

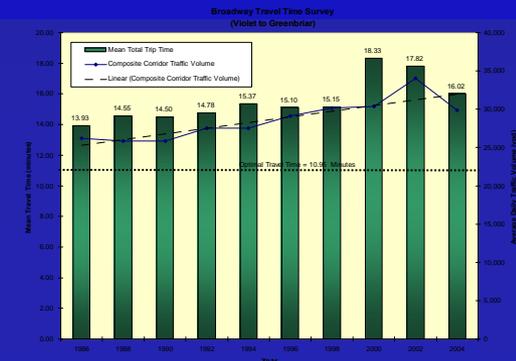
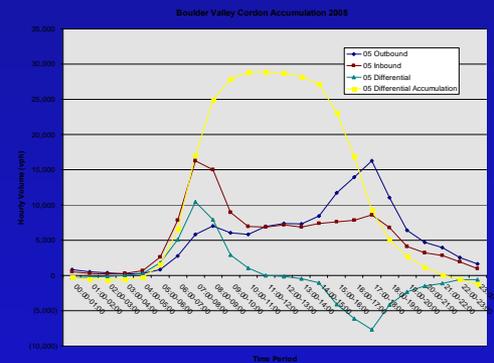
City of Boulder Transportation Metrics

**Metric (mět'řik) –
a standard of measurement**

Spring 2008

Transportation Metrics -- Presentation Elements

- TMP Context
- Quantitative Metrics
 - Resident Diary & Employee Surveys
 - Vehicle Counts
 - Bicycle Counts
 - Transit Ridership
- Performance Metrics
 - Travel time study
 - Level of service
- Synthesis



Transportation Master Plan – system monitoring

- Set the context of monitoring and progress reporting
- 1989 TMP -- lacked good information on travel behavior
 - Initiated efforts to fortify understanding → resident diary and employee survey
- 1996 TMP – built on base of new modal information

89-96 Modal Assumptions

figure 3-3. analysis: mode share objectives

| % of Daily Person Trips | | | | | |
|-------------------------|---------------|------------------|--------------|-------------|------------------|
| | 1989 TMP | | Survey Data* | | 2020 objective |
| | 1989 estimate | 2010 objective | 1990 actual | 1994 actual | |
| SOV | 73 | 15 58 | 47 | 44 | 19 25 |
| Multi-occupant auto | 23 | 27 | 24 | 22 | 29 |
| Pedestrian | } 1 | } 3 | 17 | 19 | 24 |
| Bicycle | | | 10 | 11 | 15 |
| Transit | 3 | 12 | 2 | 4 | 7 |
| TOTAL | 100 | 100 | 100 | 100 | 100 |

Original TMP SOV Reduction
 "shift 15% away from SOV"
 $15 + 73 = 21\%$ reduction

Actual Reduction '90 - '94
 $3 + 47 = 6\%$ reduction

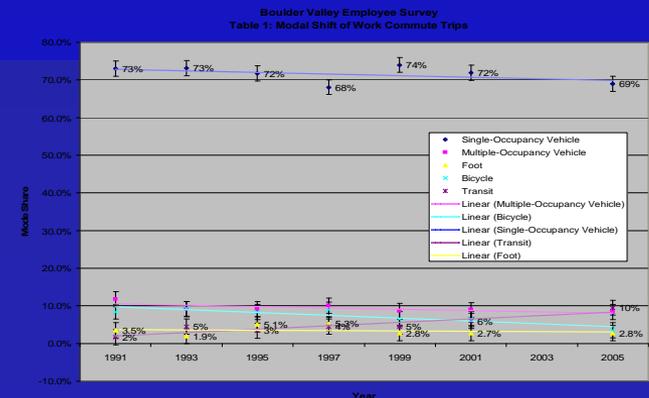
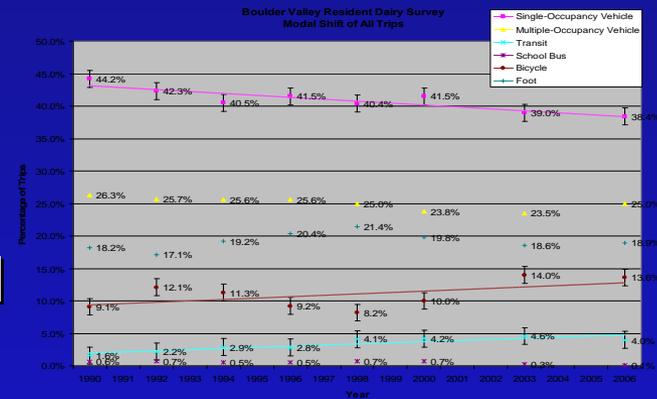
Proposed Reduction by 2020
 $19 + 44 = 43\%$ reduction

