Geocentric Project Tracking - Managing Tomorrow's Transportation System with GIS

Eric Floss – Transportation Practice Manager

Tuesday September 29, 2009

Agenda

- How GIS is shaping our work?
- Transportation Professionals Increasingly Face Major Challenges:
  - How to Effectively Support Agency-Wide Business Functions: (Data and Systems Integration)
  - Demonstrating and Monitoring the Effectiveness of our Transportation Investments
- Case Studies and Examples

ESRI

Delivering geographic information systems to millions of users

GIS Is Changing Everything…

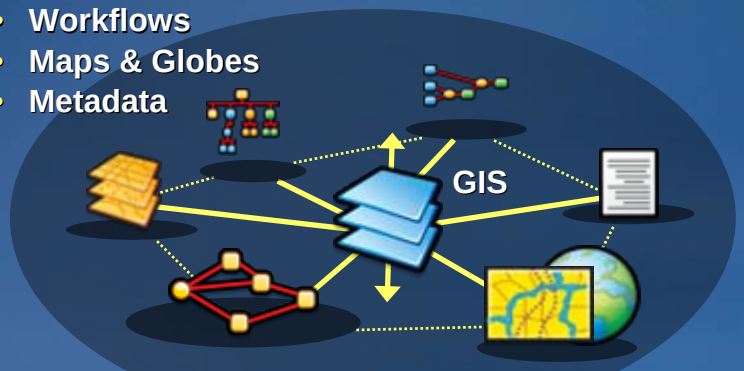
How We Reason About the Nation . . .

- Patterns
- Processes
- Relationships
- Implications

Spatially Integrated Thinking

How We Abstract Our Nation. . .

- Data & Data Models
- Models
- Workflows
- Maps & Globes
- Metadata



Digital Geographic Knowledge

How We Organize & Communicate . . .

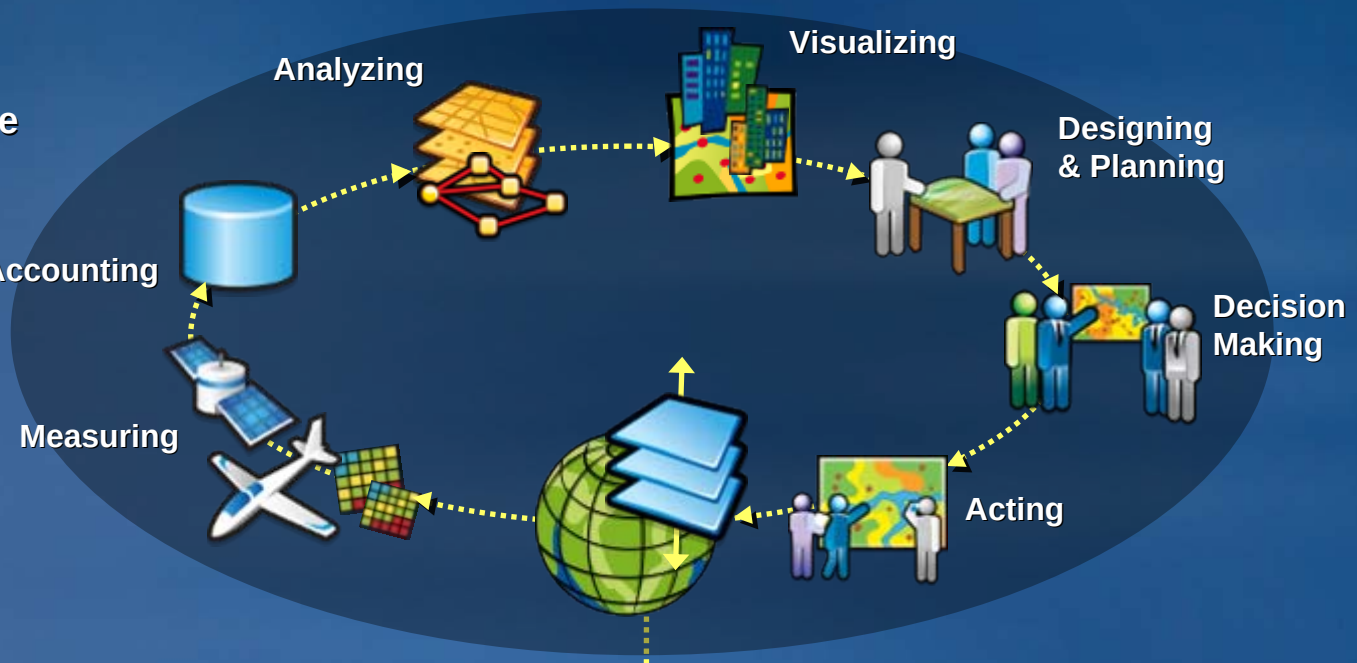
- Collaboration
- Place Based Approaches
- Integrated Teams

Shared Geographic Knowledge

. . . Providing a New Approach

GIS Is Also Changing How We Work

- Systematic
- Holistic
- Analytic
- Quantitative
- Visual



A Science Based Approach

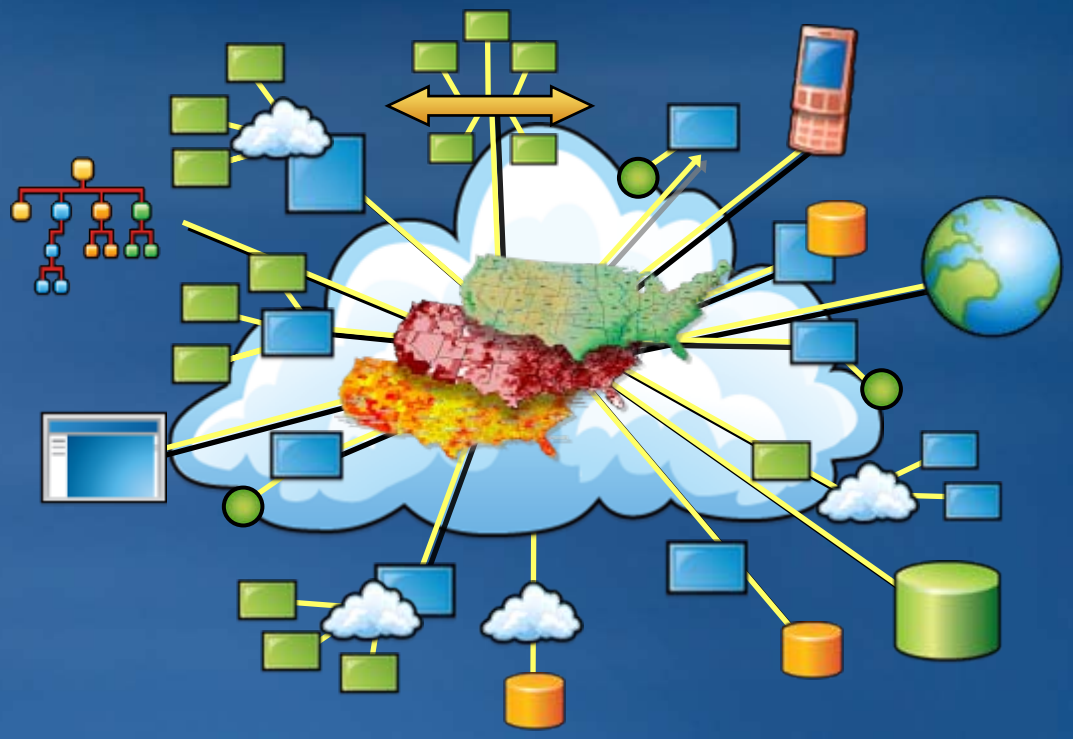
. . . And . . . How We Act
...What Should be Done Can be Addressed

GIS Is Becoming Pervasive

Enabled by Evolving Technologies . . .

- Faster Processing (100x)
- Virtualization
- Increased Bandwidth (1000x)
- Larger Storage
- Mobile
- The Web . . .

. . . and GIS Software



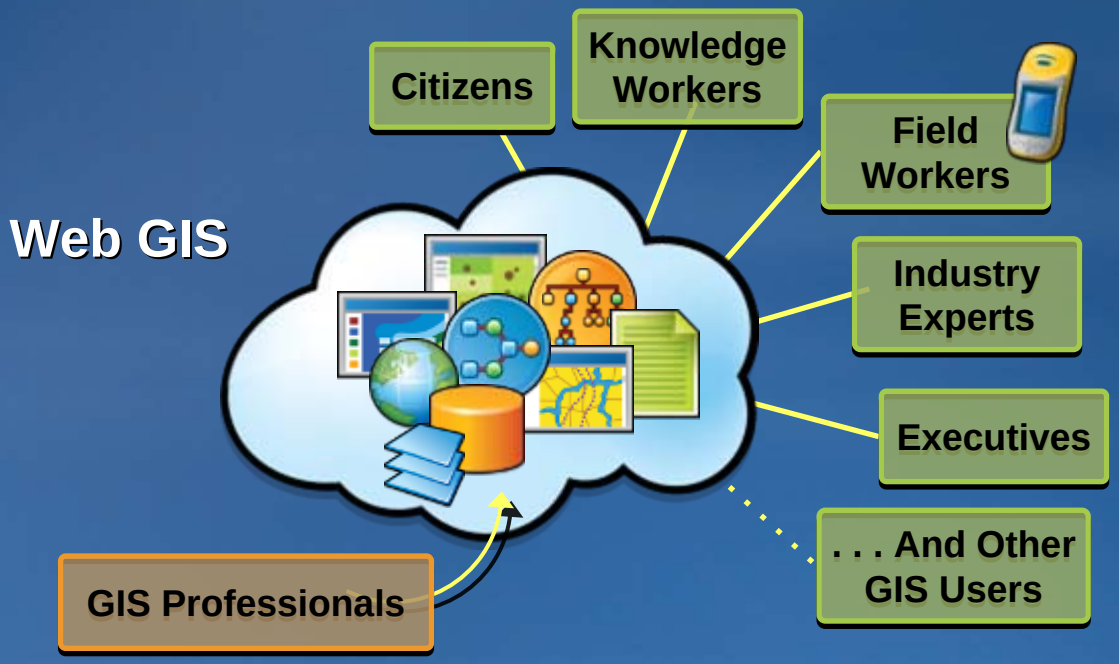
. . . And The Work of GIS Professionals

The Web Is a Strong Platform for GIS

Distributing Geographic Knowledge Everywhere

GIS Professionals Are Building the Content

- Authoritative Data
- High Quality Maps
- Visualizations
- Spatial Analysis & Models
- Rich Applications



And Leveraging this Content . . .
. . . To Serve the Needs of Multiple Users

Key DOT IT Issues

- Integration to Support Agency-Wide Business Functions:
  - Need to provide easy access to data and information: A seamless flow of information regardless of format, platform or location
  - Need to integrate data across the enterprise; to integrate data across the “project lifecycle”
  - Acquire Best of Breed COTS Solutions, and Have Them Seamlessly Integrated

Integration to Support Agency-Wide Business

- Why an Issue? Because Increasingly the Most Valuable Resource Within a DOT is the Information Infrastructure
  - 85 Percent of Data in Modern Organizations is Unstructured*
  - 30 Percent of People's Time is Spent Searching for Relevant Information*
  - 60 Percent of CEOs and Agency Directors Feel They Do Not Have the Type of Information Support to Make Good Decisions*
  - 90 Percent of Information in a DOT has a Spatial Component

* Source: IBM

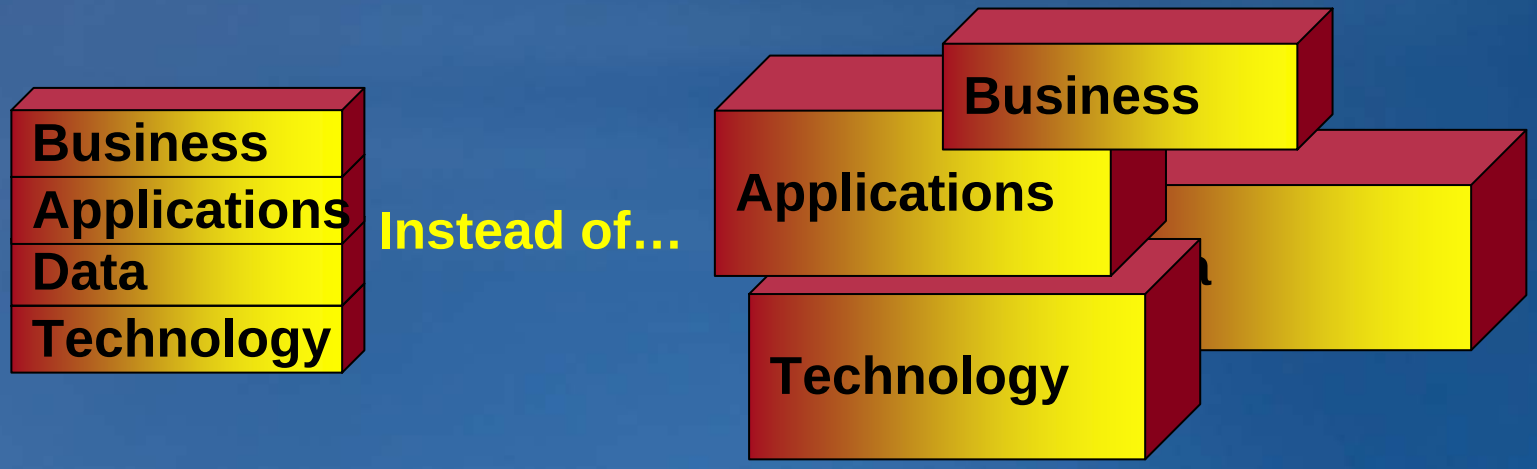
Smooth Information Flow?

Integration Issues

- Data is located at the application level, often in different formats: “Islands of Data”
- Distributed and Heterogeneous Environments: Different OS, RDBMS, Hardware Platforms
- Major Gaps in Information Flow across the Agency
- Desire to Have Technology Support Business Processes, Rather Than “Drive Them”

Obtaining Value from Enterprise Programs

- Goal is to provide a long lasting technical architecture that meets business needs and efficiently leverages COTS technology.
- Matching technology capabilities to business needs.
- An iterative process; maturity takes time!



Enterprise Integration

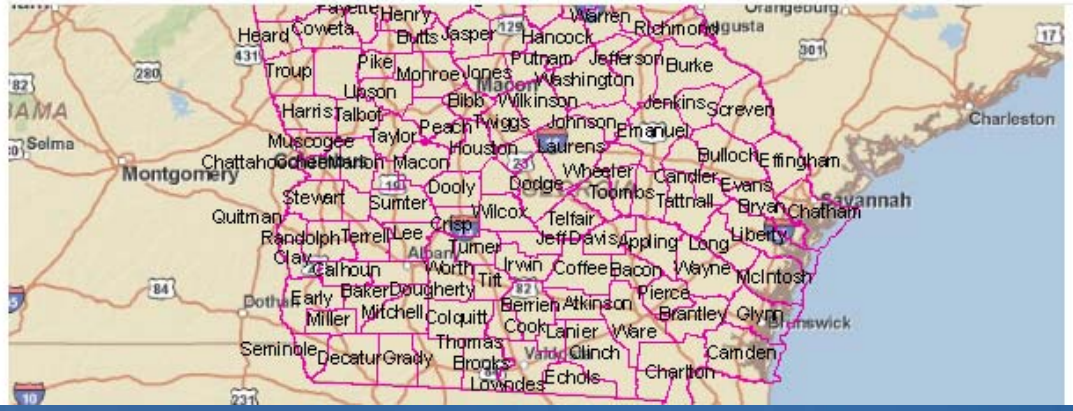
- Why?:
  - Project Management and Tracking
  - Consistent Project Details through Planning, Design, Construction, Operations and Maintenance: capture full life cycle costs of projects
  - Integrated Maintenance and Work Order Management

When to Capture Location Information?

