

CMP Congestion Management Process

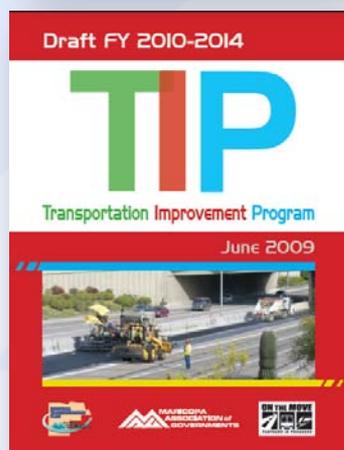
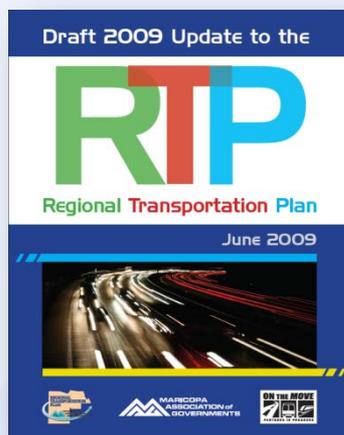
MAG Planning Certification Review
November 3, 2009





Compliance with SAFETEA-LU requirements

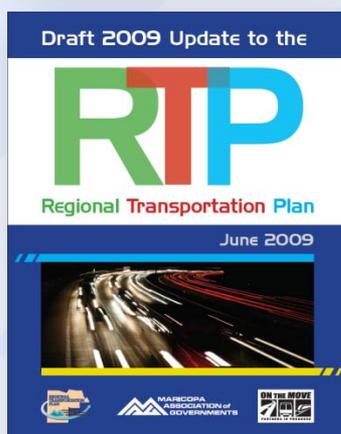
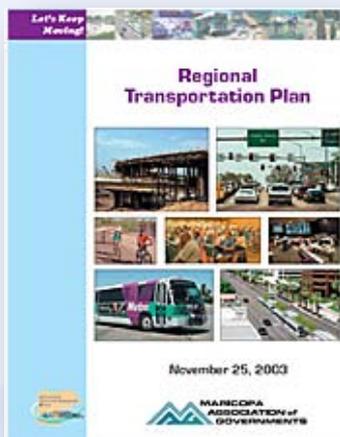
- **Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)**
 - Objectives-driven
 - Performance based
 - Collaboratively developed
 - Implemented to manage current and future projects





Compliance with SAFETEA-LU requirements

- **Regional Transportation Plan – RTP**
 - Adopted in 2003
 - Updated 2005, 2007, 2010
 - Multimodal
 - Addresses identified current and future congestion
 - Proposition 400 – Performance Audits
 - Freeway, Arterial and Transit Life Cycle Programs





Compliance with SAFETEA-LU Requirements

■ CMS to CMP

Strategies developed:

- Collaborative – Working Group
- Modal Committees
- Quantitative & Qualitative Factors
- Integral to planning process
- Consistent with RTP Objectives
- Performance Measurement





Compliance with SAFETEA-LU requirements

■ MAG CMP Components

- Identification of highest congestion at the system and corridor levels
- Performance-based Analytical and Visual Tools
- Early involvement of a stakeholder group:
 - Planning
 - Operations
- Development of Strategies that account for Operational Solutions and Travel Demand Reduction





Identification of Strategies

■ Travel Demand Reduction

- Promotion of Alternative modes
- Carpooling
- Vanpooling
- Bicycle
- Pedestrian
- Compressed Schedules, Telework

■ Operational Strategies based on recommendations from modal Committees:

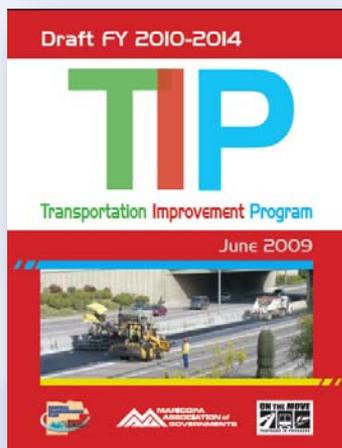
- ITS
- Safety





Projects on the TIP

Federally Funded - CMAQ



- MAG has an established project application, programming schedule, project evaluation process, and project selection process
- Includes an evaluation of the expected emissions reductions and cost effectiveness
- Project evaluation process occurs at the Technical Advisory Committees (TAC) level
- Project selection occurs through the MAG Committee Process
- In participation with ADOT in the EIS/EA process MAG identifies transit and non-motorized modal options



Enhanced MAG CMP

Factors to consider before increasing the carrying capacity for single-occupant vehicles (SOV's)