* based on resident diaries, employee surveys, traffic counts, regional origin & destination study and related sources

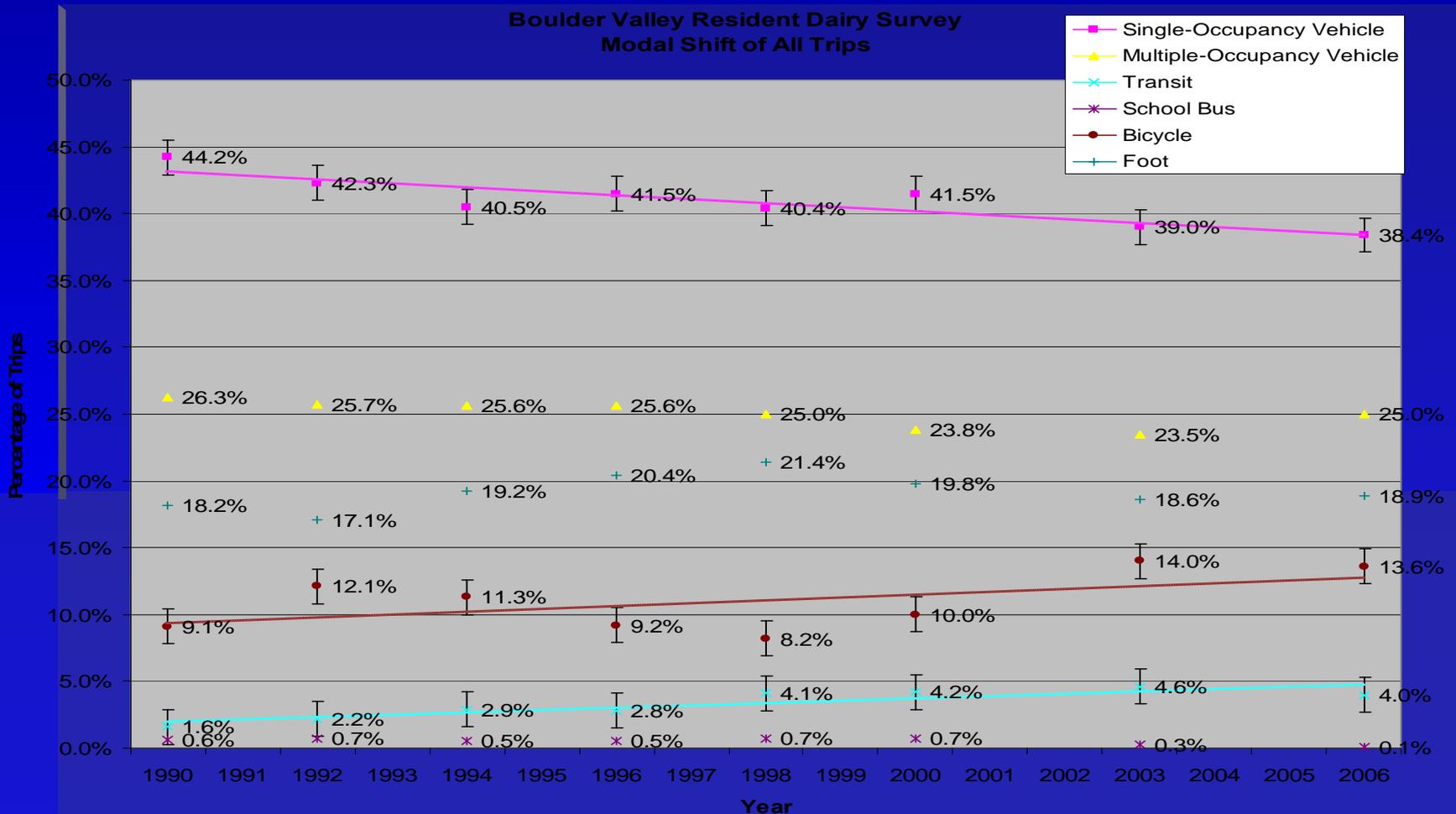
- original TMP objective: shift 15% of daily SOV trips to other modes by 2010
- TMP update direction: no growth in long-term vehicle traffic (requires reducing single-occupant vehicle trips to 25% by 2020)