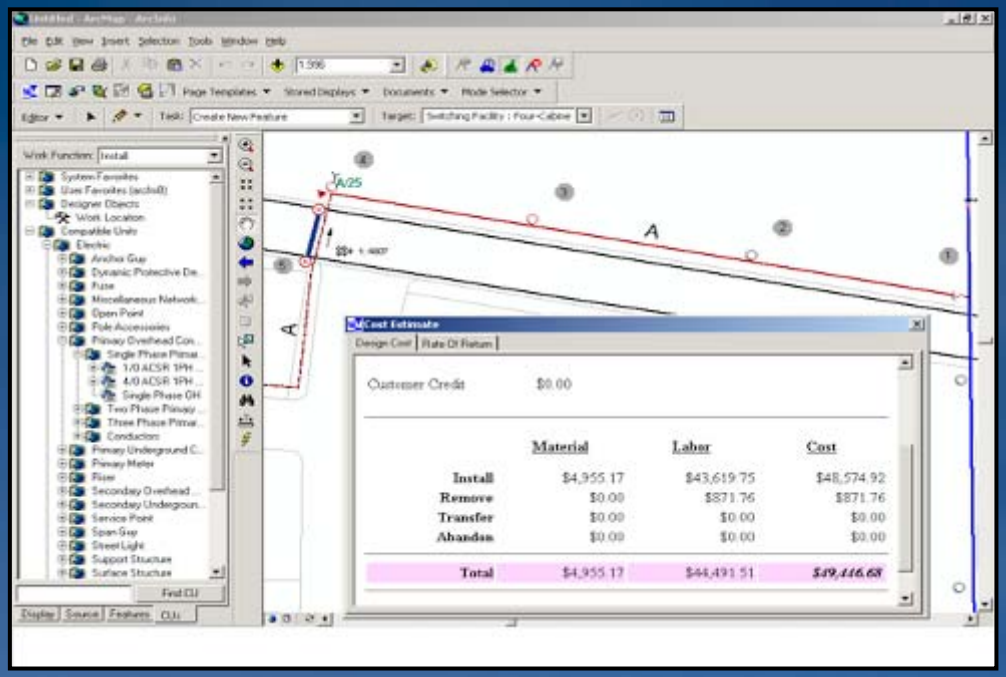
Select a stimulus project

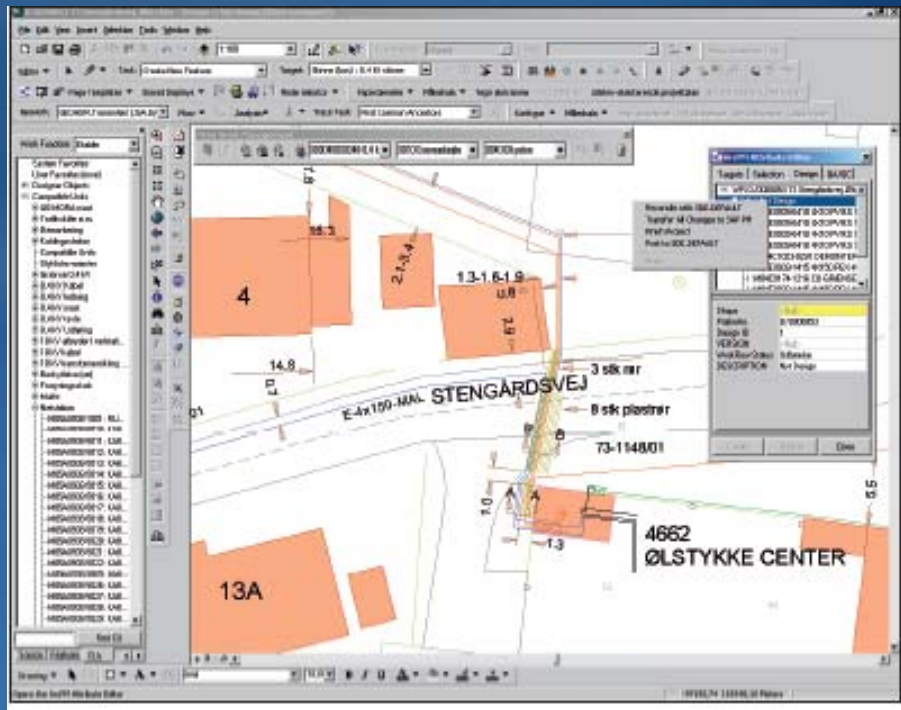
0000099

State Project Number	Project Name	Federal Aid Project Number	Total Amount Stimulus Funds	Contractor Name
0000099	WARM SPRINGS RAIL LINE BIKE/PED TRAIL	0000099	$1,250,000.00	
0000310	SR 31/US 221 @ SR 37 & SR 11/US 129 EAST OF LAKELAND	0000310	$3,129,018.22	DIXIE ROADBUILDERS, INC.
0000424	SR 5/BANKHEAD HWY/BILL ARP RD @ CS 573/ROSE AVE	0000424	$2,843,820.00	C. W. MATTHEWS CONTRACTING CO., INC.
0000683	CR 134/COUNTY LINE ROAD @ POLECAT CREEK @ MURRAY CO LINE	0000683	$1,687,137.75	CORNETT BRIDGE, INC.
0000844	SR 8/US 29 @ PLEASANT HILL/LESTER ROADS	0009344	$11,343,125.45	



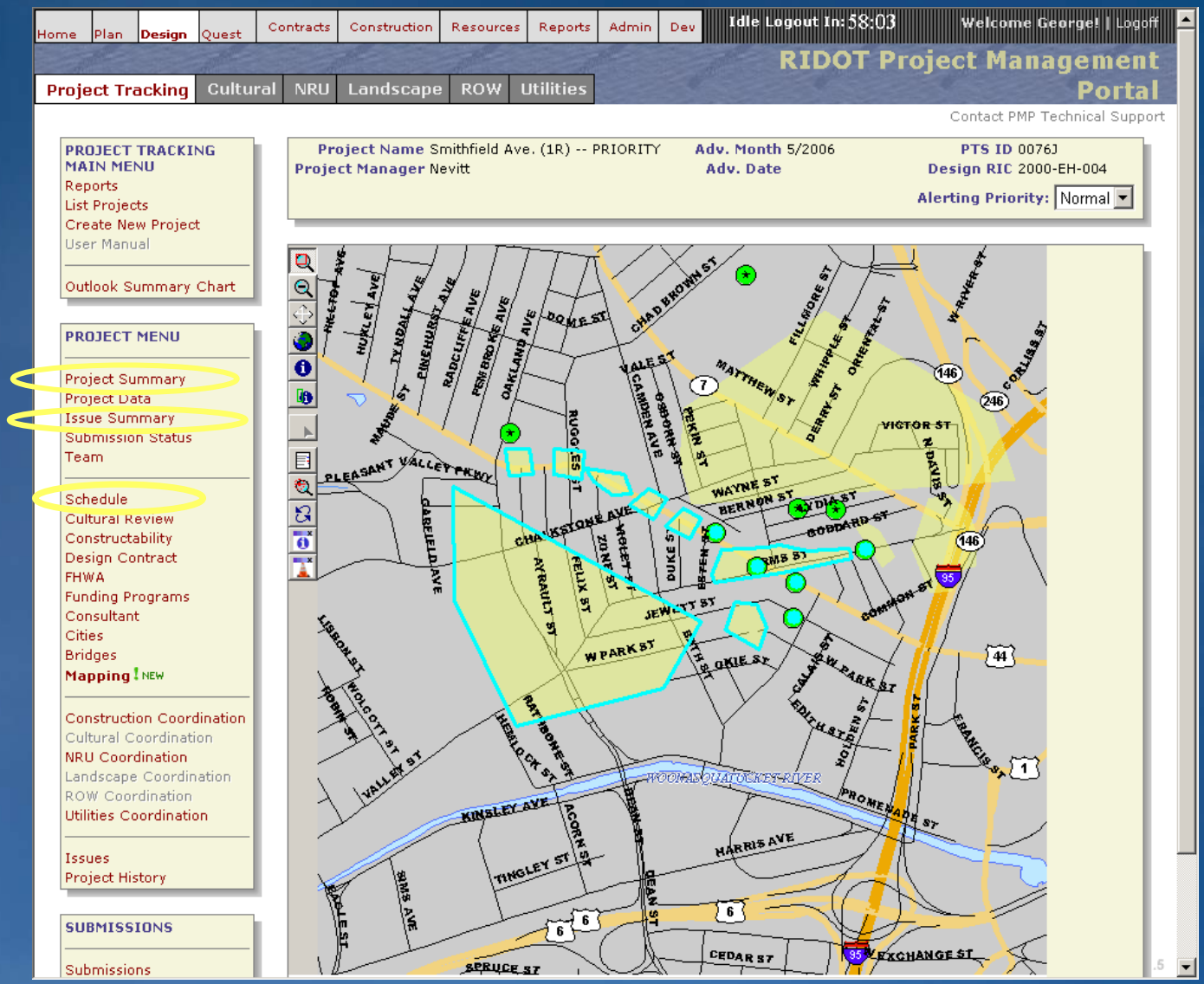
Design and Estimating



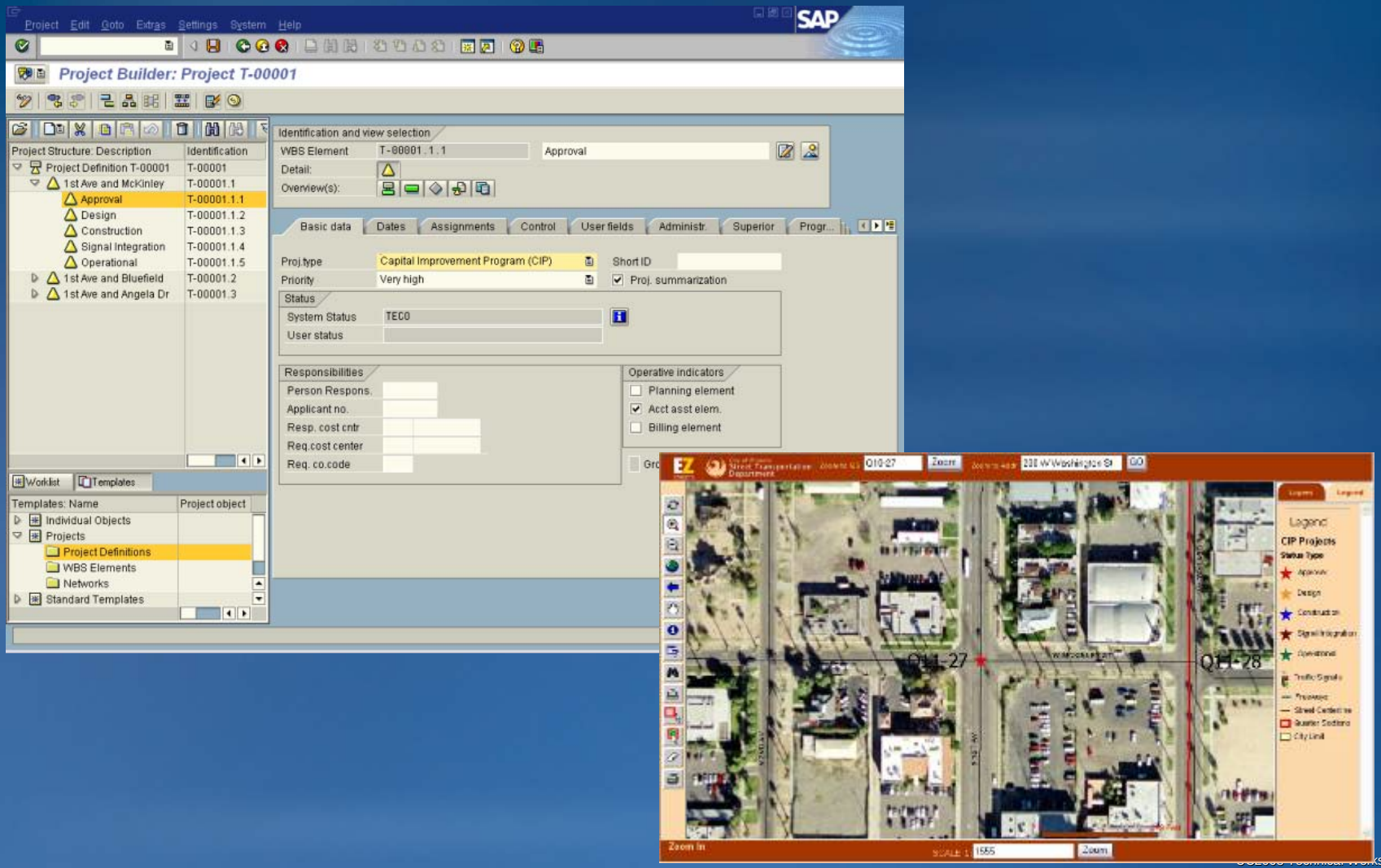


Compatible units derived from SAP's Material Master available in the GIS environment for design."

Construction and Project Management



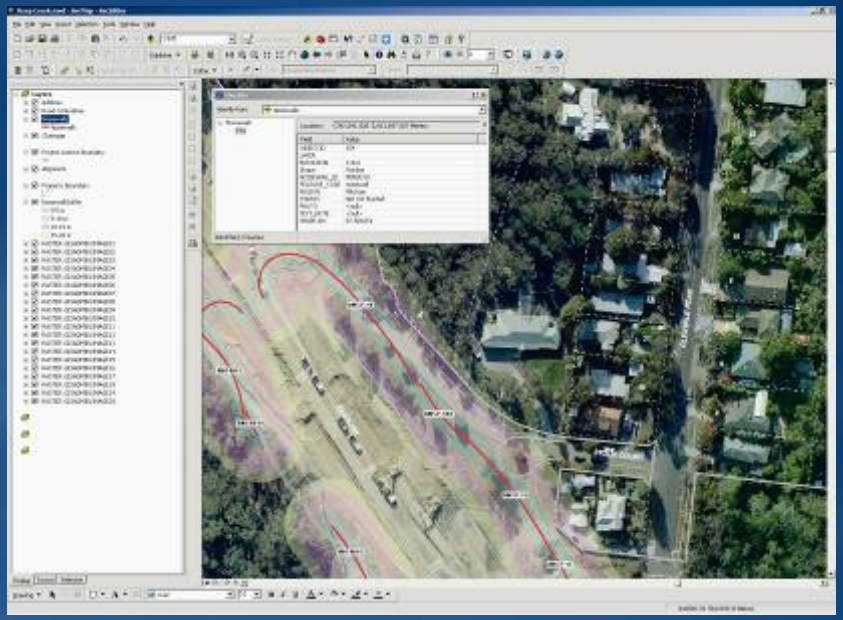
Project and Construction Management



Project Support from Start to Finish

- Modern Infrastructure Projects are Complex Multi-Year Projects which require careful monitoring, coordination, and management

- Require access to large amounts of data and information in real-time



Australia's Eastlink Project

Eastlink Project - Real Benefits

•Easy access to accurate and timely information at their fingertips.