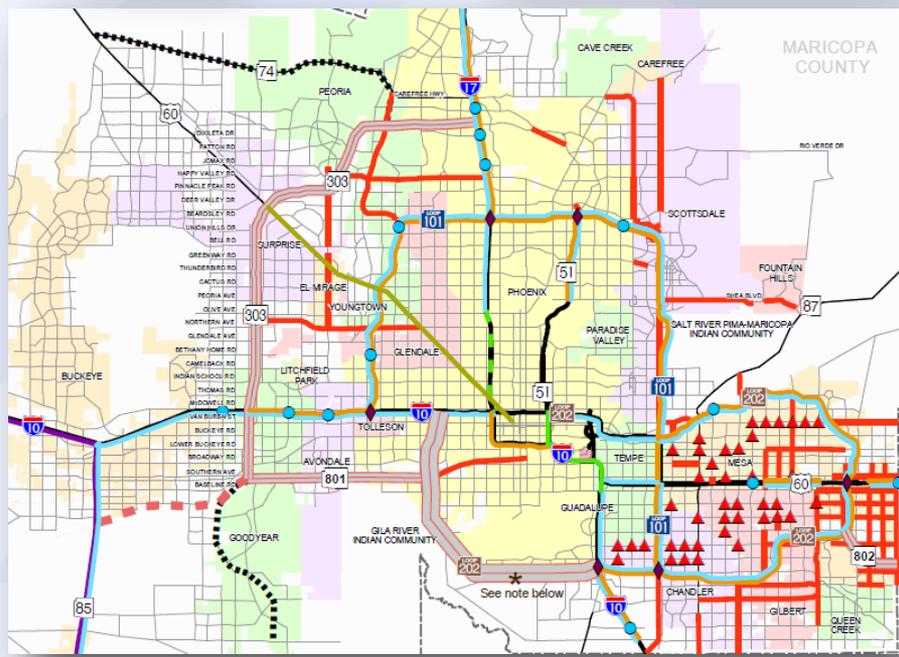
1. Transportation demand management measures
2. Traffic operational improvements
3. HOV usage
4. Public transit capital improvements
5. Public transit operational improvements
6. Non-traditional mode usage
8. Growth management and activity center strategies
9. Access management techniques
10. Incident management techniques on freeways
11. Intelligent Vehicle Highway System strategies
12. Additional capacity to existing roadways or freeways



RTP Goals and Objectives



■ Measures were developed to ensure consistency with regional goals and objectives



- System Preservation and Safety
- Access and Mobility
- Sustaining the Environment
- Accountability and Planning



Performance Measurement



RTP goals and objectives

Focus Area/Mode	Limited Access Highways (GP)	HOV Lanes	Arterials	Transit	Freight	Bicycle/Pedestrian (Non-Motorized)
Travel Time, Delay, & Reliability	Mean and 80 th -95 th Percentile & Point-to-Point Travel Times	Mean and 80 th -95 th Percentile & Point-to-Point Travel Times	Mean and 80 th -95 th Percentile & Point-to-Point Travel Times	Point-to-Point Travel Times	Point-to-Point Travel Times	
	Congestion – Spatial & Temporal					
	Travel Time Variability	Travel Time Variability	Travel Time Variability	On-time Performance		
Incident Management	Incident Clearance Time		Incident Clearance Time			
Mobility – Throughput (People/Freight)	Volume (Person and/or Vehicle)	Volume (Person and/or Vehicle)	Volume (Person and/or Vehicle)	Ridership – by mode	Freight Volume	<u>Bicycle/Pedestrian LOS**</u>
	On-Ramp Queue Size		Intersection LOS – based on V/C	Peak Hour Load Factor (Average Load Factor on Express bus/free way BRT)	<u>Commodity flows from, to, within, and through the region, by mode</u>	<u>Per capita miles traveled</u>
	Lost Productivity		Signal Cycle Failures / Intersection Queue Size			
	Per Capita VMT		Per Capita VMT	Boardings per Revenue Mile		
Safety & Security	Crash/Injury/Fatality Rate		Intersection Crash Ranking	Crash Rate	Crash/Injury/Fatality rates for large truck involved crashes on the freeway system	Crash Totals for the Region
			Crash/ Injury/Fatality Rate	Transit Crime Rate (Safety Incidents per 100k vehicle miles)	Crash/Injury/Fatality rates for large truck involved crashes on the arterial system	<u>Number of Schools participating in Safe Routes to Schools program</u>
System Accessibility & Modal Options				Percent of Park and Ride Capacity Used	<u>Percent of freight terminals/ intermodal facilities (air, rail, and truck cargo) located within 5 miles of a freeway</u>	<u>Sidewalk and/or Bicycle Network Completeness</u>
				Vehicle Revenue Miles of Service		<u>Availability of Safe Street Crossing Facilities for Access to Transit Stops</u>
				<u>Percent of population residing within ¼ mile of local bus and ½ mile of LRT/Express Bus</u>		<u>Bicycle Storage Facilities</u>
				Transit share of travel (by mode)		Bicycle/Pedestrian share of travel
System Preservation	<u>Bridge/Pavement Condition Rating</u>	<u>Bridge/Pavement Condition Rating</u>	<u>Bridge/Pavement Condition Rating</u>			
Environmental Preservation	<u>Air Quality Index</u>	<u>Air Quality Index</u>	<u>Air Quality Index</u>	<u>Air Quality Index</u>	<u>Air Quality Index</u>	<u>Vehicle Emissions Reduced by Pedestrians and Bicycle Users</u>
Quality of Life	<u>Customer Satisfaction</u>	<u>Customer Satisfaction</u>	<u>Customer Satisfaction</u>	<u>Customer Satisfaction</u>	<u>Customer Satisfaction</u>	<u>Customer Satisfaction</u>
	Participation in MAG Region Trip Reduction Program		Participation in MAG Region Trip Reduction Program	Participation in MAG Region Trip Reduction Program		Participation in MAG Region Trip Reduction Program
Cost Effectiveness	<u>Trips served/Time Savings per dollar invested</u>	<u>Trips served/Time Savings per dollar invested</u>				



Performance Measures



- **Freeway GP lanes and HOV Lanes**
 - Access and Mobility Measures
 - Travel Time, Travel Time Variability, and Delay Measures
 - Safety Measures