Metrics – Resident Diary and Employee Surveys

- Resident Diary and Employee Surveys
- Initiated to better understand Boulder travel behavior
- Started in 1990, alternate years
- Margin of error +/- 1% to 2%
- Useful to identify travel trends over time



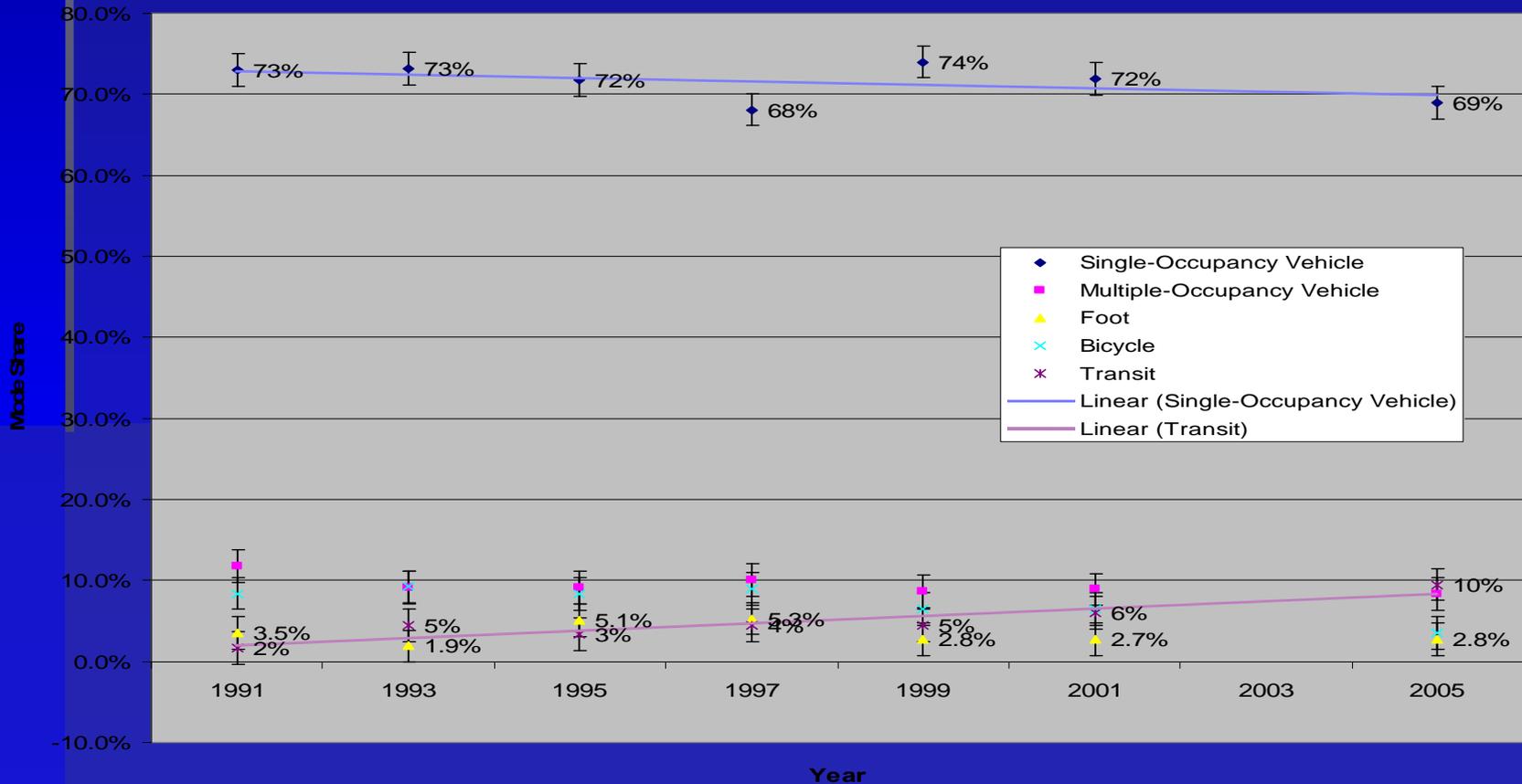
Metrics - Resident Dairy Modal Shift All Trips