•The ease of map production resulted in significant productivity and efficiency improvements, making production 50 percent faster.

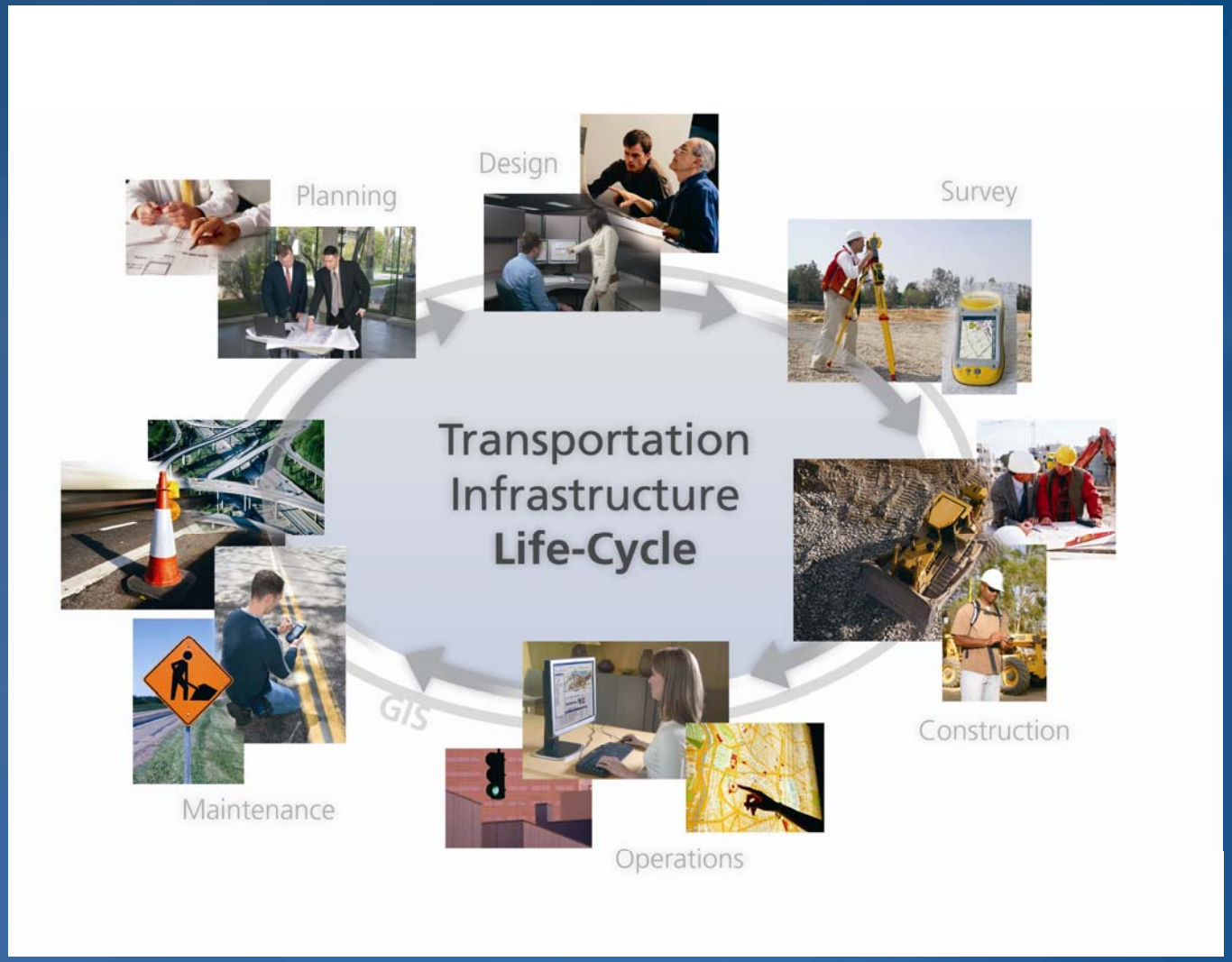
• Significant savings were achieved by avoiding the need to outsource these GIS services and through the supply of products and services provided by the GIS solution.

•Automated data collection and validation helped reduce erroneous data entry, ensuring more accurate data.

•Time required to locate and collate information in the system has been dramatically reduced, with this process now 80 percent faster.

•Reporting capabilities and the ability to integrate other corporate systems have provided EastLink with a powerful management tool.

GIS in the Project Life-Cycle



. . Continual Stream of incoming Location Data Can Be Managed Using GIS

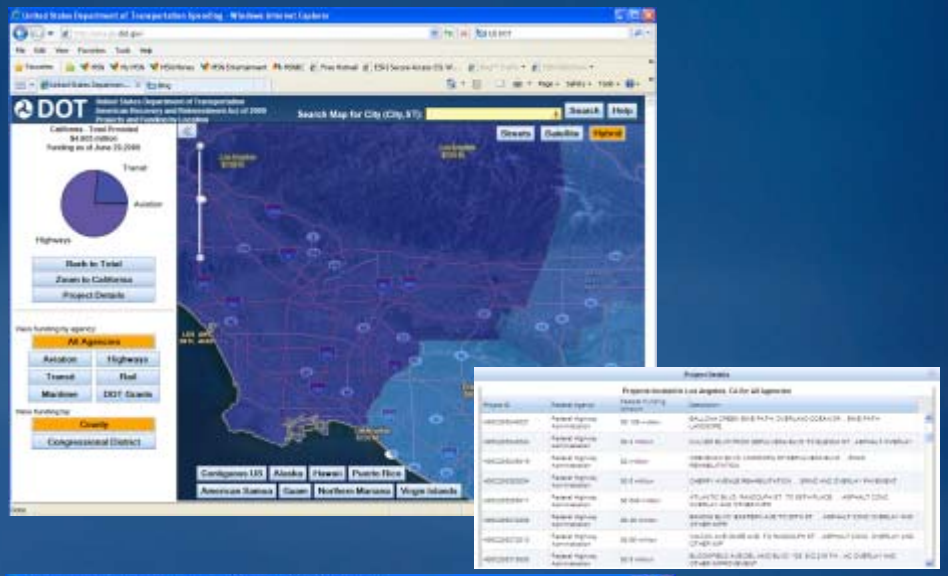
Performance Dashboards

Benefits of GIS for Performance Dashboards

- Comprehensive view of information
- Make information available across entire organization and external customers (i.e. Public)
- Effectively communicate complex information and data
- Bring together a wide range of information that is presented in a single place

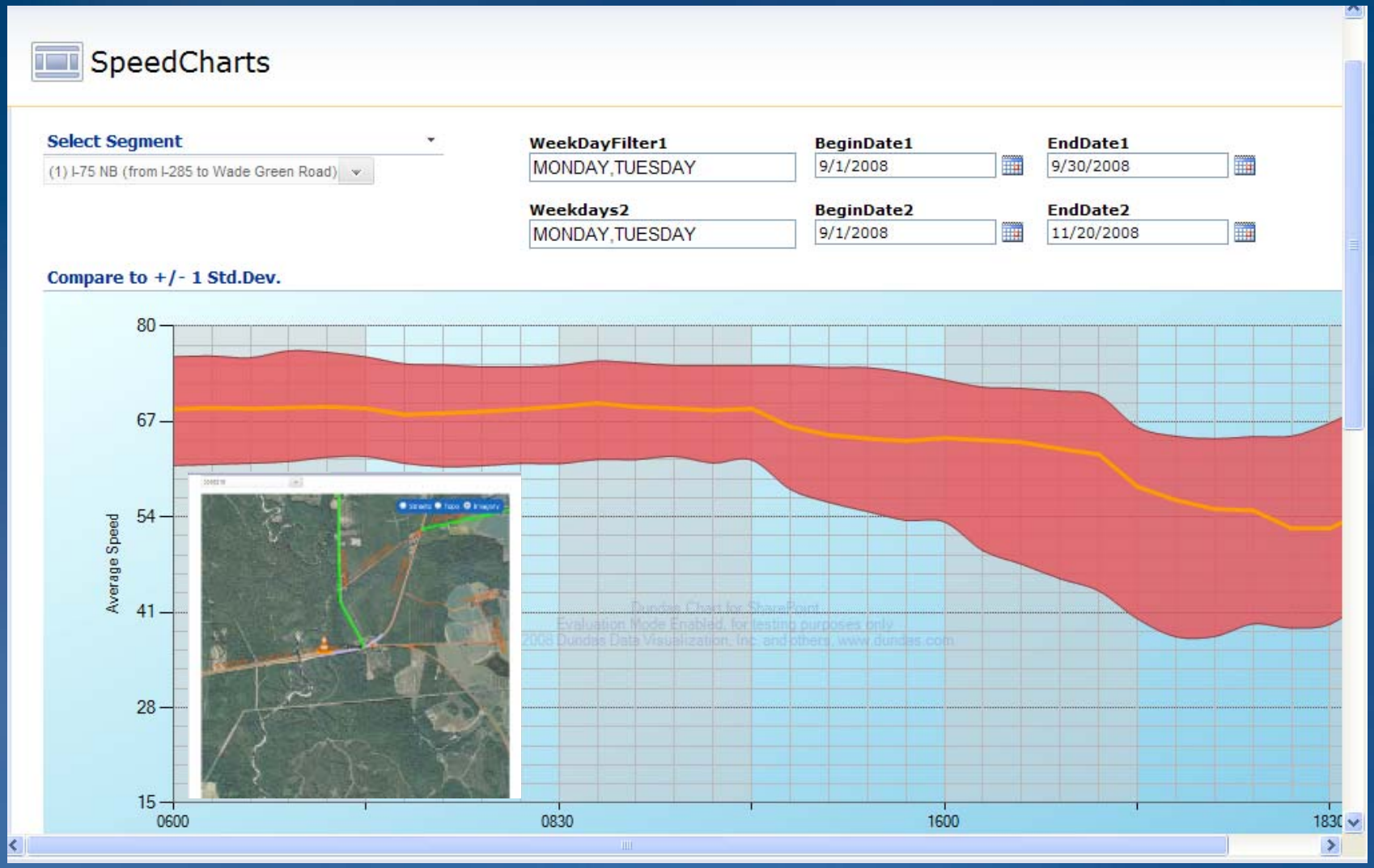
GIS Enables Effective Communication

- Supports integrated dashboards
- Clear presentation of complex material
- Interoperable with other business systems



. . GIS offers a Proactive Solution

Traffic Dashboard - GDOT



DOT Dashboard Proof of Concept

- Windows Internet Explorer

http://redhook1/PerformanceDashBoard/#app=d15c&1c46-selectedIndex=1&1260-selectedIndex=1

Google

Page Tools

MARYLAND

DEPARTMENT OF TRANSPORTATION

Performance Dashboard

Problem Solver | Maryland.gov | Online Services | State Agencies | Phone Directory

Search

Start Here

Performance Summary

Performance measures are a way of quickly assessing overall departmental performance.

Each dial, chart or graphic communicates the status or value of each performance measure.

Click on any performance measure to drill down and see more information.

Indicator View

State Map View

County Map View

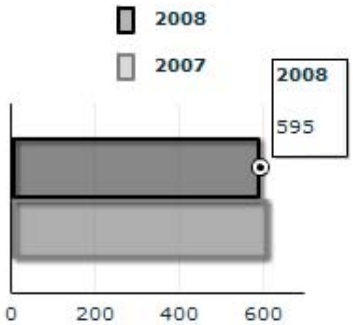
Site Map View

Integration of GIS and BI

PERFORMANCE

Congestion Free Travel

SAFETY

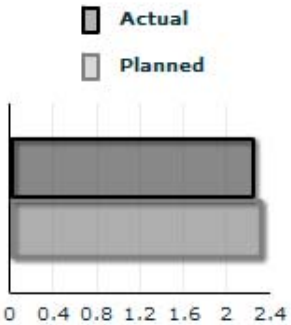


Deaths

CONDITION

Road Surface Condition

FINANCE

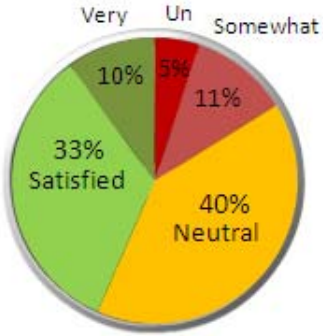


Expenses Budget ($B)

MANAGEMENT

Performance Areas

SATISFACTION



Citizen Survey Results

PROJECTS

On Time

A prototype built using ArcGIS Server's Flex™ API

Done

Local intranet

100%

- Windows Internet Explorer

http://redhook1/PerformanceDashBoard/#app=d15c&1c46-selectedIndex=2&1260-selectedIndex=1

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Performance Dashboard

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Search

- Start Here
- Performance Summary
- Indicator View

Indicators are a way of further analyzing performance measures.

Each gauge and chart communicates the status of indicators that together define the value of a higher level performance measure.

Click a chart or gauge to that indicator mapped at the state level.

- State Map View
- County Map View
- Site Map View
- Integration of GIS and BI

PERFORMANCE | SAFETY | CONDITION | FINANCE | MANAGEMENT | SATISFACTION | PROJECTS

CRASHES x 1,000

INJURIES x 1,000

DEATHS

WORK ZONE

A prototype built using ArcGIS Server's Flex™ API

Done | Local intranet | 100%

- Windows Internet Explorer

http://redhook1/PerformanceDashBoard/#app=d15c&1c46-selectedIndex=3&ac1c-selectedIndex=1

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Search

- Start Here
- Performance Summary
- Indicator View
- State Map View

The state level map is a way of looking at county differences of factors that may be contributing to the value of an indicator.

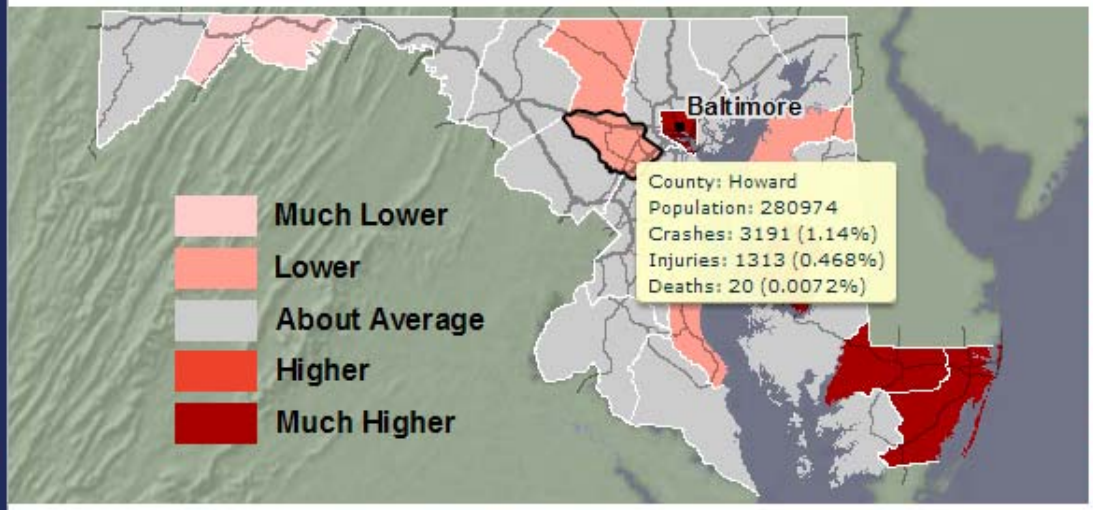
Each indicator for the chosen performance measure is now shown at a county level.