- **Arterial Performance**
 - Access and Mobility Measures
 - Safety Measures





Performance Measures

■ Transit Performance

- Access and Mobility Measures
- Effectiveness and Efficiency Measures
- System Accessibility and Modal Options



■ Bicycle and Pedestrian Performance

- Access and Mobility Measures
- Safety Measures





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Performance Measures

● Freeway GP lanes and HOV Lanes

Access and Mobility Measures

Throughput – Vehicle (AADT) and (AAWDT)

Throughput – Freight (Estimated Truck Volume)

Per Capita Vehicle-Miles of Travel (VMT)

Lost Productivity (Percent of Productivity Lost)





Performance Measures

- Freeway GP lanes are
- Access and Mobility

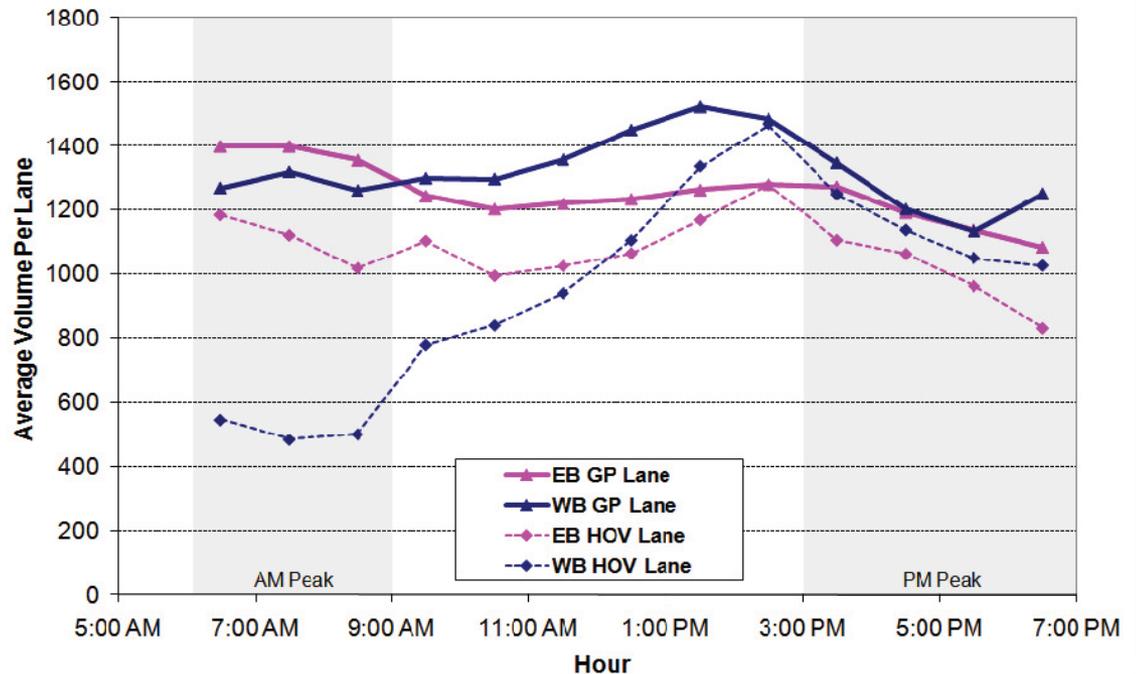
Throughput – vehicle

Throughput – Freight (B)

Per Capita Vehicle-Miles

Lost Productivity (Perce

Average Vehicle Throughput Per Lane by Hour
I-10 Papago: I-17 to SR 51





Performance Measures

- Freeway GP lanes and HOV Lanes

Access and Mobility Measures

Throughput – Vehicle (AADT) and (AAWDT)

Throughput – Freight (Estimated Truck Volume)

Per Capita Vehicle-Miles of Travel (VMT)

Lost Productivity (Percent of Productivity Lost)



Perform

- Freeway GP lanes and Access and Mobility Meas

Throughput – Vehicle (AADT)

Throughput – Freight (Esti

Per Capita Vehicle-Miles of

Lost Productivity (Per

Corridor ID	Analysis Corridor	Milepost	Detector Station	Nearest Cross Street	Dir	Peak Period	Average % of Productivity Lost During Peak Period (2007)
A	I-10 Papago	138.8	STN 20	59 th Ave.	EB	AM	50.4%
A	I-10 Papago (HOV)	137.9	STN 1014	65 th Ave.	EB	AM	69.4%
B	I-10 Papago	144.6	STN 78	9 th Ave.	WB	PM	30.6%
B	I-10 Papago (HOV)	145.7	STN 1084	4 th St.	WB	PM	37.1%
C	I-10 Maricopa	152.4	STN 55	42 nd St.	EB	PM	52.0%
C	I-10 Maricopa (HOV)	153.5	STN 1064	53 rd St.	EB	PM	19.3%
D	I-10 Maricopa	156.4	STN 420	Guadalupe	WB	AM	33.3%
E	I-17	195.1	STN 98	15 th St.	NB	PM	25.6%
E	I-17	199.3	STN 156	Lincoln St.	NB	PM	57.5%
E	I-17	194.5	STN 36	22 nd St.	SB	PM	59.3%
F	I-17	205.7	STN 367	Lamar Rd.	SB	AM	47.4%
G	SR 51	1.79	STN 206	Avalon Dr.	NB	PM	42.2%
H	SR 51	11.3	STN 306	Voltaire Ave.	SB	AM	7.5%
G	SR 51 (HOV)	5.5	STN 1201	Lamar Rd.	SB	AM	36.2%
I	Loop 202	6.5	STN 246	Roosevelt St.	EB	PM	19.5%
I	Loop 202	1.6	STN 220	31 st St.	WB	AM/PM	14.5%/39.3%
I	Loop 202	8.5	STN 275	78 th St.	WB	AM	17.6%
I	Loop 202 (HOV)	0.6	STN 1217	22 nd St.	WB	PM	62.6%