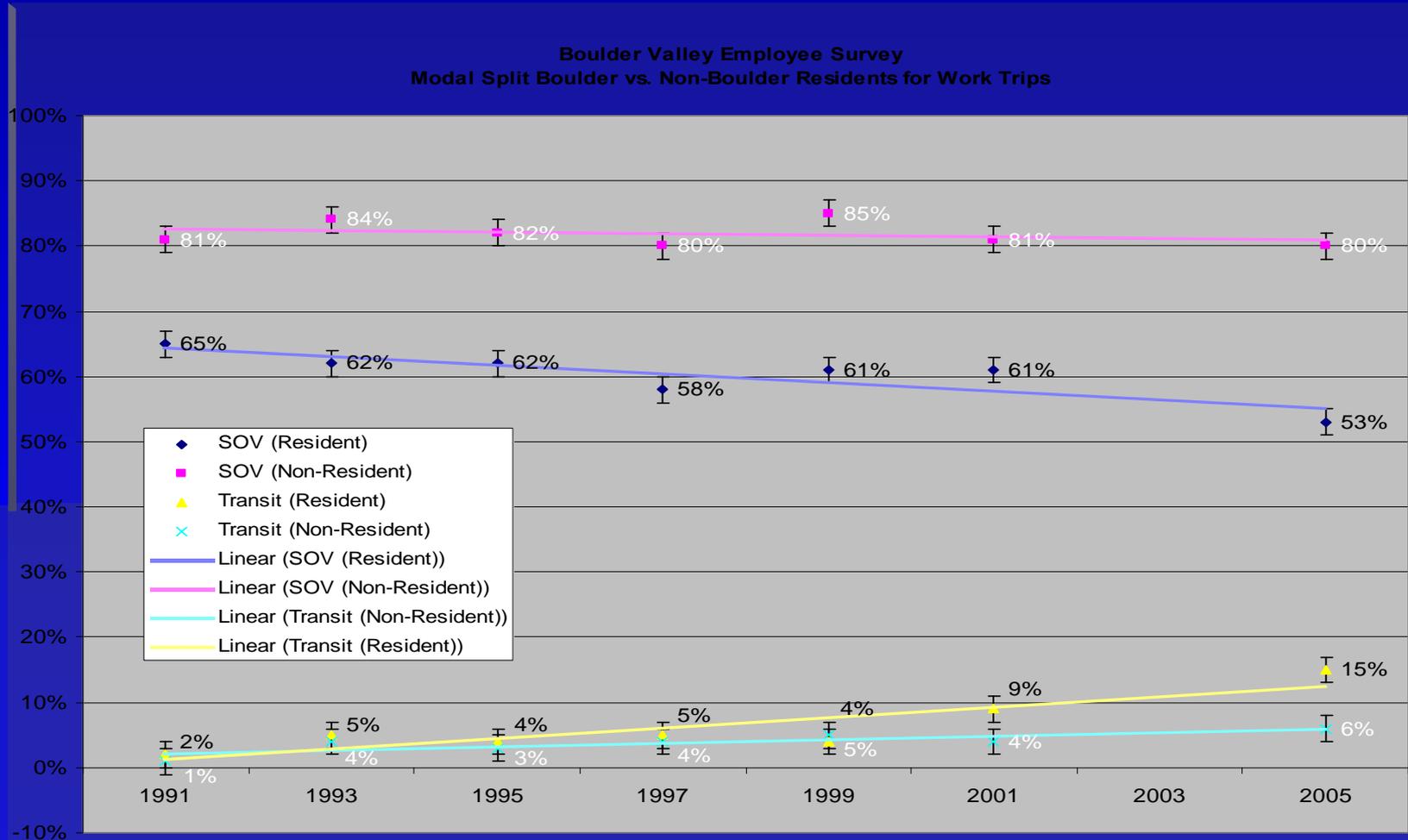
Metrics - Employee Survey

Modal Shift Commute Trips

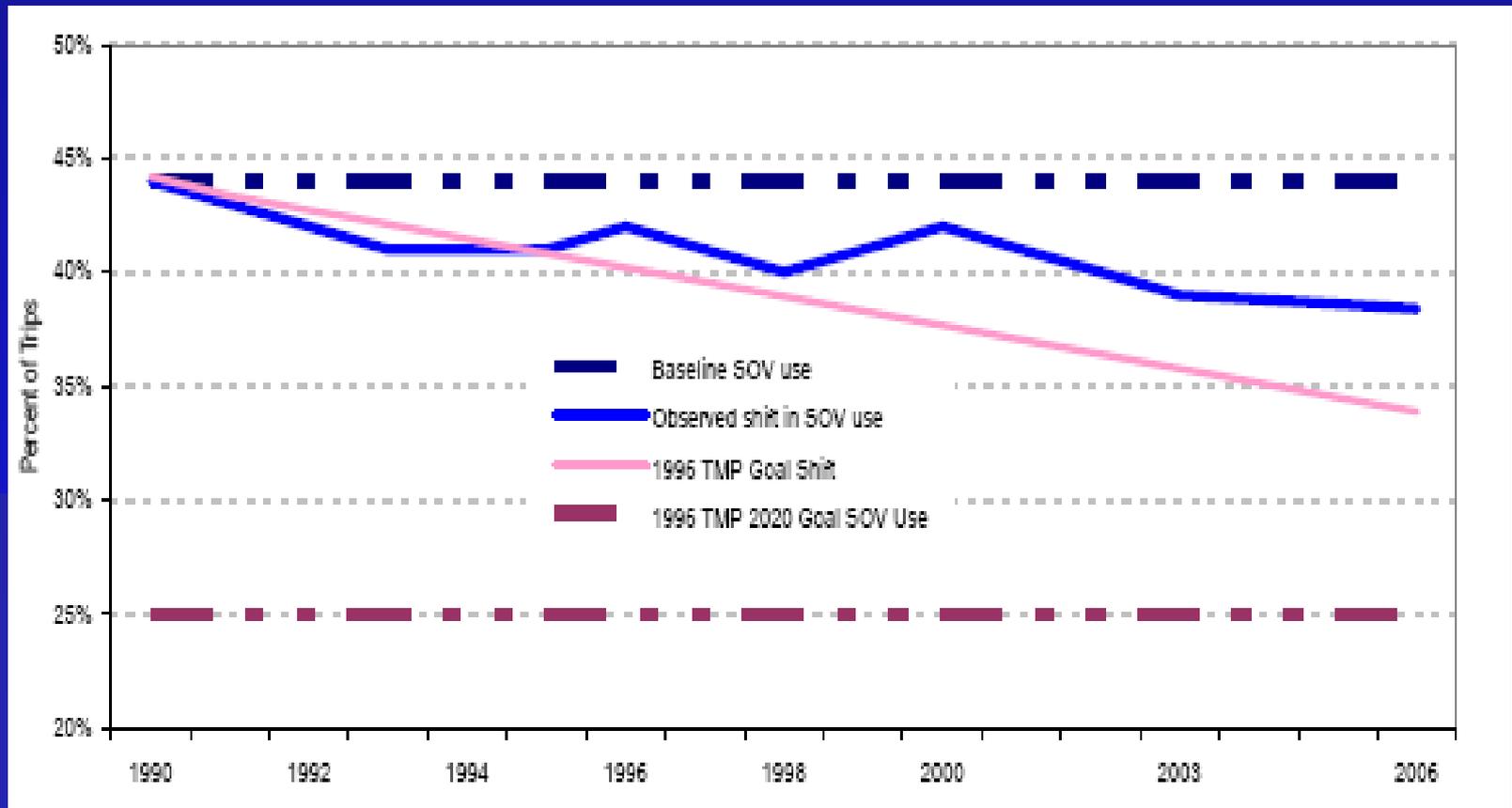
Boulder Valley Employee Survey
Table 1: Modal Shift of Work Commute Trips



Metrics - Resident vs. Non-resident Commute Trips



Metrics – Progress toward community modal shift goals



Metrics – Resident & Employee Survey Observations

- Residents are using cars less for all trips
 - SOV decreased 44% to 38%
 - Transit increased 1% to 4%
 - Bicycle increased 9% to 14%
- Employees commuting are using cars less
 - SOV decreased 73% to 69%
 - Transit increased 2% to 10%
 - Bike decrease in 2005 under review