Click a column heading to change the data used in the map and chart.

Click a county for a more detailed map.

- County Map View
- Site Map View
- Integration of GIS and BI

PERFORMANCE | SAFETY | CONDITION | FINANCE | MANAGEMENT | SATISFACTION | PROJECTS



Name	Crashes	Injuries	Deaths	Wkzone	Crash%	Injury%	Death%	Wkzone'
Howard	3191	1313	20	3	1.14%	0.468%	0.0072%	0.00001
Kent	227	89	5	1	1.08%	0.423%	0.0238%	0.00004
Montgon	13220	5351	54	4	1.39%	0.559%	0.0057%	0.00000
Prince G	15884	5597	102	20	1.86%	0.655%	0.012%	0.00002
Queen A	758	300	8	1	1.57%	0.621%	0.0166%	0.00002
St. Mary	1360	560	17	0	1.32%	0.541%	0.0164%	0%
Somerse	346	157	4	1	1.33%	0.601%	0.0154%	0.00003
Talbot	914	283	6	0	2.35%	0.726%	0.0154%	0%

- Allegany
- Anne Arundel
- Baltimore
- Baltimore City
- Calvert
- Caroline
- Carroll
- Cecil
- Charles
- Dorchester
- Frederick
- Garrett
- Harford
- Howard
- Kent
- Montgomery
- Prince George's
- Queen Anne's
- Somerset
- St. Mary's
- Talbot
- Washington
- Wicomico
- Worcester

A prototype built using ArcGIS Server's Flex™ API

Done | Local intranet | 100%

- Windows Internet Explorer

http://redhook1/PerformanceDashBoard/#app=d15c&1c46-selectedIndex=3&ac1c-selectedIndex=1

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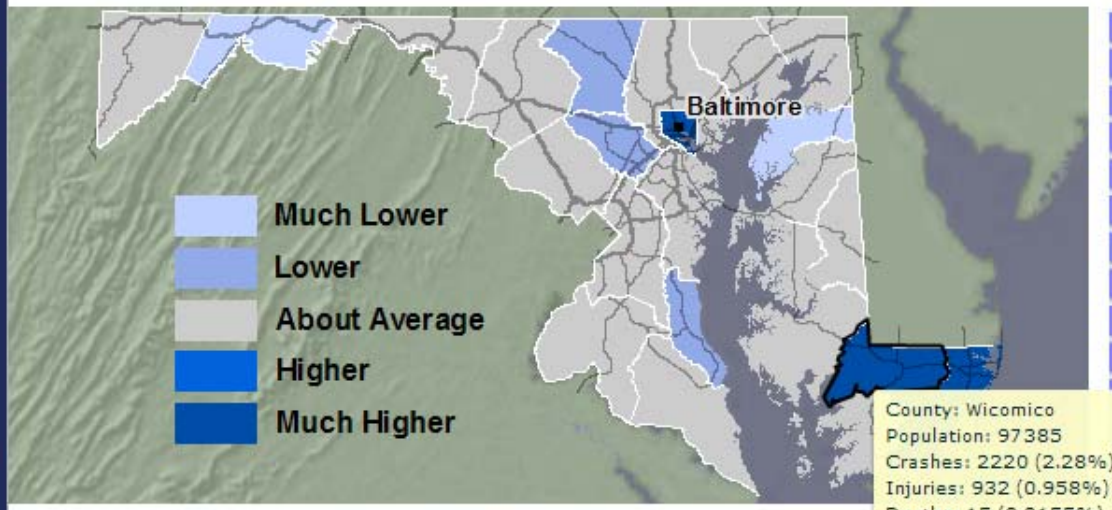
PERFORMANCE | SAFETY | CONDITION | FINANCE | MANAGEMENT | SATISFACTION | PROJECTS



Name	Crashes	Injuries	Deaths	Wkzone	Crash%	Injury▲	Death%	Wkzone
Dorches	497	218	4	1	1.53%	0.67%	0.0123%	0.00003
Washing	2807	1004	25	3	1.89%	0.675%	0.0168%	0.00002
Cecil	1650	732	21	0	1.6%	0.71%	0.0204%	0%
Talbot	914	283	6	0	2.35%	0.726%	0.0154%	0%
Baltimor	19168	5114	41	5	3.08%	0.822%	0.0066%	0.00000
Wicomic	2220	932	15	2	2.28%	0.958%	0.0155%	0.00002
Worcest	1349	544	10	0	2.6%	1.049%	0.0193%	0%

- Allegany
- Anne Arundel
- Baltimore
- Baltimore City
- Calvert
- Caroline
- Carroll
- Cecil
- Charles
- Dorchester
- rederick
- arrett
- arford
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- Somerset
- St. Mary's
- Talbot
- Washington
- Wicomico
- Worcester

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Done

Local intranet

100%

- Windows Internet Explorer

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Search

- Start Here
- Performance Summary
- Indicator View
- State Map View
- County Map View
- Site Map View

PERFORMANCE | SAFETY | CONDITION | FINANCE | MANAGEMENT | SATISFACTION | PROJECTS

View: Map

Year: 2008

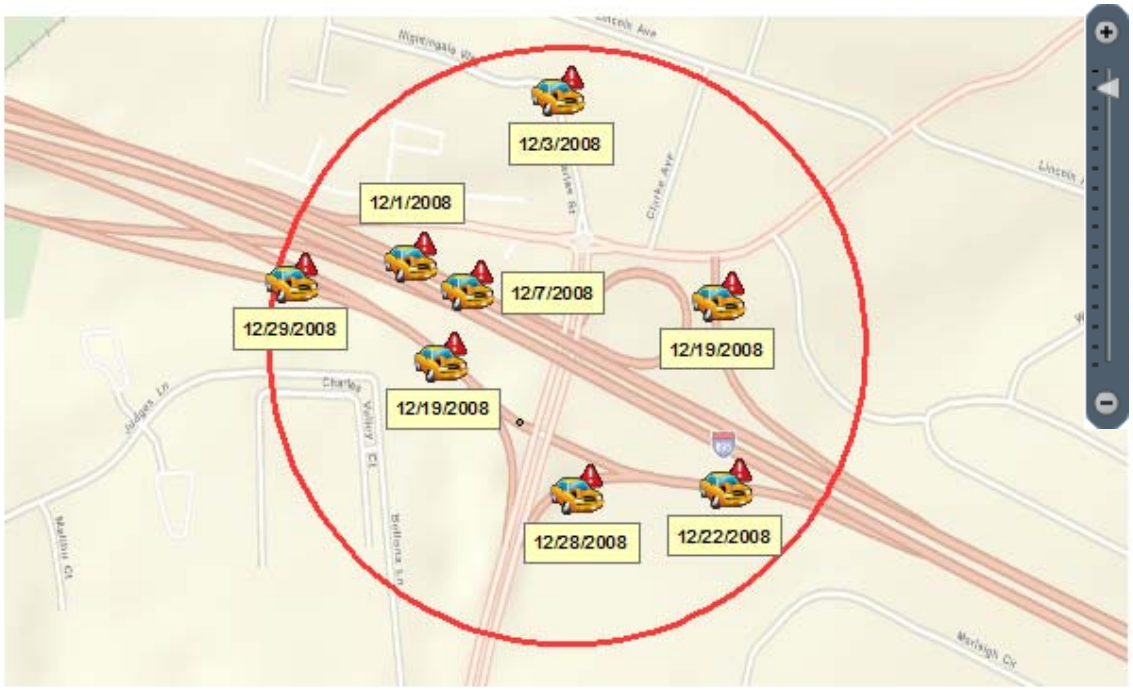
Analysis

- [x] Site
- [ ] Strip
- [ ] Corridor

Parameters

Severity

- [x] Fatalities
- [ ] Injuries
- [ ] Property Damage



From: 11/30/2008

To: 12/31/2008

Distance: 1/4 mile

Type: Single Vehicle

Cause: Alcohol

Weather: Raining

Integration of GIS and BI

A prototype built using ArcGIS Server's Flex™ API

Done | Local intranet | 100%

Federal Examples
Recovery.gov

Recovery.gov

MONDAY, SEPTEMBER 28, 2009

Text -A A +A | Google Translate | RSS Feeds

REPORT FRAUD, WASTE & ABUSE

RECOVERY.GOV
TRACK THE MONEY

Connect With Us

Recovery.gov is the U.S. government's official website providing easy access to data related to Recovery Act spending and allows for the reporting of potential fraud, waste, and abuse.

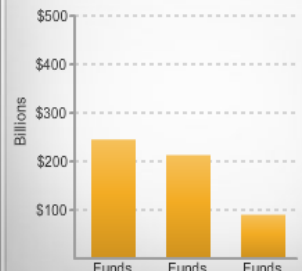
Search Go

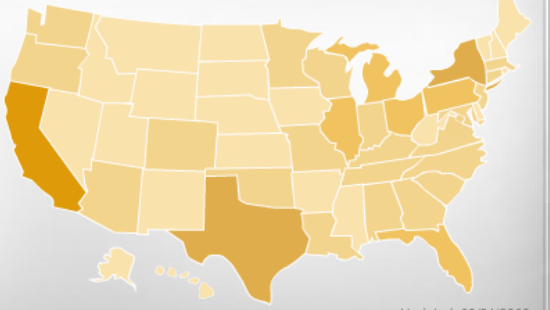
HOME | ABOUT | ACCOUNTABILITY | WHERE IS THE MONEY GOING? | OPPORTUNITIES | NEWS | FAQS & RESOURCES | CONTACT US

AGENCY REPORTED | RECIPIENT REPORTED

Based on Funds Available
$0 $25 B

U.S. TOTAL
for contracts, grants, loans and entitlements





Roll over graph and map to see Recovery data.
Click on any state for more data.

Updated: 09/21/2009

Territories

Text View of Data Source

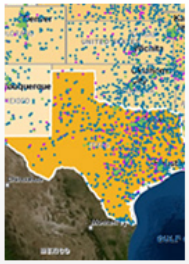
View Recovery Information in Your Neighborhood Zip Go

WHAT'S NEW & WHAT'S NEXT?

September 26, 2009

What's New: Mapping that shows Recovery projects in your state or zip code. What's Next: Recipients report on how they used Recovery funds and that data will be displayed on new maps and charts.

Find out more about What's New & What's Next? >>



1 2 3 4 5

ESTIMATED JOBS CREATED/SAVED

Recipient Data Will Be Released Between Oct. 12th and Oct. 30th

- Find more information about Recovery related jobs.
- How Job Data is Estimated - CEA (PDF 58kb)

A company receiving Recovery Act funding through a contract or grant and projects yet to be contracted out (Contracts Up for Bid) may offer job opportunities.

DATA, DATA & MORE DATA

To see where the money is going, make your selections below and click go.

Contracts Grants Loans

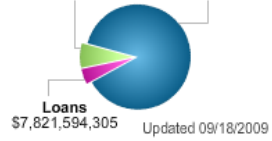
-- Agency --

-- State --

-- Amount --

Go

Funds Available by Award Type



Updated 09/18/2009

Source

CHAIRMAN'S CORNER

Earl E. Devaney is chairman of the Recovery Accountability and Transparency Board, which manages this website and oversees spending under the American Recovery and Reinvestment Act of 2009.

September 28, 2009

After overcoming many challenges, the Recovery Board is launching its new

Recovery.gov

View Recovery Information In Your Area | VIEW ALL | Go | or | Zip Code | Go | Reset to U.S. View

Map View: Funding Map | Street Map | Aerial Map

Show Recipients

USA [-]

Agency Reported | Recipient Reported

Type	# of Awards	Amount
Contracts	20287	$11,956,974,078
Grants	60320	$141,341,379,611
Loans	17438	$7,821,594,305
Total	98045	$161,119,947,994

Roll over type to view source | Updated 9/24/09

$0 $19B
Based on funds available

1000 km
500 mi

Text View of Data

MAP TASKS: DOWNLOAD KML | PRINT MAP

Recovery.gov

View Recovery Information In Your Area | VIEW ALL | Go | or | 30328 | Go | Reset to U.S. View

Map View: Funding Map | Street Map | Aerial Map

Show Recipients

Select Recipient Award Type(s)

Contracts ☑ Grants ☑ Loans ☑

Select All ☐

Select Agency

- Department of the Interior
- Department of the Treasury
- Department of Transportation
- Department of Veterans Affairs

Select Amount

Minimum $0

Maximum $18,595,064,866

Go | Clear

$0 $19B

Based on funds available

1000 km

500 mi

USA [-]

Agency Reported | Recipient Reported

Type	# of Awards	Amount
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Total	98045	$161,119,947,994

Roll over type to view source | Updated 9/24/09

Text View of Data

MAP TASKS: DOWNLOAD KML | PRINT MAP

Recovery.gov

View Recovery Information In Your Area | Maryland | Go | or | Zip Code | Go | Reset to U.S. View

Map View: Funding Map | Street Map | Aerial Map

1 recipients found in this location

CONSISTS OF ROADWAY OBLITERATION AND TURF ESTABLISHMENT.