Performance Measures

▶ Travel Time, Travel Time Variability, and Delay Measures

Speed (Average Corridor and Point-based Speeds)

Point-to-Point Travel Times (Average Commute Time)

Travel Time Variability (Average Travel Time, Travel Time and Buffer Indices)

Extent of Congestion (Percent of Time Congested)

▶ Safety Measures

Crash/Injury/Fatality Rates on Freeways (Crashes per Million VMT)

Crash/Injury/Fatality Totals for Large Truck-Involved Crashes on Freeways (Total Number of Truck-Involved Crashes)



Performance

▶ Travel Time, Tra

Speed (Average Corridor)
 Point-to-Point Travel Time
 Travel Time Variability
 Indices

Extent of Congestion (C

▶ Safety Measures

Crash/Injury/Fatality R
 Crash/Injury/Fatality T
 Freeways (Total Number

Table 2.7 Results for Average Speed for Freeway Corridors

Corridor ID	Freeway Corridor	Dir	AM Peak Period		PM Peak Period	
			2007	Change from 2006	2007	Change from 2006
A+B	I-10 Papago: 81st Avenue to SR 51	EB	39.6	0.0	58.8	1.1
	I-10 Papago EB HOV: 81st Avenue to SR 51	EB	44.1	-4.2	60.5	-1.5
	I-10 Papago: SR 51 to 82nd Avenue	WB	60.4	0.2	36.6	-1.5
	I-10 Papago HOV: SR 51 to 82nd Avenue	WB	63.8	-1.3	42.2	-0.7
C+D	I-10 Maricopa: SR 51 to Chandler Blvd	EB	60.1	1.6	34.8	1.9
	I-10 Maricopa HOV: SR 51 to Chandler Blvd	EB	64.7	2.0	39.2	2.2
	I-10 Maricopa: Chandler Blvd to SR 51	WB	36.3	-0.1	54.5	-0.1
	I-10 Maricopa HOV: Chandler Blvd to SR 51	WB	56.6	-0.4	64.7	1.1
E+F	I-17: Maricopa Traffic Interchange to Peoria Avenue	NB	57.8	-0.1	38.9	-1.9
	I-17 HOV: McDowell Road to Peoria Avenue	NB	64.3	-0.7	53.9	-0.7
	I-17: Peoria Ave to Maricopa Traffic Interchange	SB	39.1	0.0	49.3	2.2
	I-17 HOV: Peoria Avenue to Thomas Road	SB	51.9	-4.7	63.6	0.7
G+H	SR 51: I-10/Loop 202 to Bell Road	NB	64.3	-0.8	53.4	-0.3
	SR 51 HOV: McDowell Road to Shea Blvd	NB	64.4	-1.6	60.2	-1.4
	SR 51: Bell Road to I-10/Loop 202	SB	52.3	3.0	56.9	2.5
	SR 51 HOV: Shea Blvd to I-10/Loop 202	SB	58.5	-2.4	63.1	-1.1
I	Loop 202: I-10/SR 51 to Loop 101	EB	60.7	-0.3	37.6	-0.5
	Loop 202 HOV: I-10/SR 51 to Loop 101	EB	66.8	0.4	53.4	0.2
	Loop 202: Loop 101 to I-10/SR 51	WB	44.0	-0.1	41.2	-0.8
	Loop 202 HOV: Loop 101 to I-10/SR 51	WB	60.7	0.1	49.3	-1.1
	US 60: I-10 to Val Vista Drive	EB	59.5	2.3	52.4	3.8



Performance Measures

▶ Travel Time, Travel Time Variability, and Delay Measures

Speed (Average Corridor and Point-based Speeds)

Point-to-Point Travel Times (Average Commute Time)

Travel Time Variability (Average Travel Time, Travel Time and Buffer Indices)

Extent of Congestion (Percent of Time Congested)

▶ Safety Measures

Crash/Injury/Fatality Rates on Freeways (Crashes per Million VMT)

Crash/Injury/Fatality Totals for Large Truck-Involved Crashes on Freeways (Total Number of Truck-Involved Crashes)