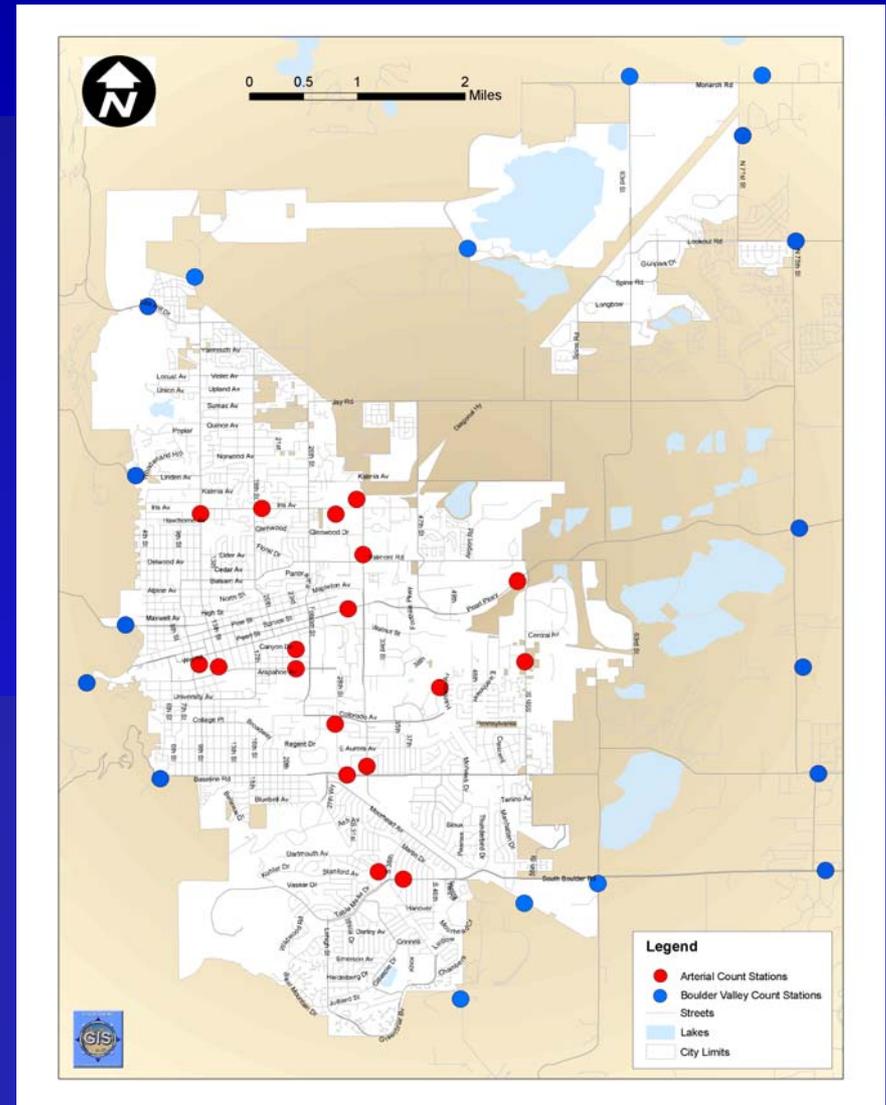
Metrics – Resident & Employee Survey Observations

- Resident and non-resident commute travel behavior significantly different
 - Non-resident SOV – 80% vs. Resident SOV – 53%
 - Non-resident Transit – 6% vs. Resident Transit – 15%
- Making progress toward modal objectives