Award Location:
ROCKVILLE, MD

Award Amount:
$1,138,150

More Details (opens new window)

Show Recipients

Uniontown
Cumberland
Maryland
West Virginia
Hagerstown
Front Royal
Elkins
Washington D.C.
Annapolis
Arlington
Alexandria
Burke
Annandale
Silver Spring
Wheaton-Glenmont
Philadelphia
Camden
Cherry Hill
Wilmington
Vineland
Dover
Georgetown
Salisbury

$0 — $19B
Based on funds available

50 km
50 mi

Maryland [-]

Agency Reported | Recipient Reported

Type	# of Awards	Amount
Contracts	265	$819,298,823
Grants	1168	$4,472,746,307
Loans	209	$93,619,119
Total	1642	$5,385,664,249

Roll over type to view source — Updated 9/24/09

Text View of Data

MAP TASKS: DOWNLOAD KML | PRINT MAP

Recovery.gov

State Government Example

State of Maryland – StateStat Recovery and Reinvestment Site

Maryland StateStat

Maryland StateStat

Maryland StateStat

Maryland StateStat

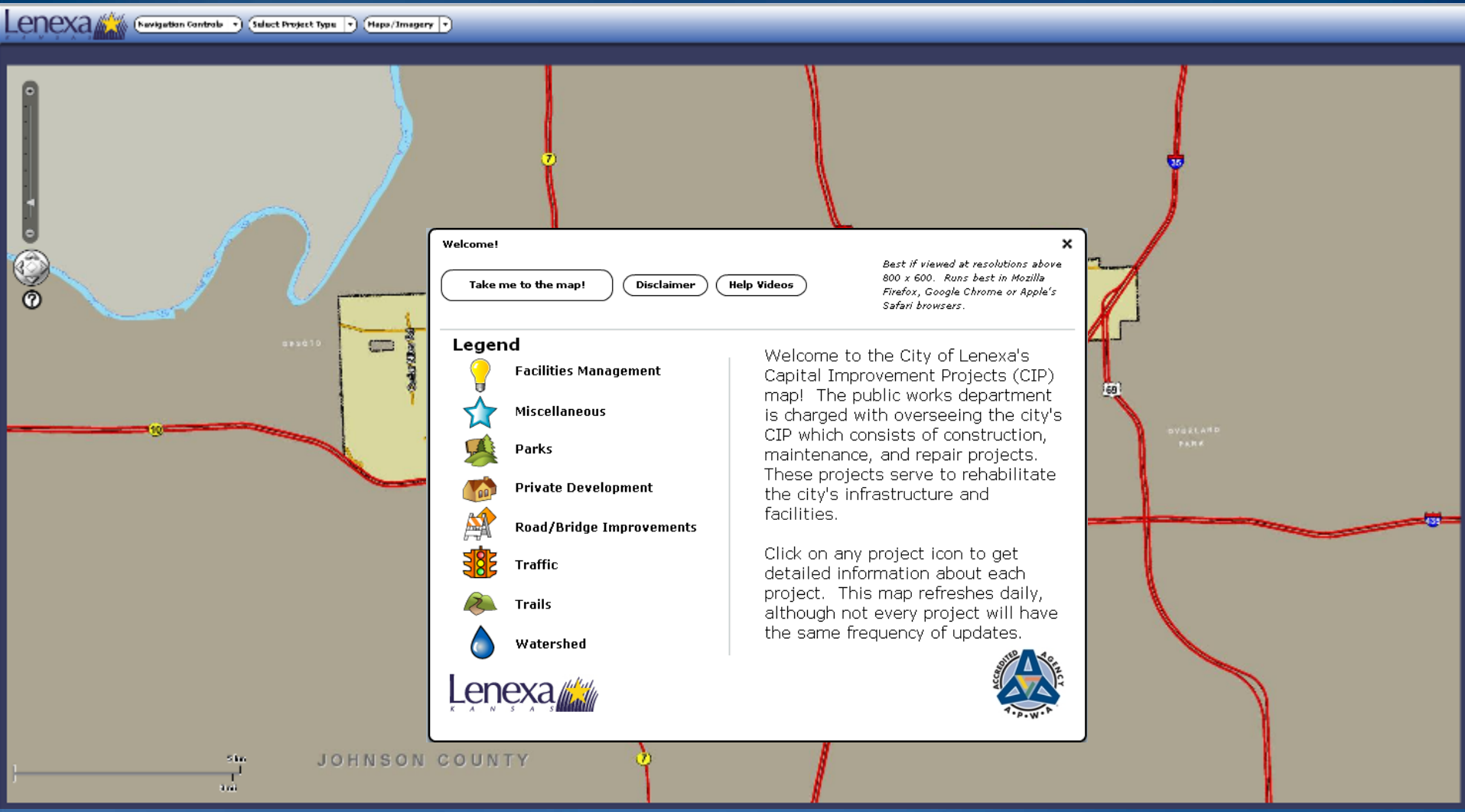
Maryland StateStat

Maryland StateStat

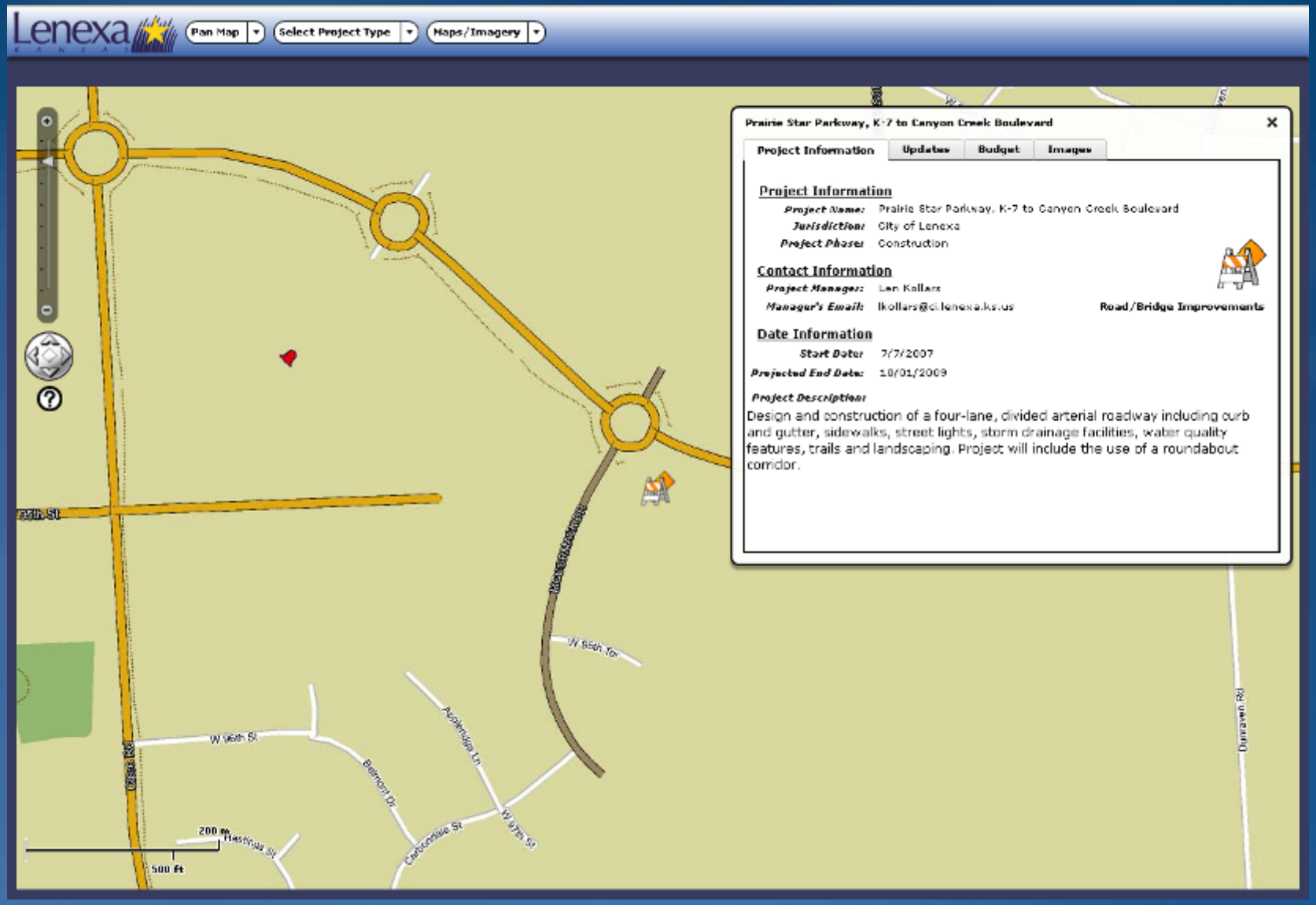
Local Government Examples

City of Lenexa, KS – Interactive Project Status Map

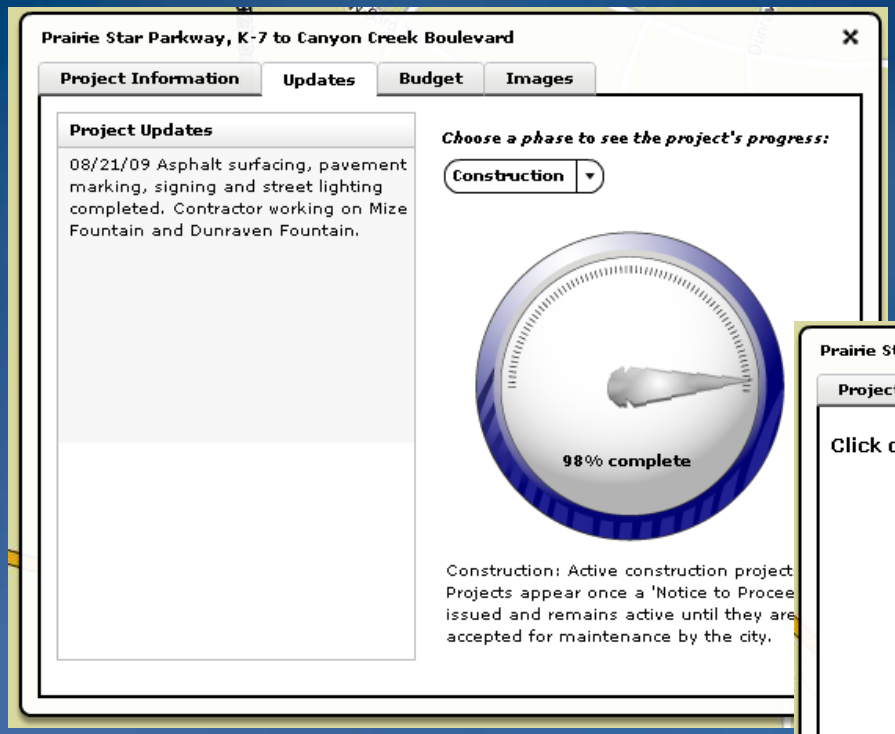
City of Lenexa, KS

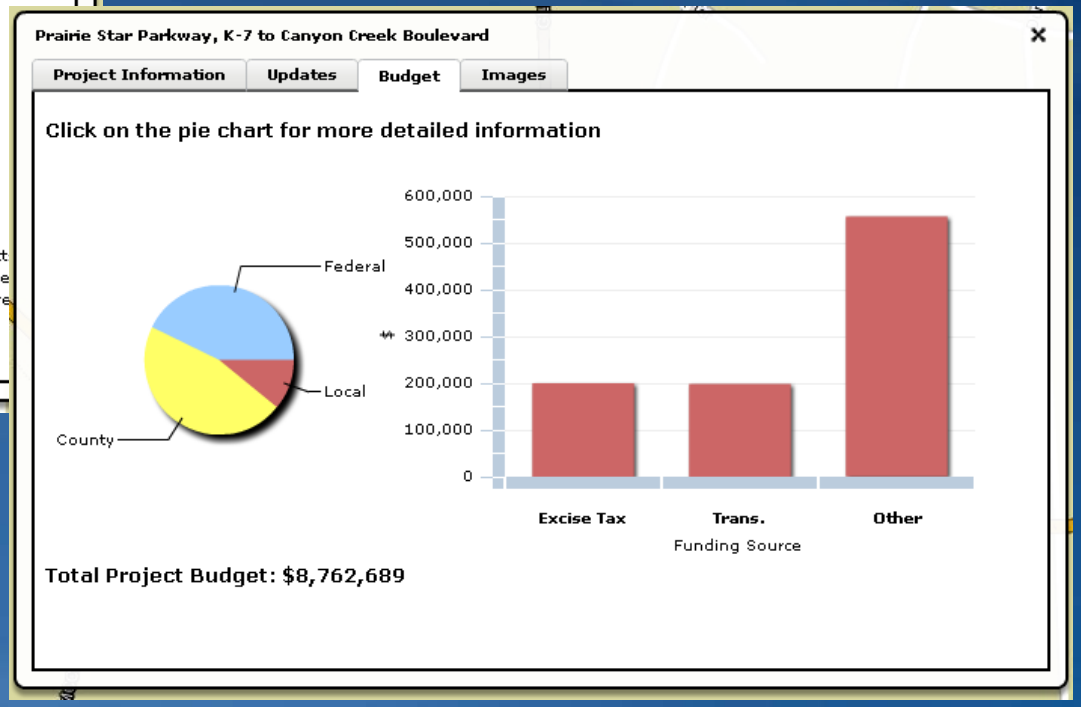


City of Lenexa, KS



City of Lenexa, KS





City of Lenexa, KS

Proof of Concept

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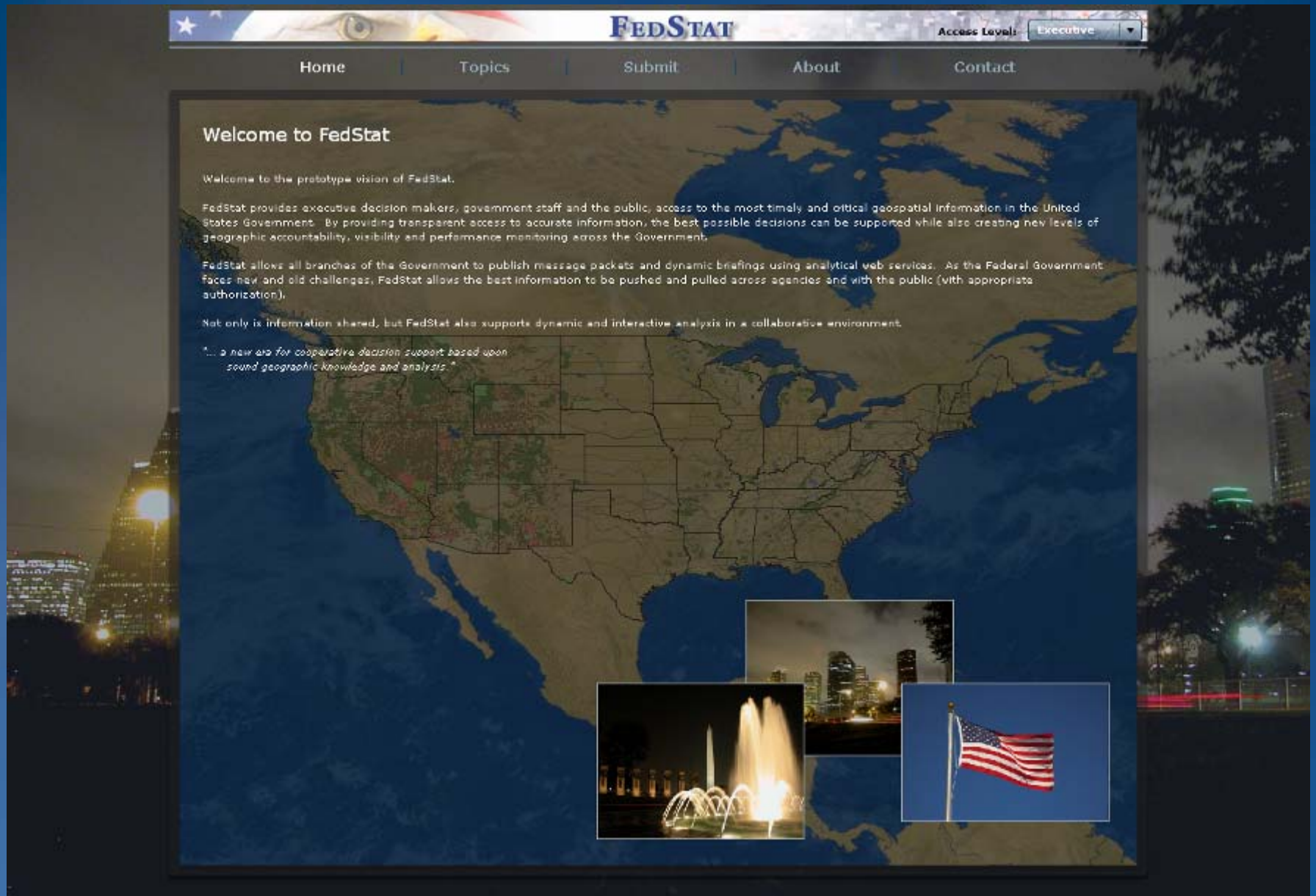
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Welcome to FedStat
Welcome to the prototype vision of FedStat.
FedStat provides executive decision makers, government staff and the public, access to the most timely and critical geospatial information in the United States Government. By providing transparent access to accurate information, the best possible decisions can be supported while also creating new levels of geographic accountability, visibility and performance monitoring across the Government.
FedStat allows all branches of the Government to publish message packets and dynamic briefings using analytical web services. As the Federal Government faces new and old challenges, FedStat allows the best information to be pushed and pulled across agencies and with the public (with appropriate authorization).
Not only is information shared, but FedStat also supports dynamic and interactive analysis in a collaborative environment.
"... a new era for cooperative decision support based upon sound geographic knowledge and analysis."