Performance

► Travel Time, Tra

Speed (Average C
Point-to-Point Trav

Travel Time Variab
Indices

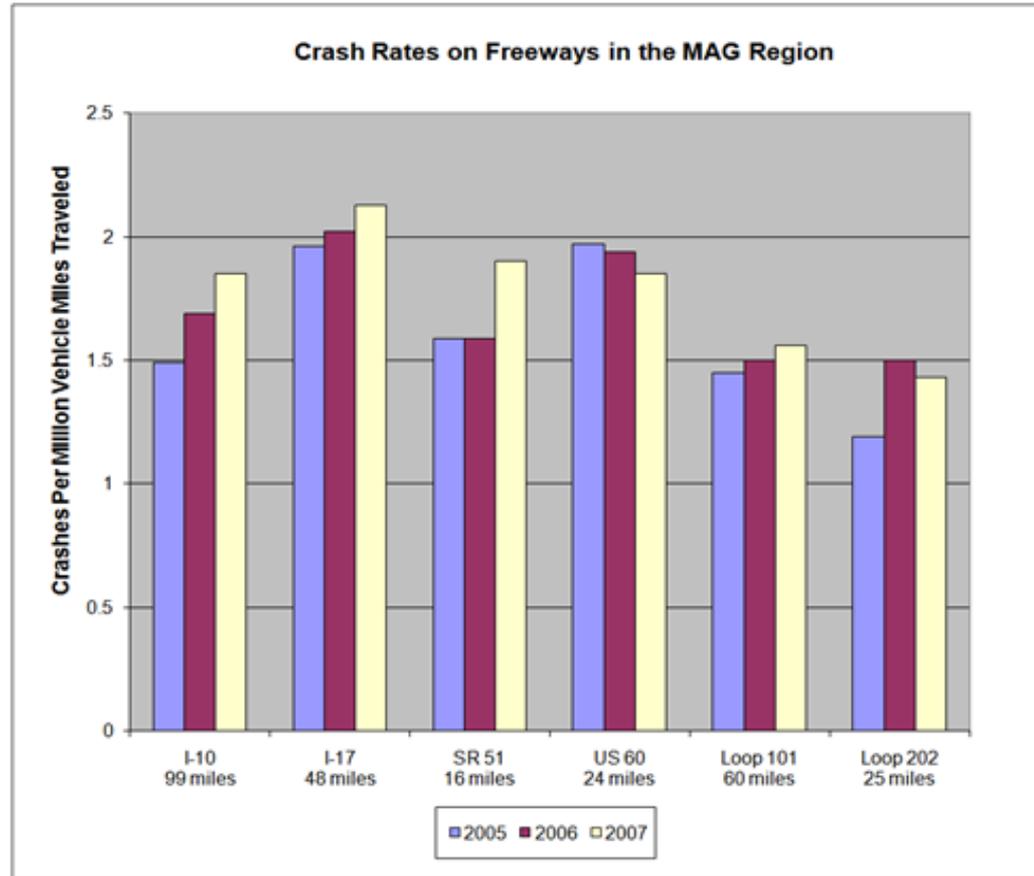
Extent of Congest

► Safety Meas

Crash/Injury/Fatal

Crash/Injury/Fatal
Freeways (Total Num

Crash Rates on Freeways in the MAG Region





Performance Measures

- **Arterial Performance**

Access and Mobility Measures

Throughput – Vehicle (Weighted Corridor Throughput)

Travel Time, Travel Time Variability, and Delay Measures

Spatial Extent of Congestion (Percent of Time Congested)

Safety Measures

Intersection Crash Ranking

Crash/Injury/Fatality Totals for Large Truck-Involved Crashes on the Arterial System (Total Number of Truck Involved Crashes)



Performance Measures

- **Arterial Performance**

Access and Mobility

Throughput – Vehicle (

Travel Time, Travel T

Spatial Extent of Congestion

Safety Measures

Intersection Crash Ran

Crash/Injury/Fatality To
the Arterial System (Total

Table 3.2 Arterial Spatial Extent of Congestion

Route Name	AM Peak Period	Midday Period	PM Peak Period
19th Ave - NB	41.2%	19.6%	43.8%
19th Ave - SB	27.7%	21.6%	45.5%
59th Ave - NB	15.8%	12.0%	30.6%
59th Ave - SB	28.6%	25.0%	36.6%
Baseline RD - EB	29.9%	14.4%	37.6%
Baseline RD - WB	14.2%	14.9%	28.6%
Bell Rd / Sun Valley Pkwy - EB	31.5%	26.0%	33.2%
Bell Rd / Sun Valley Pkwy - WB	21.6%	35.6%	46.5%
Chandler Blvd - EB	32.1%	13.8%	37.2%
Chandler Blvd - WB	17.0%	16.5%	16.4%
Country Club Dr - NB	34.0%	21.6%	49.2%
Country Club Dr - SB	41.0%	35.1%	60.2%
Dysart - NB	21.9%	12.0%	39.0%
Dysart - SB	61.1%	20.3%	18.6%
Frank Lloyd Wright Blvd - EB	13.9%	14.3%	45.4%
Frank Lloyd Wright Blvd - WB	36.0%	39.8%	18.4%
Glendale Ave / Lincoln Dr - EB	40.9%	14.6%	21.8%
Glendale Ave / Lincoln Dr - WB	14.6%	10.6%	75.9%
Grand Ave - NW	14.7%	11.2%	46.8%
Grand Ave - SE	38.5%	11.2%	24.4%
Happy Valley Rd/7th St - NB	23.0%	21.6%	43.6%
Happy Valley Rd/7th St - SB	31.8%	38.3%	36.7%
Indian School Rd - EB	39.2%	15.6%	35.4%
Indian School Rd - WB	37.8%	32.4%	51.4%
McDowell Rd - EB	37.7%	25.1%	46.1%
McDowell Rd - WB	35.0%	29.4%	57.3%
Power Rd - NB	47.2%	49.5%	42.0%
Power Rd - SB	46.8%	54.0%	32.3%