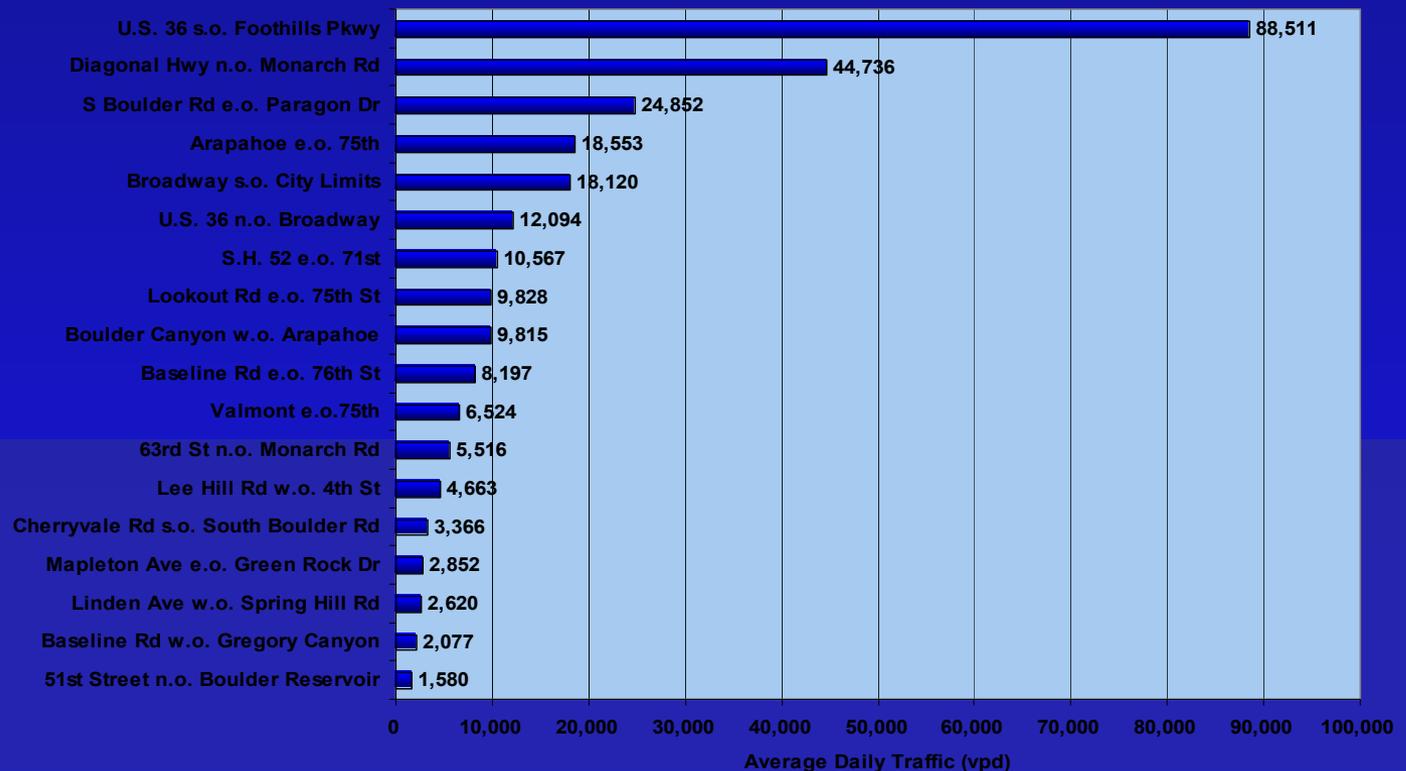
Metrics – Vehicle Counts

- Boulder Valley Program
 - Travel entering/exiting city
 - 18 stations
 - Data since 1993
- Arterial Program
 - Internal travel
 - 18 stations
 - Data since 1983