FedStat


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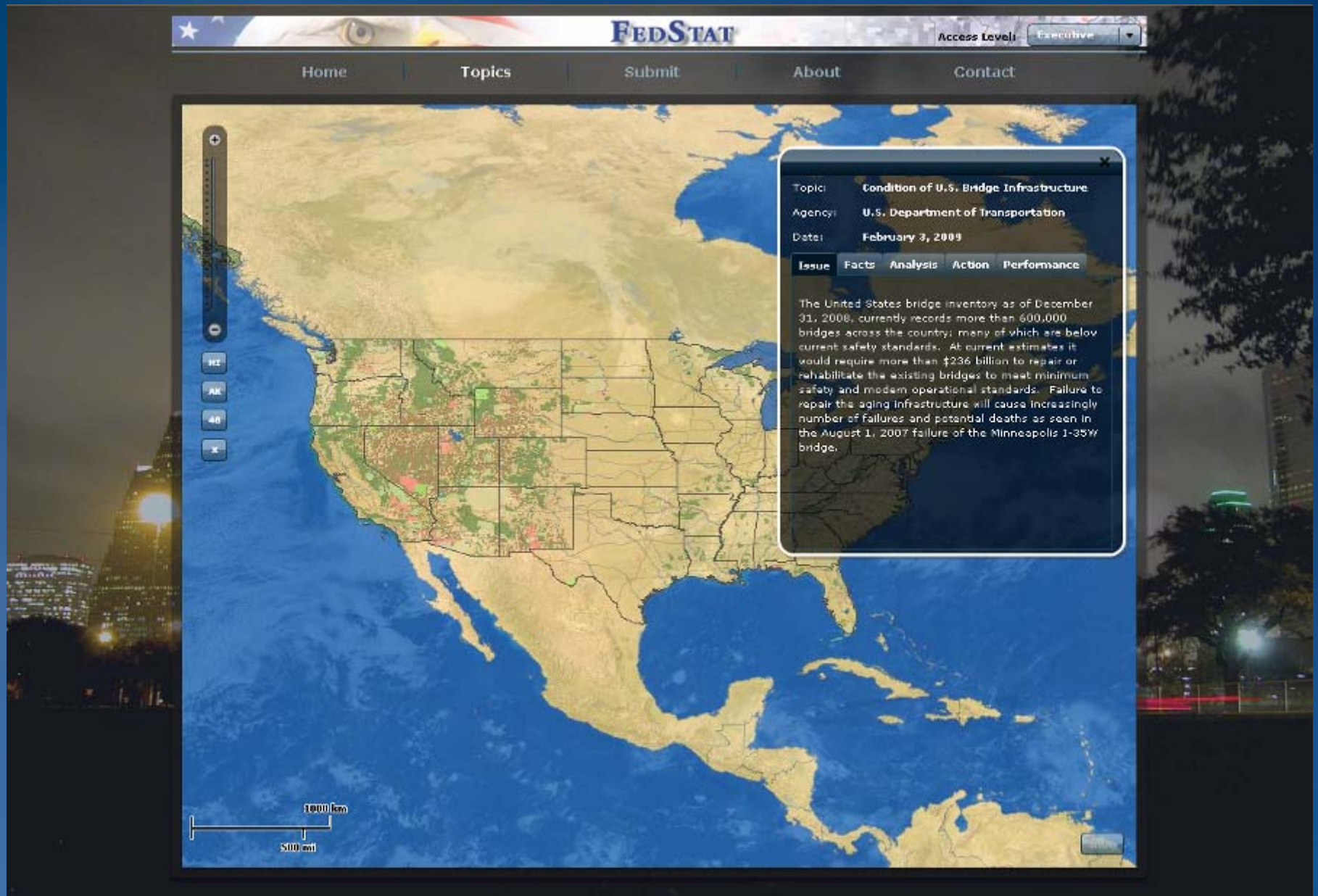
HI
AK
AR
Infrastructure
Condition of U.S. Bridge Infrastructure
Rural Broadband Internet
More...
Federal Spending
USA Spending.gov
Stimulus Package
More...
Economy
Unemployment
House Foreclosures
More...

FedStat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Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
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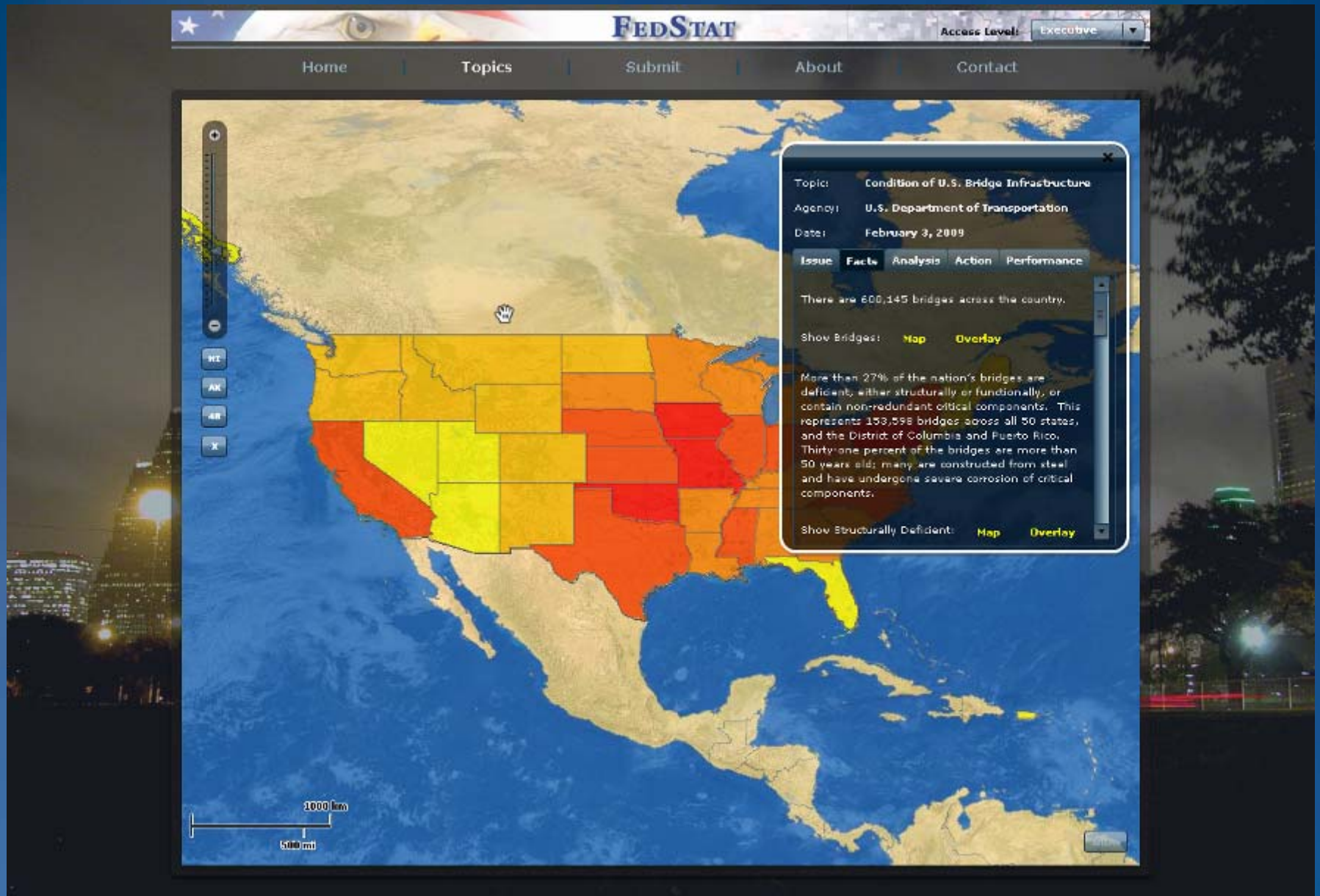
Analysis
Action
Performance
The United States bridge inventory as of December 31, 2008, currently records more than 600,000 bridges across the country; many of which are below current safety standards. At current estimates it would require more than $236 billion to repair or rehabilitate the existing bridges to meet minimum safety and modern operational standards. Failure to repair the aging infrastructure will cause increasingly number of failures and potential deaths as seen in the August 1, 2007 failure of the Minneapolis I-35W bridge.
HI
AK
48
1000 km
500 mi

FedStat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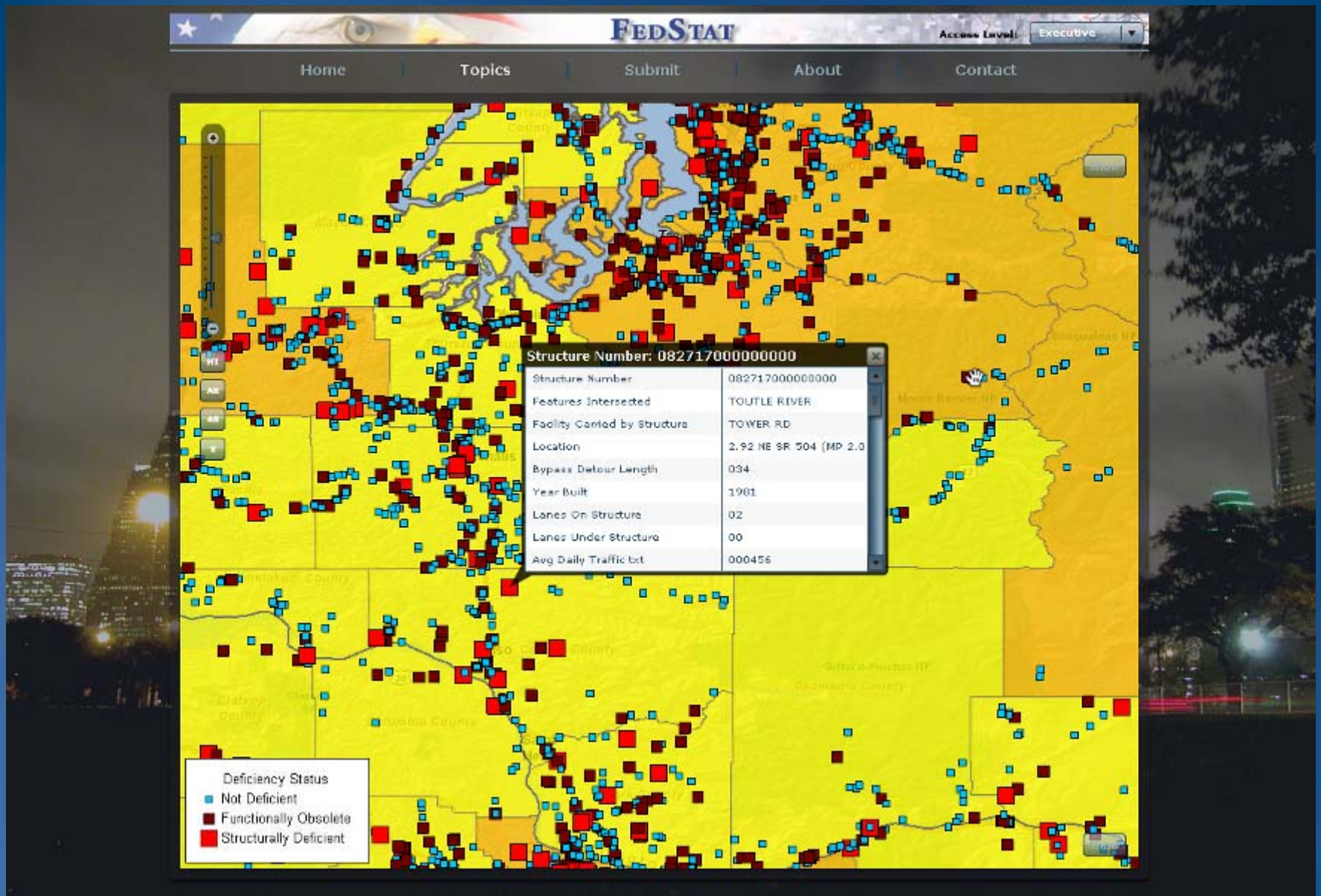
Performance
There are 600,145 bridges across the country.
Show Bridges: Map Overlay
More than 27% of the nation's bridges are deficient, either structurally or functionally, or contain non-redundant critical components. This represents 153,598 bridges across all 50 states, and the District of Columbia and Puerto Rico. Thirty-one percent of the bridges are more than 50 years old; many are constructed from steel and have undergone severe corrosion of critical components.
Show Structurally Deficient: Map Overlay
1000 km
500 mi

FedStat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Structure Number: 082717000000000
Structure Number 082717000000000
Features Intersected TOUTLE RIVER
Facility Carried by Structure TOWER RD
Location 2.92 NE SR 504 (MP 2.0
Bypass Detour Length 034
Year Built 1981
Lanes On Structure 02
Lanes Under Structure 00
Avg Daily Traffic txt 000456
Deficiency Status
Not Deficient
Functionally Obsolete
Structurally Deficient