Performance Measures

- **Arterial Performance**

Access and Mobility

Throughput – Vehicle

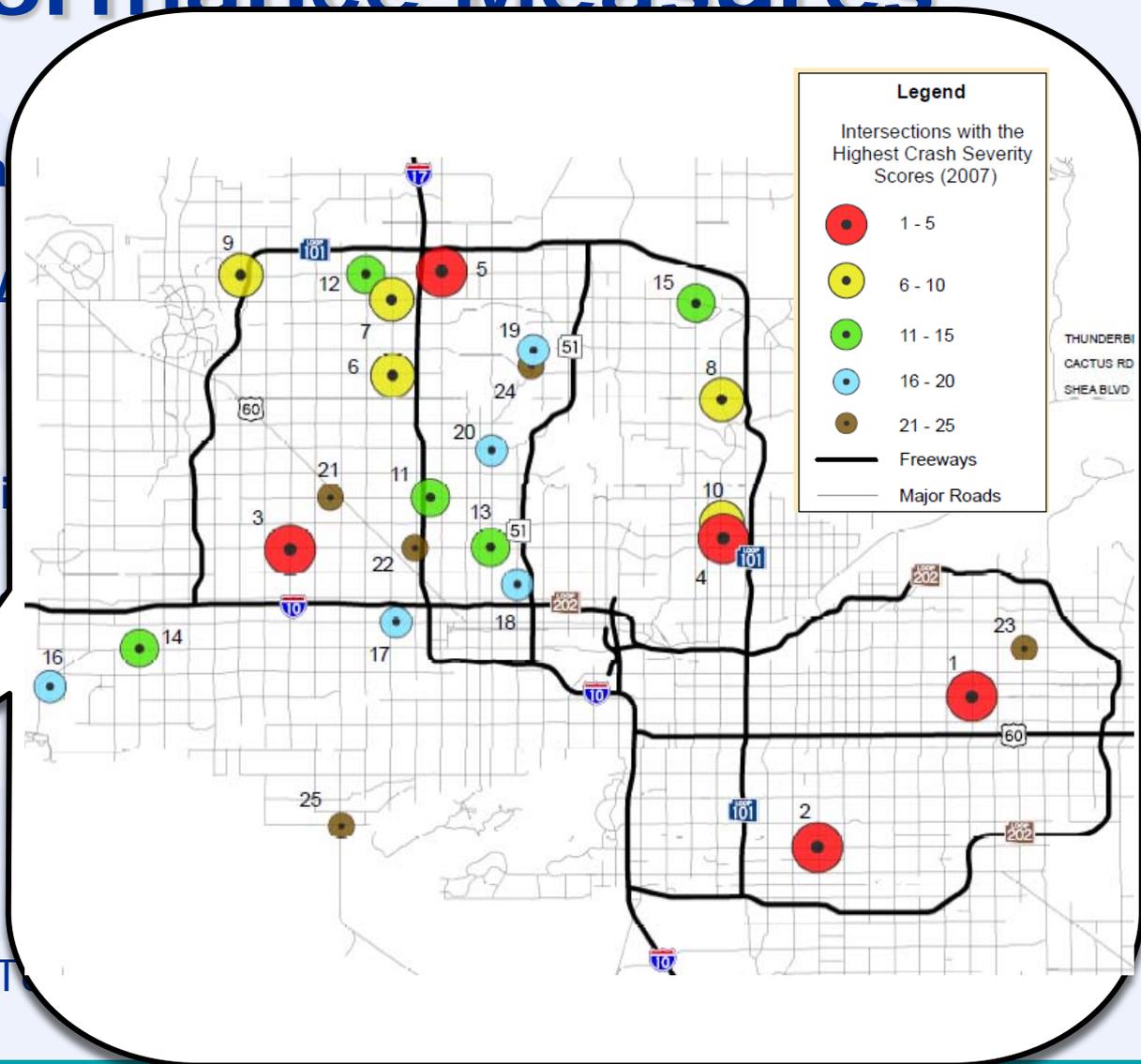
Travel Time, Travel Time

Spatial Extent of Congestion

Safety Measures

Intersection Crash

Crash/Injury/Fatality
the Arterial System (T





Performance Measures

- **Transit Performance**

Access and Mobility Measures

Transit Boardings (Total Number of Annual Transit Boardings)

Boardings per Revenue Mile (Total Number of Annual Transit

Boardings / Total Number of Transit Agency Revenue Miles)

Travel Time, Travel Variability, and Delay Measures

Transit On-Time Performance (Percentage of "On-Time" Trips)



Performance Measures

- **Transit Performance**

Access and Mobility

Transit Boardings (Total)

