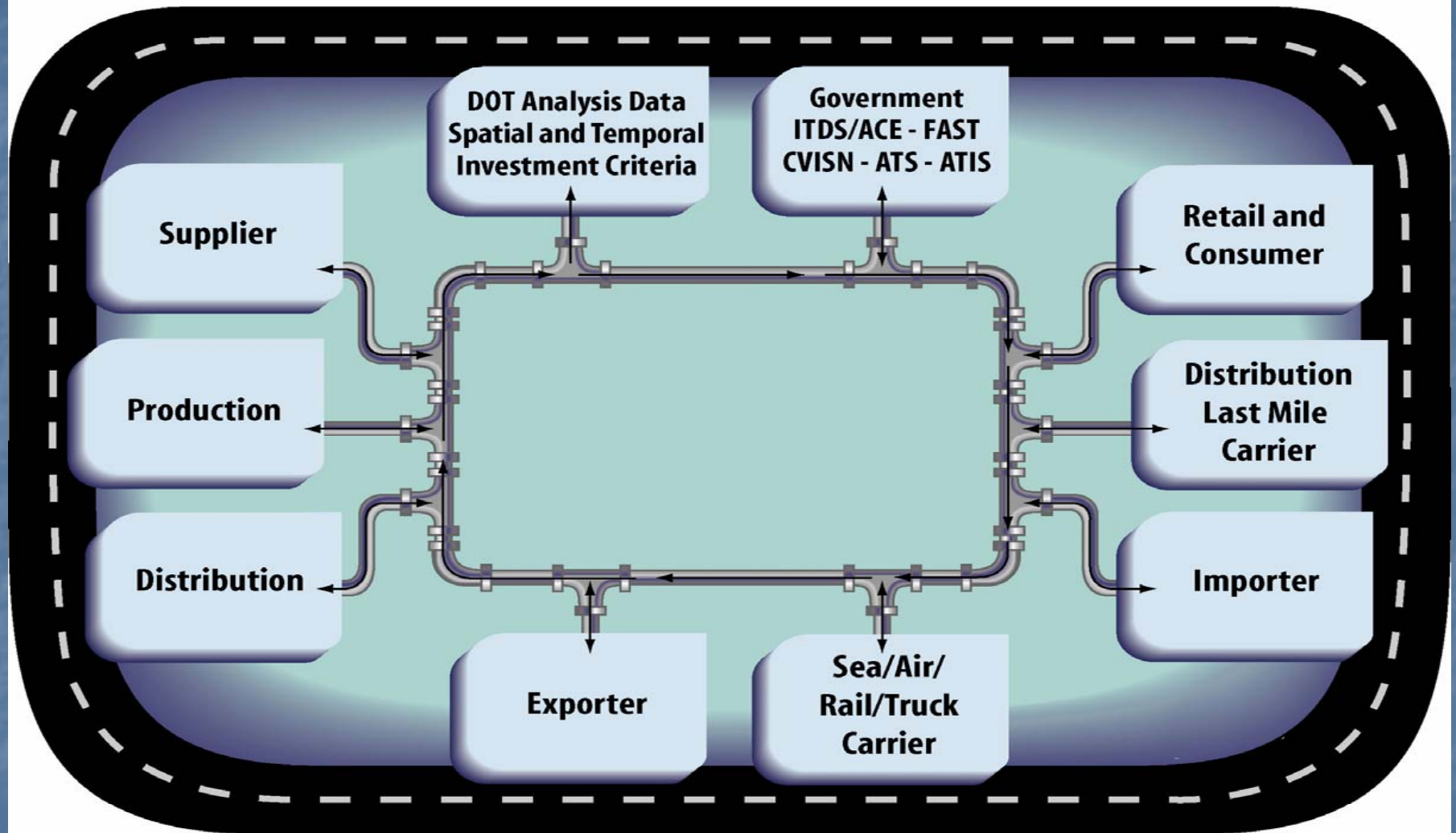
## Disparate Legacy Systems

Each System Requiring Direct Connections to Support Data Collaboration between Supply Chain Partners