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Analysis
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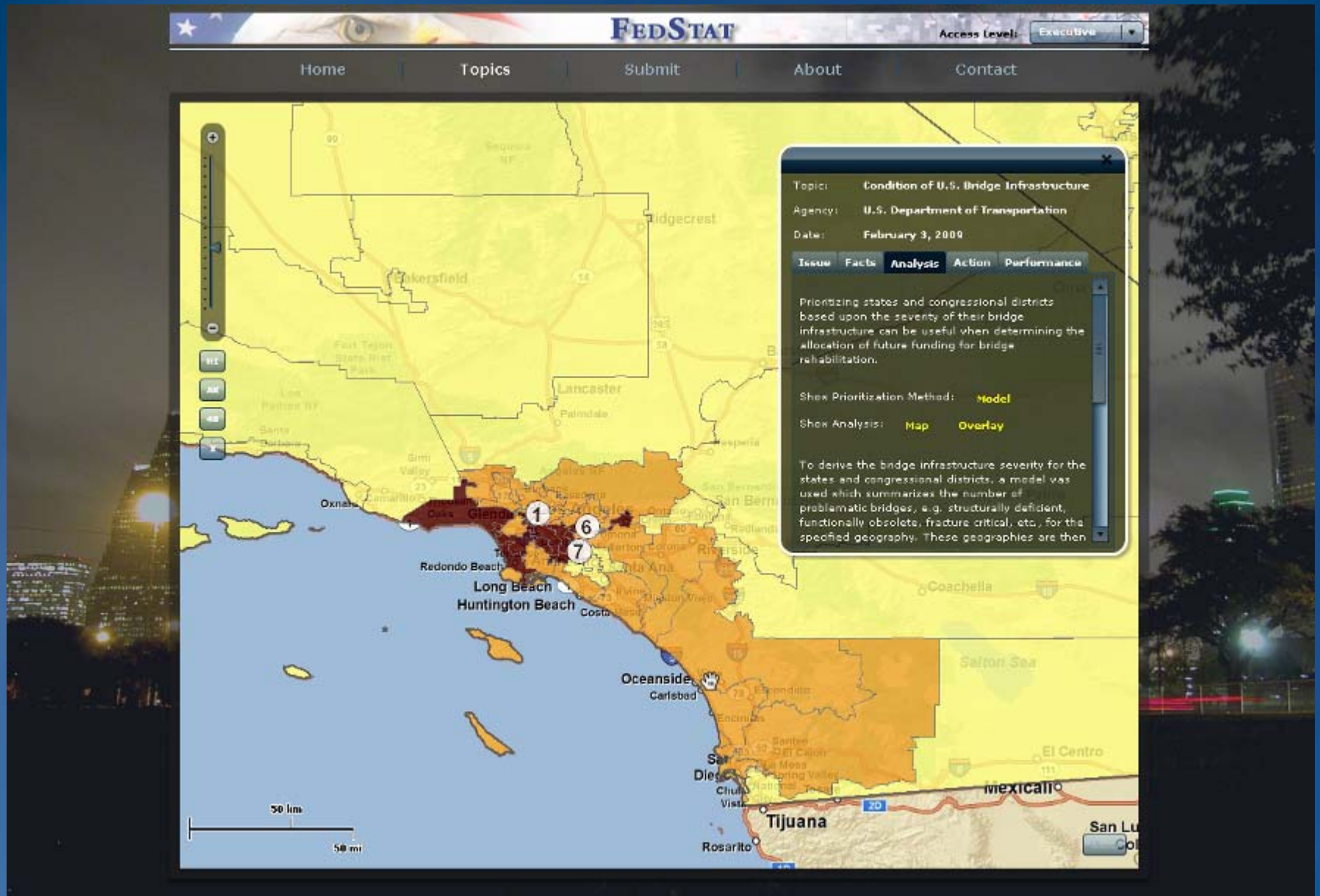
Performance
Prioritizing states and congressional districts based upon the severity of their bridge infrastructure can be useful when determining the allocation of future funding for bridge rehabilitation.
Show Prioritization Method:
Model
Show Analysis:
Map
Overlay
To derive the bridge infrastructure severity for the states and congressional districts, a model was used which summarizes the number of problematic bridges, e.g. structurally deficient, functionally obsolete, fracture critical, etc., for the specified geography. These geographies are then
1
2
3
4
5
6
7
8
9
10
HI
AK
48
1000 km
500 mi

FedStat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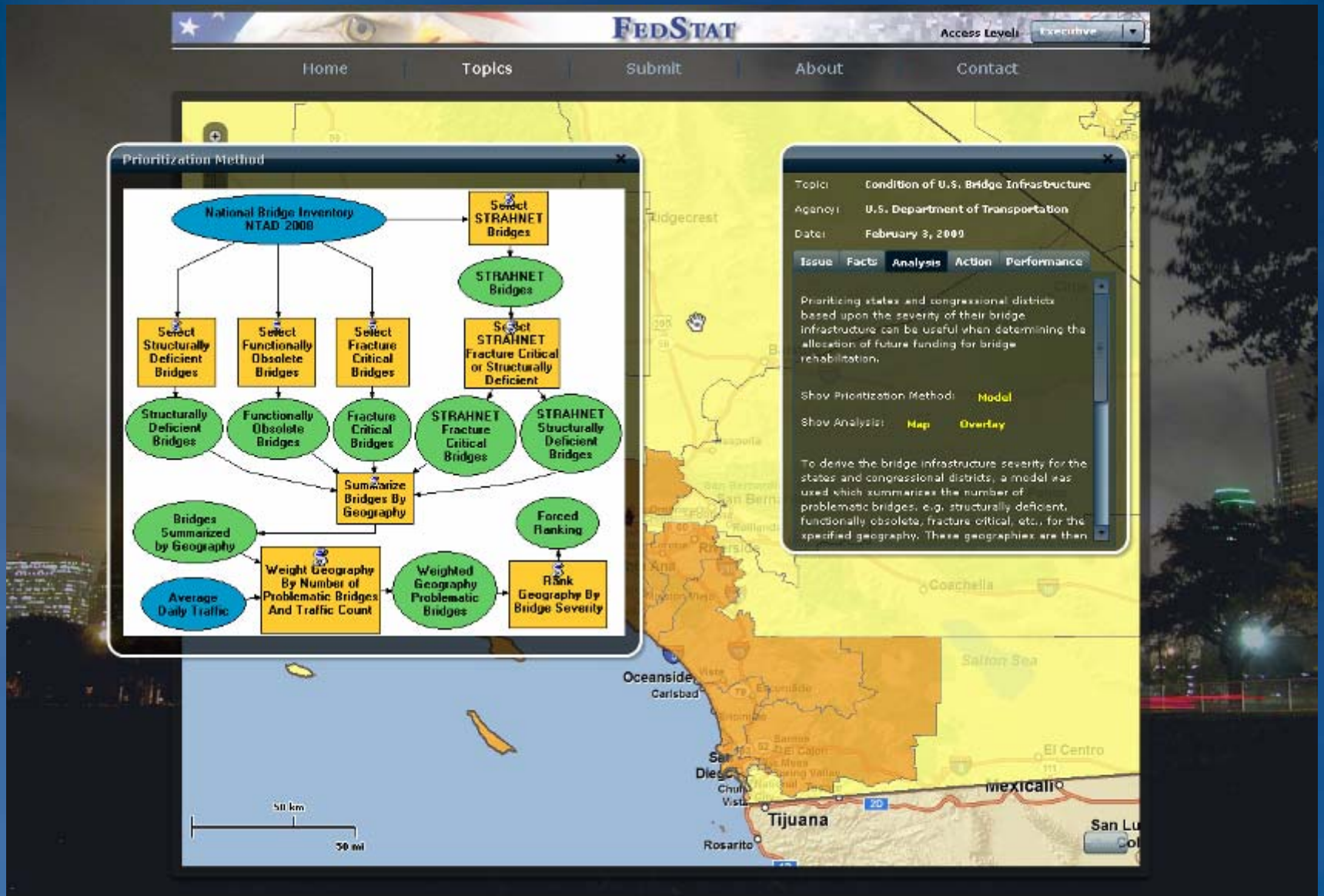
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
Facts
Analysis
Action
Performance
Prioritizing states and congressional districts based upon the severity of their bridge infrastructure can be useful when determining the allocation of future funding for bridge rehabilitation.
Show Prioritization Method: Model
Show Analysis: Map Overlay
To derive the bridge infrastructure severity for the states and congressional districts, a model was used which summarizes the number of problematic bridges, e.g. structurally deficient, functionally obsolete, fracture critical, etc., for the specified geography. These geographies are then
Bakersfield
Lancaster
Palmdale
Ridgecrest
Oxnard
Redondo Beach
Long Beach
Huntington Beach
Oceanside
Carlsbad
Coachella
Salton Sea
El Centro
Mexicali
Tijuana
Rosarito
50 km
50 mi
1
6
7

FedStat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Topics
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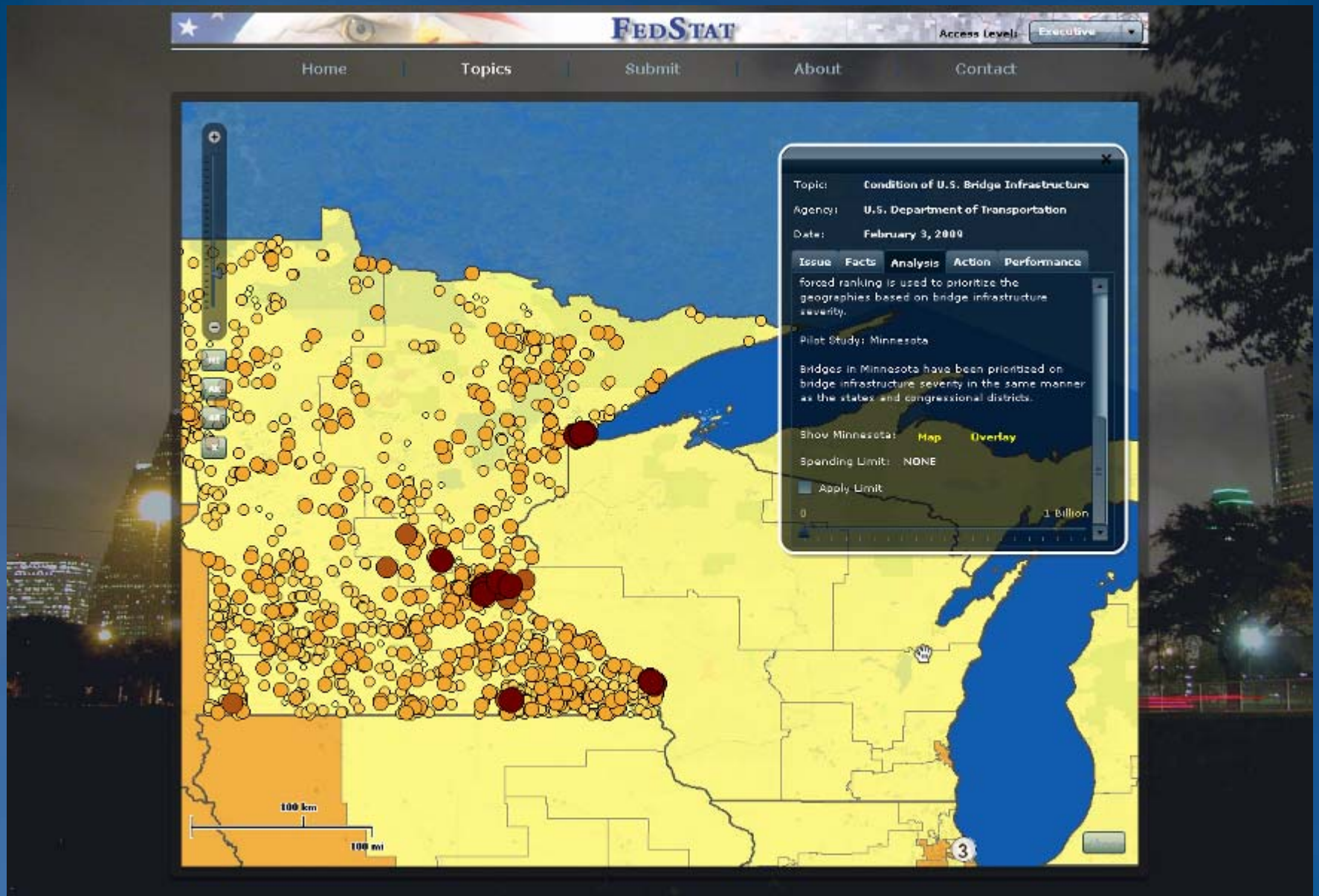
About
Contact
Prioritization Method
National Bridge Inventory NTAD 2000
Select STRAHNET Bridges
STRAHNET Bridges
Select Structurally Deficient Bridges
Select Functionally Obsolete Bridges
Select Fracture Critical Bridges
Select STRAHNET Fracture Critical or Structurally Deficient
Structurally Deficient Bridges
Functionally Obsolete Bridges
Fracture Critical Bridges
STRAHNET Fracture Critical Bridges
STRAHNET Structurally Deficient Bridges
Summarize Bridges By Geography
Bridges Summarized by Geography
Forced Ranking
Weight Geography By Number of Problematic Bridges And Traffic Count
Weighted Geography Problematic Bridges
Rank Geography By Bridge Severity
Average Daily Traffic
Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2000
Issue
Facts
Analysis
Action
Performance
Prioritizing states and congressional districts based upon the severity of their bridge infrastructure can be useful when determining the allocation of future funding for bridge rehabilitation.
Show Prioritization Method: Model
Show Analysis: Map Overlay
To derive the bridge infrastructure severity for the states and congressional districts, a model was used which summarizes the number of problematic bridges, e.g. structurally deficient, functionally obsolete, fracture critical, etc., for the specified geography. These geographies are then
Oceanside
Carlsbad
San Diego
Chula Vista
Tijuana
Rosarito
Mexicali
El Centro
Coachella
Salton Sea
50 km
30 mi

FedStat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Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
Facts
Analysis
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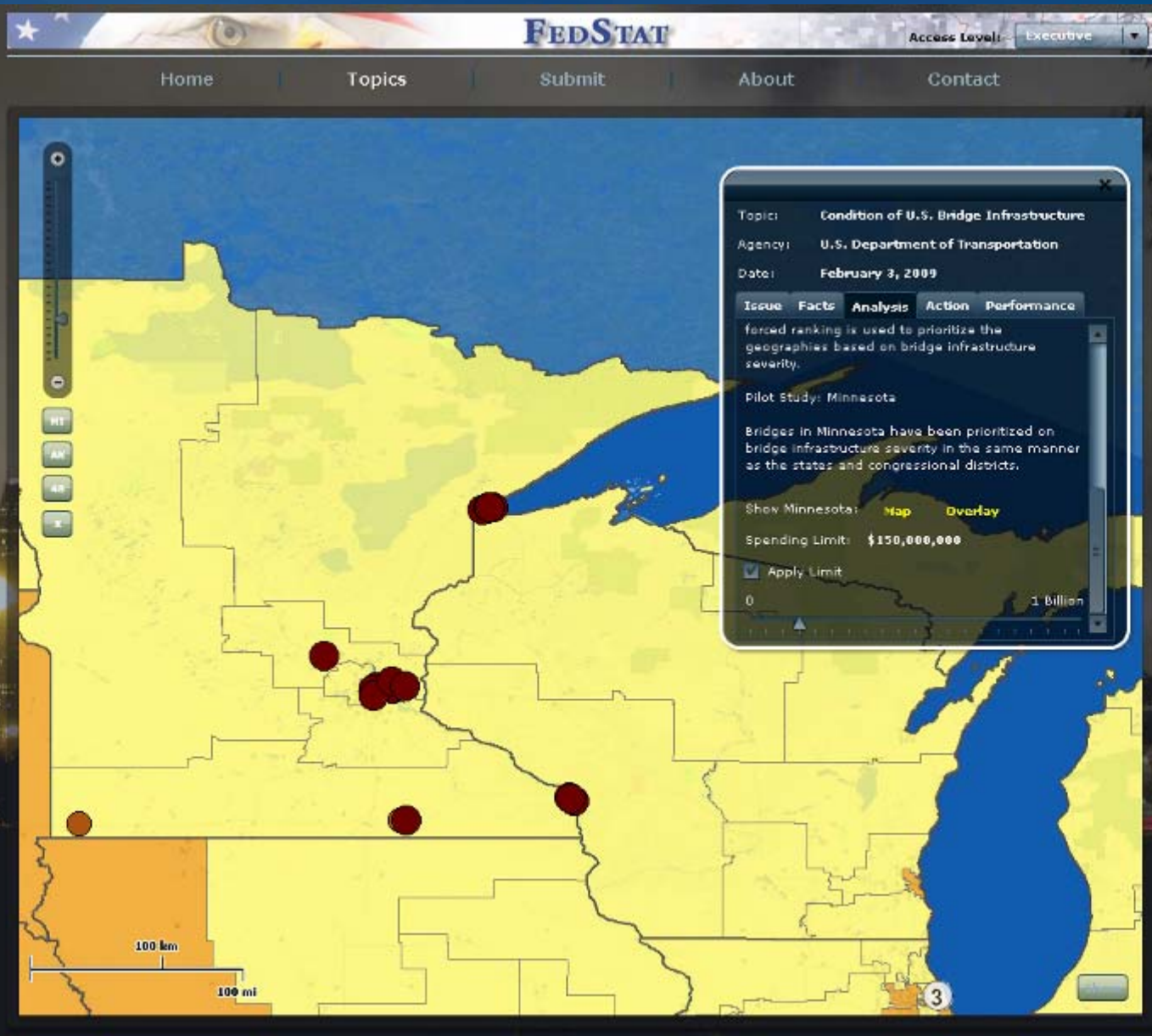
Performance
forced ranking is used to prioritize the geographies based on bridge infrastructure severity.
Pilot Study: Minnesota
Bridges in Minnesota have been prioritized on bridge infrastructure severity in the same manner as the states and congressional districts.
Show Minnesota: Map Overlay
Spending Limit: NONE
Apply Limit
0
1 Billion
100 km
100 mi