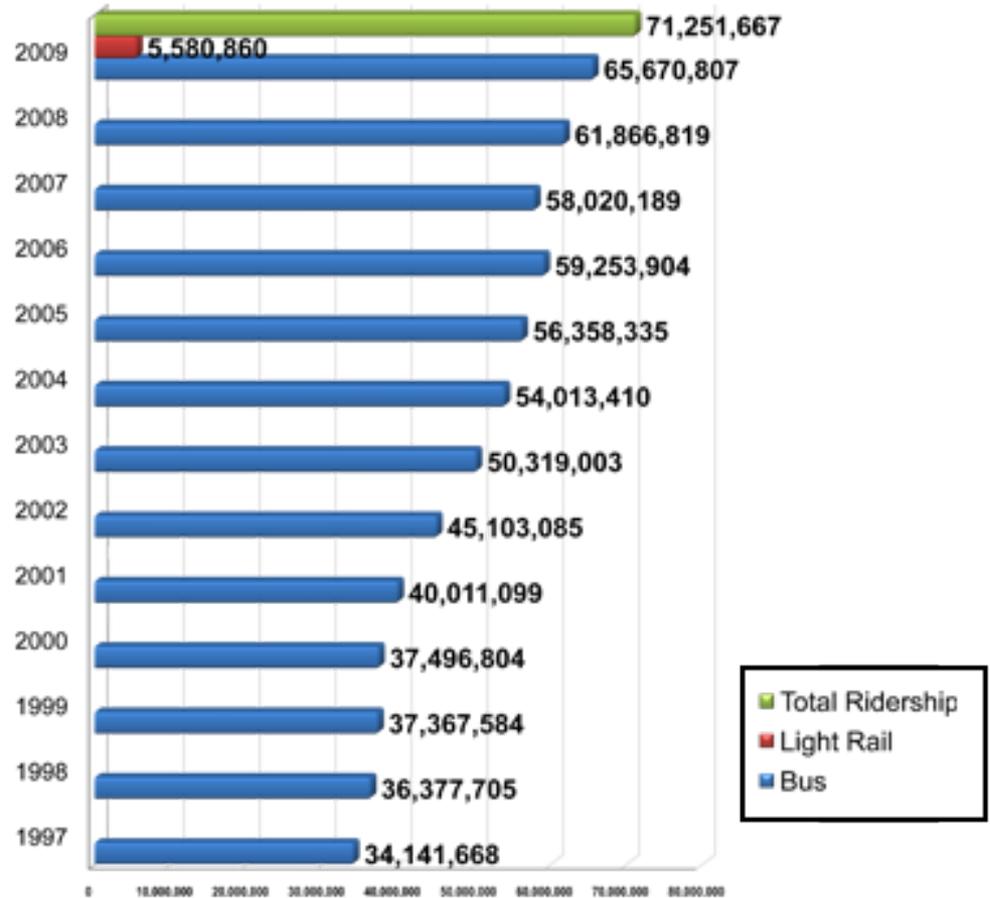
Boardings per Revenue

Boardings / Total Number

Travel Time, Travel Variability

Transit On-Time Performance

Fiscal Years 1997 - 2009 Annual Ridership





Performance Measures

- **Transit Performance**

- Access and Mobility Measures

- Transit Boardings (Total Number of Annual Transit Boardings)

- Boardings per Revenue Mile (Total Number of Annual Transit

- Boardings / Total Number of Transit Agency Revenue Miles)

- Travel Time, Travel Variability, and Delay Measures

- Transit On-Time Performance** (Percentage of "On-Time" Trips)



Performance Measures

- **Transit Performance**

Access and Mobility Measures

Transit Boardings (Total Number)

Boardings per Revenue Mile

Boardings / Total Number

Travel Time, Travel Variability

Transit On-Time Performance

Table 4.2 - Fixed Route Service On-Time Performance

	2006	2007
City of Phoenix	92%	91%
RPTA/Valley Metro	95%	96%
City of Tempe	88%	90%