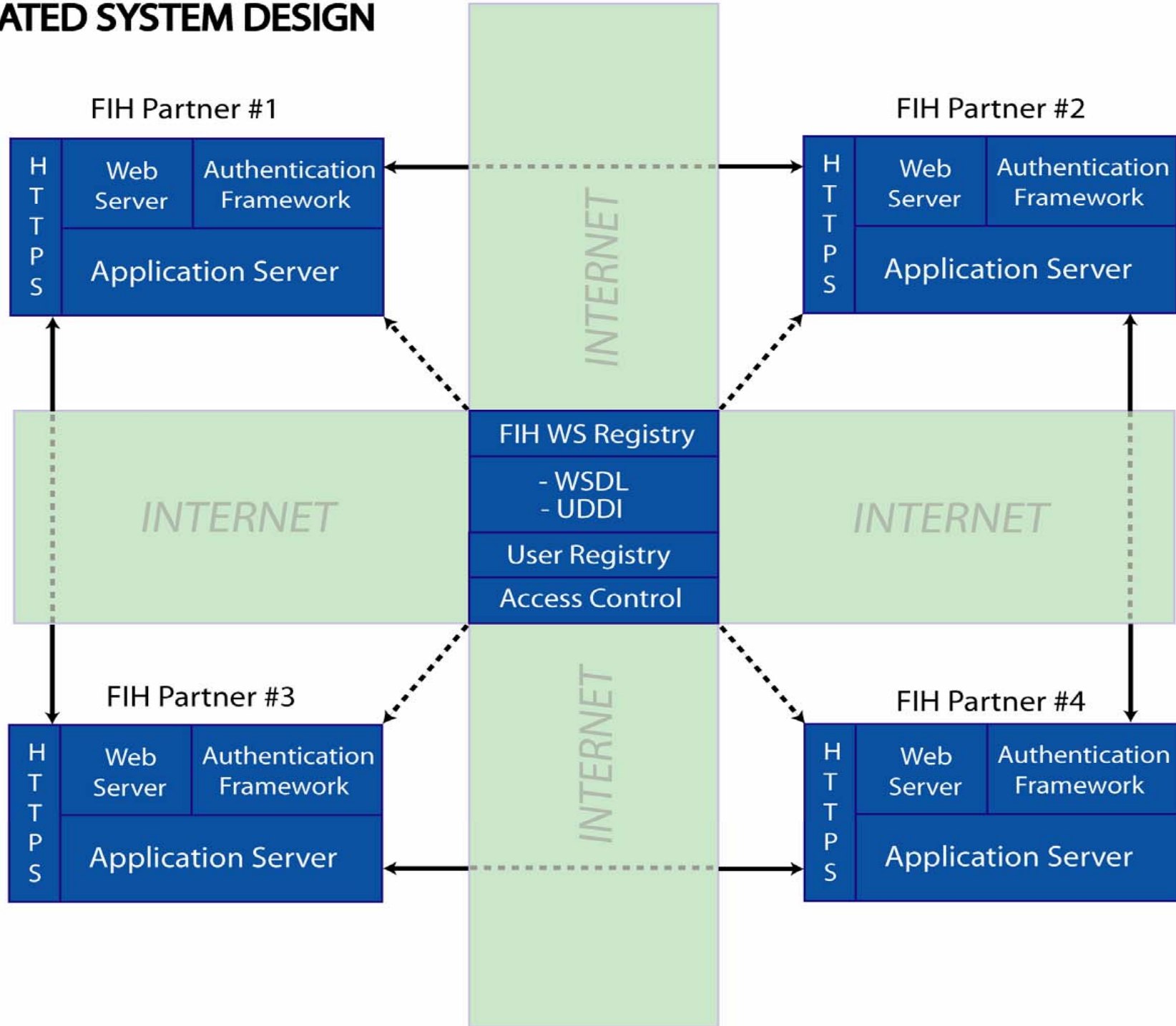
↔ Current Data Connections

# Freight Information Highway



A framework of virtual connections allowing complete collaboration between supply chain partners