FedStat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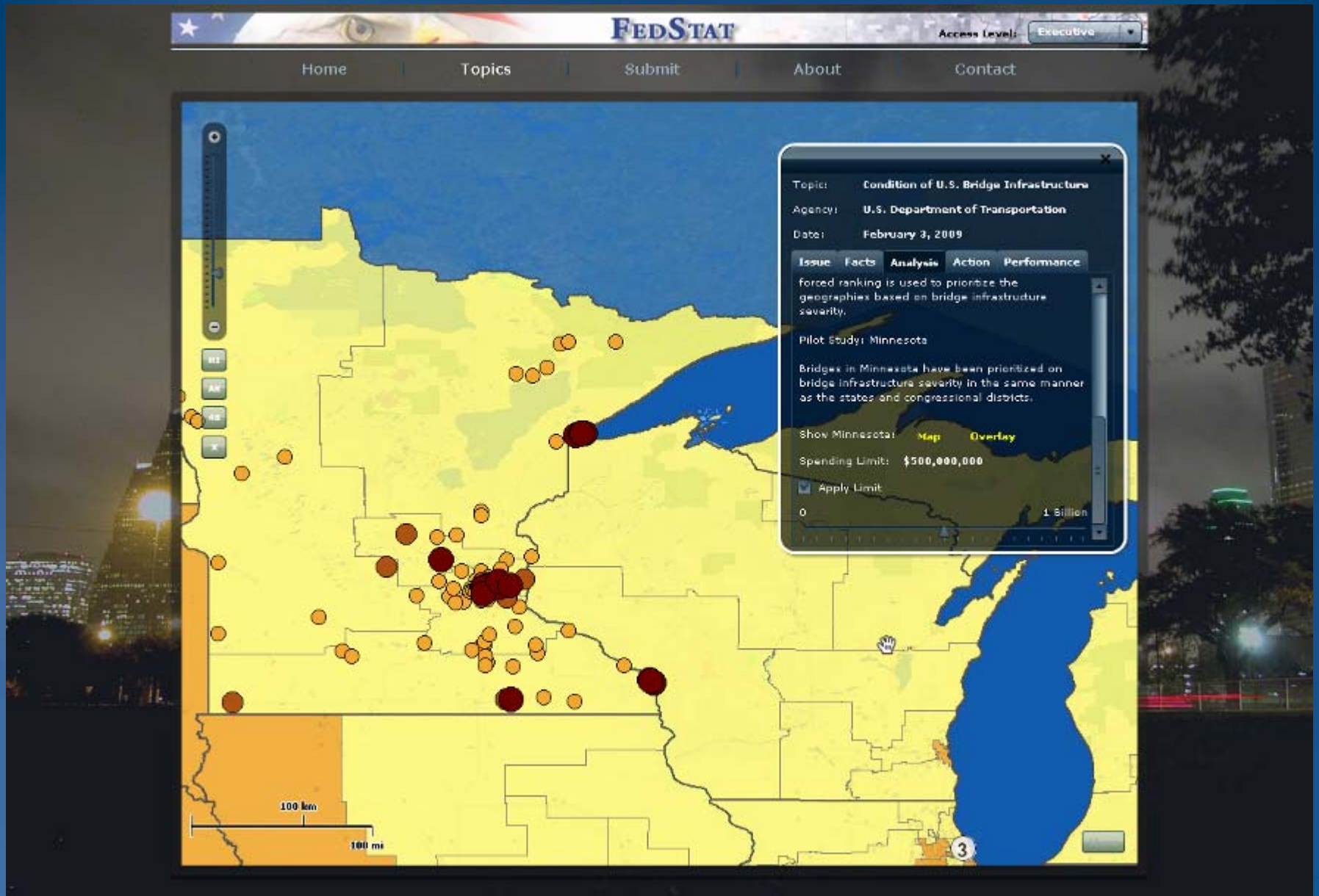
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
Facts
Analysis
Action
Performance
forced ranking is used to prioritize the geographies based on bridge infrastructure severity.
Pilot Study: Minnesota
Bridges in Minnesota have been prioritized on bridge infrastructure severity in the same manner as the states and congressional districts.
Show Minnesota: Map Overlay
Spending Limit: $150,000,000
Apply Limit
0
1 Billion
100 km
100 mi
3

FedStat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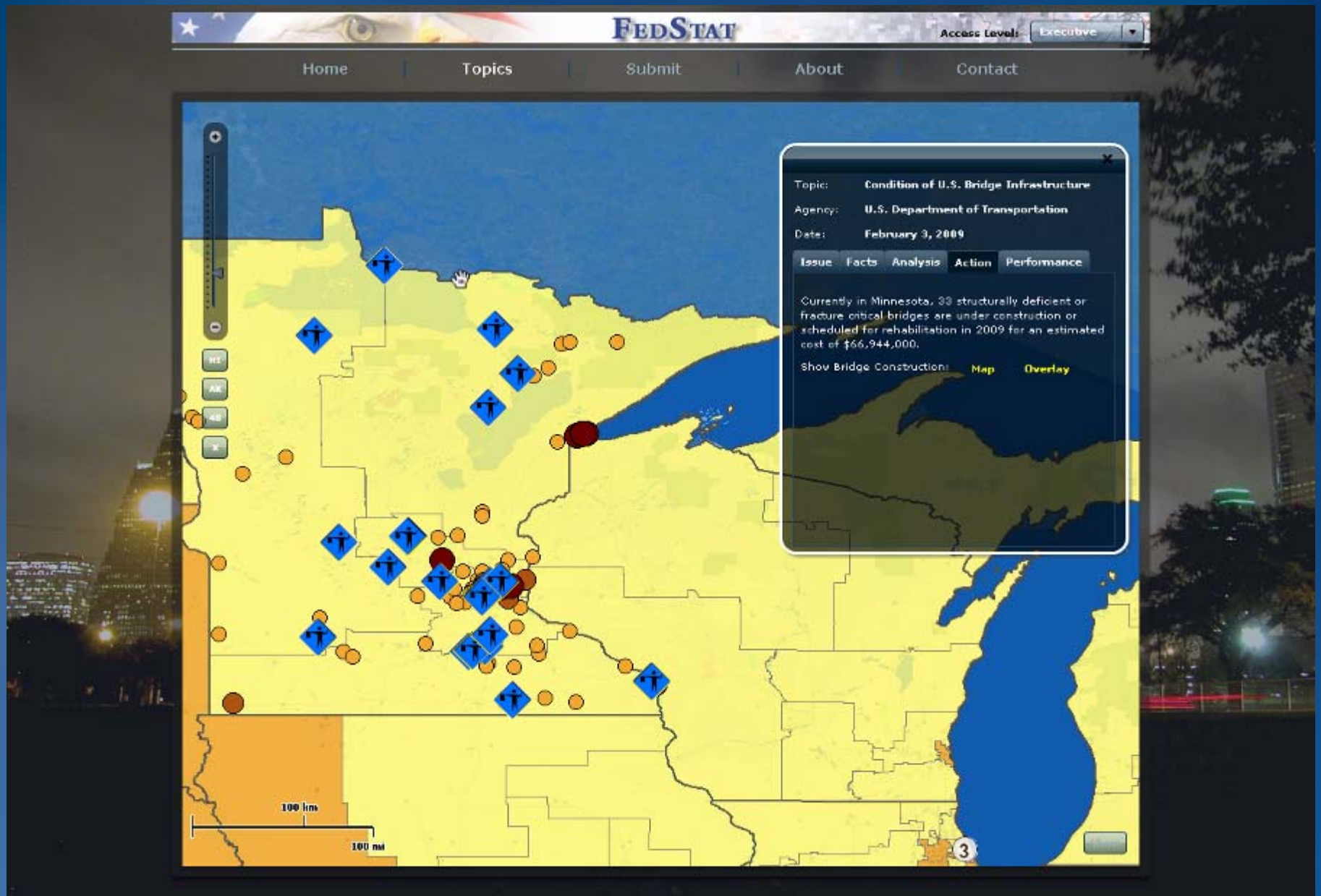
Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
Facts
Analysis
Action
Performance
forced ranking is used to prioritize the geographies based on bridge infrastructure severity.
Pilot Study: Minnesota
Bridges in Minnesota have been prioritized on bridge infrastructure severity in the same manner as the states and congressional districts.
Show Minnesota: Map Overlay
Spending Limit: $500,000,000
Apply Limit
0
1 Billion
100 km
100 mi
3

FedStat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Contact
Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
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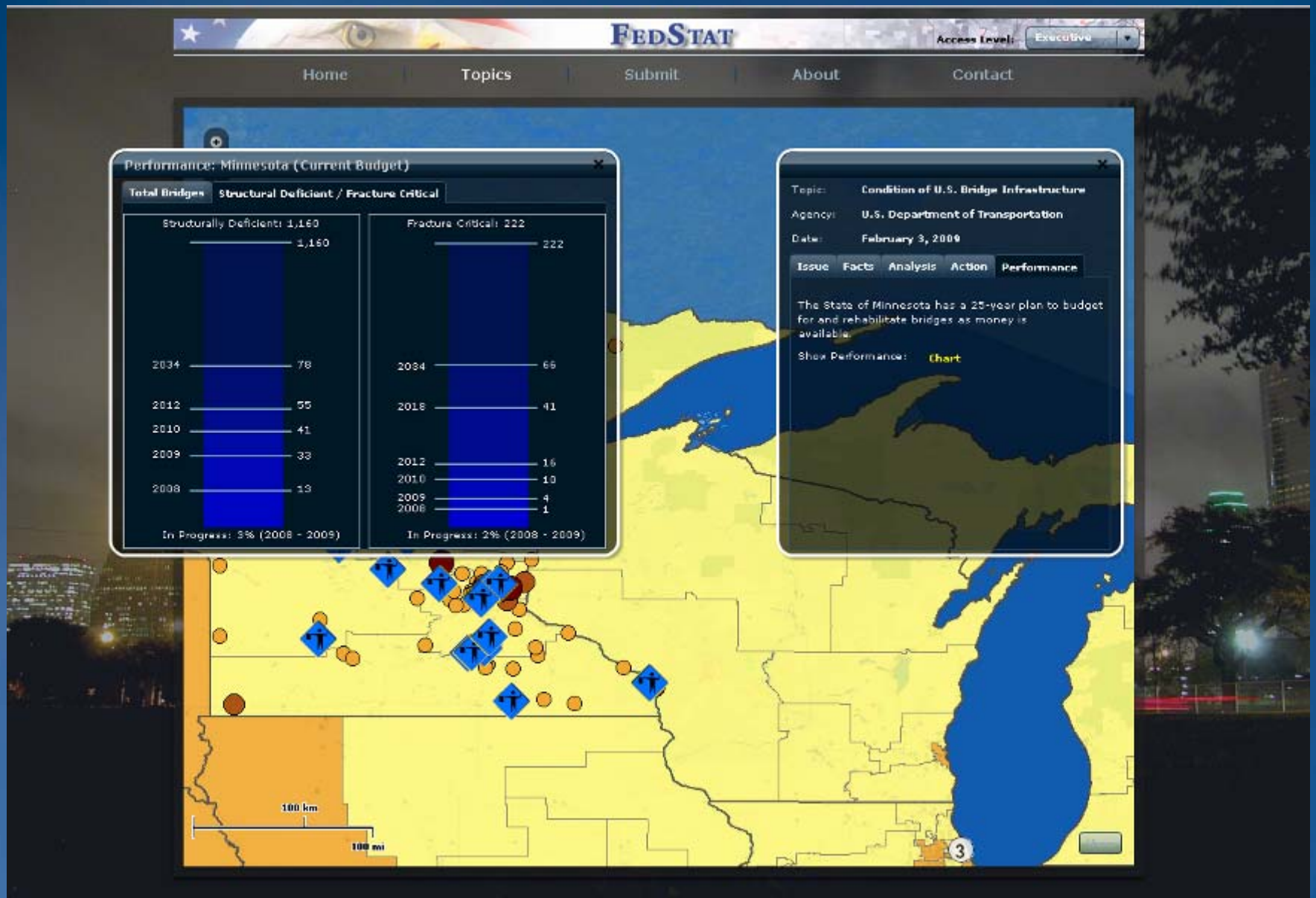
Performance
Currently in Minnesota, 33 structurally deficient or fracture critical bridges are under construction or scheduled for rehabilitation in 2009 for an estimated cost of $66,944,000.
Show Bridge Construction: Map Overlay
100 km
100 mi

FedStat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Access Level: Executive
Home
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About
Contact
Performance: Minnesota (Current Budget)
Total Bridges
Structural Deficient / Fracture Critical
Structurally Deficient: 1,160
1,160
2034 78
2012 55
2010 41
2009 33
2008 13
In Progress: 3% (2008 - 2009)
Fracture Critical: 222
222
2034 66
2018 41
2012 16
2010 10
2009 4
2008 1
In Progress: 2% (2008 - 2009)
Topic: Condition of U.S. Bridge Infrastructure
Agency: U.S. Department of Transportation
Date: February 3, 2009
Issue
Facts
Analysis
Action
Performance
The State of Minnesota has a 25-year plan to budget for and rehabilitate bridges as money is available.
Show Performance: Chart
100 km
100 mi