Source: 2008 Valley Metro Transit Performance Report

Table 4.3 - Dial-A-Ride Service On-Time Performance

	2006	2007
City of Phoenix	91.5%	93.2%
RPTA/Valley Metro	90%	92.7%

Source: 2008 Valley Metro Transit Performance Report



Performance Measures

- **Transit Performance**

System Accessibility and Modal Options Measures

Percent of Park and Ride Capacity Used

Vehicle Revenue Miles of Transit Service per Agency

Subsidy Per Boarding

Transit Share of Travel



Performance

- Transit Performance

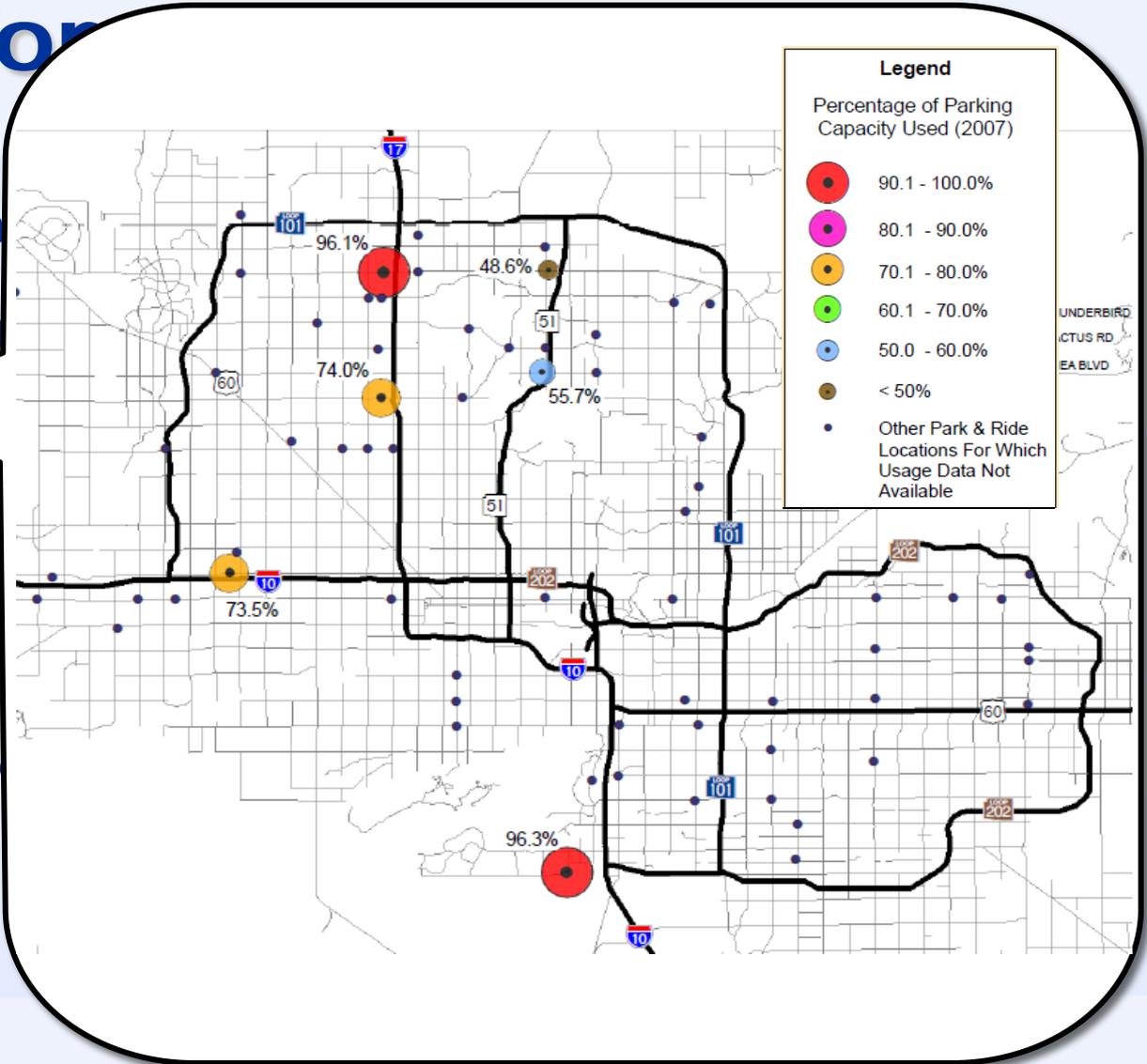
System Accessibility

Percent of Transit

Vehicle Revenue Mile

Subsidy Per Boarding

Transit Share of Travel





Performance

- Bicycle/Pedestrian**

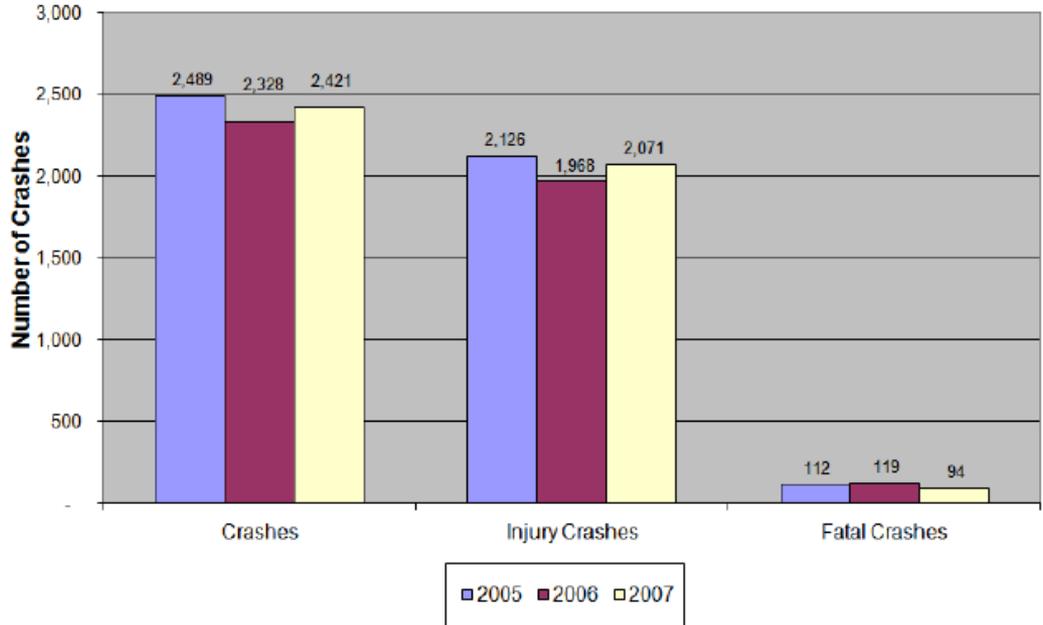
Safety Measures

Bicycle and Pedestrian

System Accessibility and

Bicycle and Pedestrian
 Percentage of Total Co
 Bicycles or Pedestrians

Number of Bicycle & Pedestrian Crashes in the MAG Region





Performance

- Bicycle/Pedestrian**

Safety Measures

Bicycle and Pedestrian

System Accessibility

Bicycle and Pedestrian

Percentage of Total Commute

Bicycles or Pedestrians

Table 5.3 - Characteristics of Different Modes of Commuter Travel in the MAG Region²⁶

	Average Trip Length (Miles)		Average Trip Time (Minutes)		Percent of Travel ²⁷	
	2007	2008	2007	2008	2007	2008
Drive Alone	13.32	12.24	21.04	21.59	76.8%	75.6%
Alt. Fuel Vehicle	15.79	16.9	24.77	26.48	0.3%	0.7%
Bicycle	5.32	6.12	16.84	16.84	1.0%	1.0%
Bus	11.07	14.03	33.24	34.07	3.7%	2.9%
Carpool	11.54	11.06	19.31	19.8	12.6%	14.0%
CWW	-16.3	-17.28		-29.56	2.5%	2.5%
Telecommute	-19.01	-19.65	-32.91	-32.93	0.9%	1.2%
Vanpool	28.6	21.82	27.71	30.25	0.5%	0.6%
Walk	1.78	2.04	13.82	13.96	1.6%	1.6%

Source: Maricopa County Air Quality Department Annual Trip Reduction Report