# FIH: FEDERATED SYSTEM DESIGN



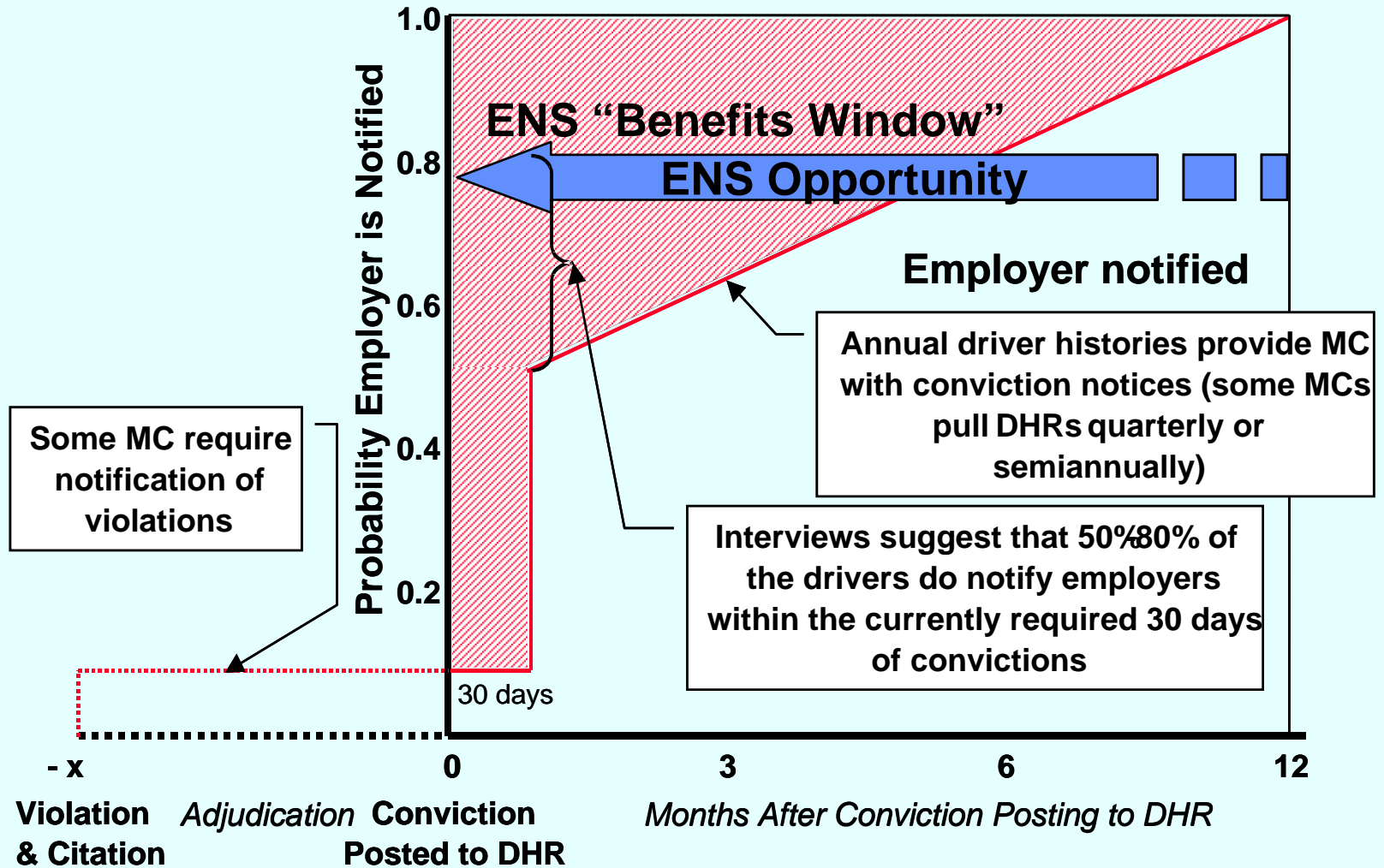
# ENS Project Background

- Grew from the results of the FMCSA-sponsored Driver Violation Notification (DVN) project ("Phase I")
  - Analyzed drivers' histories and their relationship to highway safety
  - Identified potential gaps in driver compliance with Federal requirements
  - Identified significant potential safety benefits of ENS system
  - Identified potential cost savings for jurisdictions and industry
  - Defined high-level ENS system requirements

# ENS Phase II Pilot Test Overview

- *Title:* Employer Notification System (ENS) Prototype
  1. Develop study design and performance measures
  2. Build and test prototype ENS
  3. Select Pilot States and Motor Carriers
  4. Develop and deploy prototype system in Pilot States
  5. Conduct Pilot Test
  6. Evaluate and document results of the Pilot Test
- *Sponsor:* FMCSA/DOT
- *Period of Performance:* 9/8/04 – 3/07/07
- *Two Pilot States:* California and Colorado

# ENS Benefit Window



# MORE INFORMATION

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