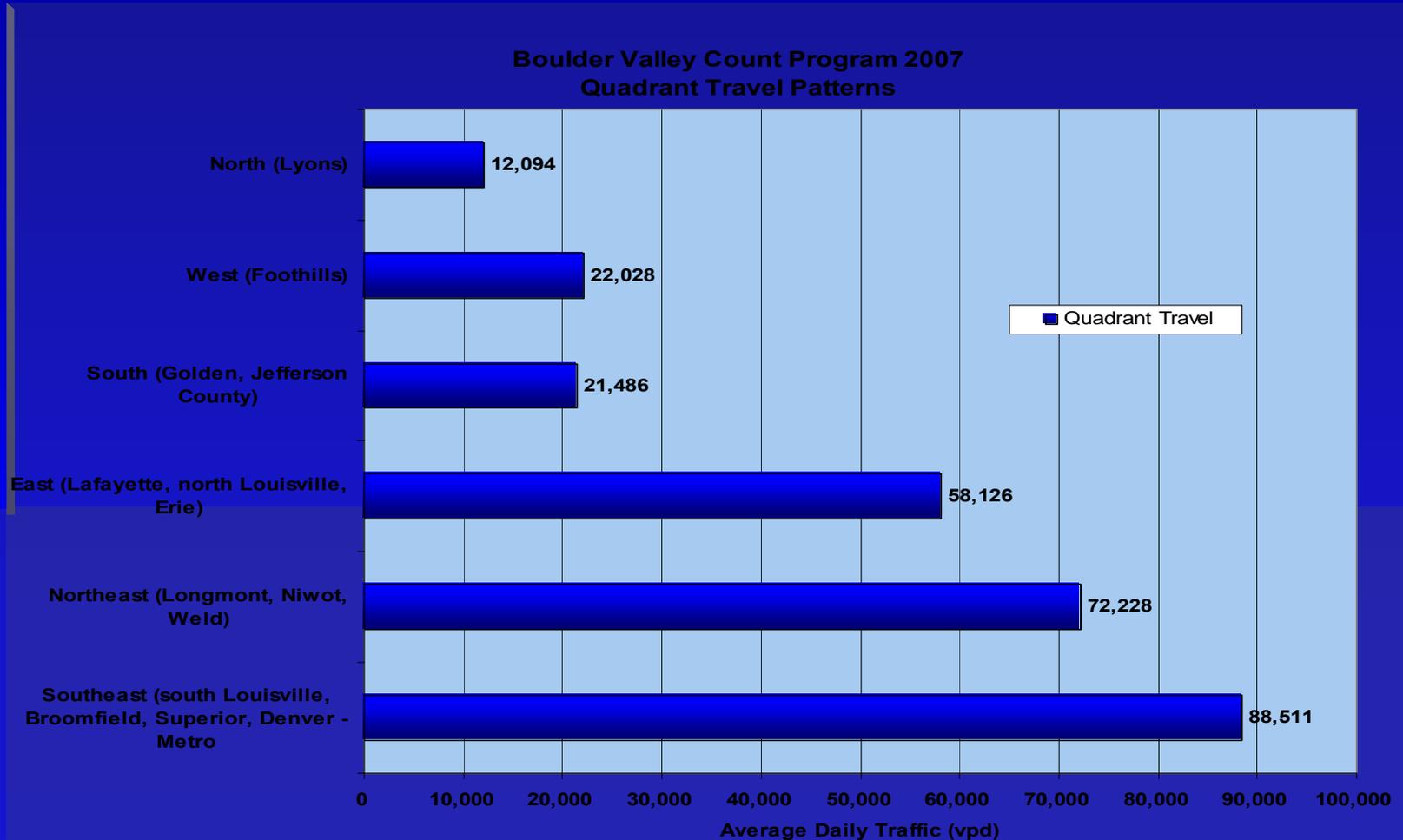


Metrics – Boulder Valley Program

Boulder Valley Count Program
2007 ADT Summary by Count Station

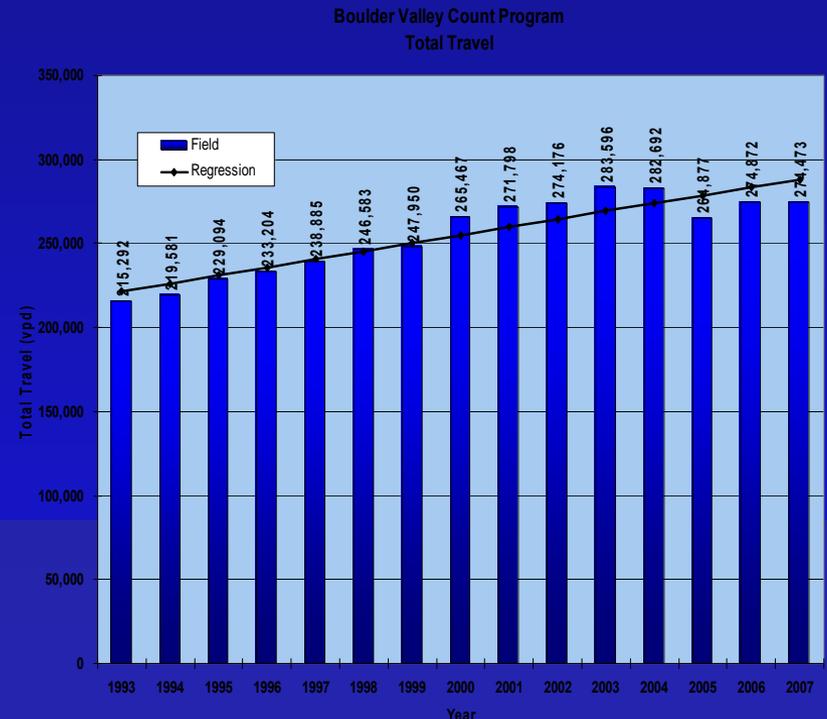


Metrics - Boulder Valley Travel Patterns

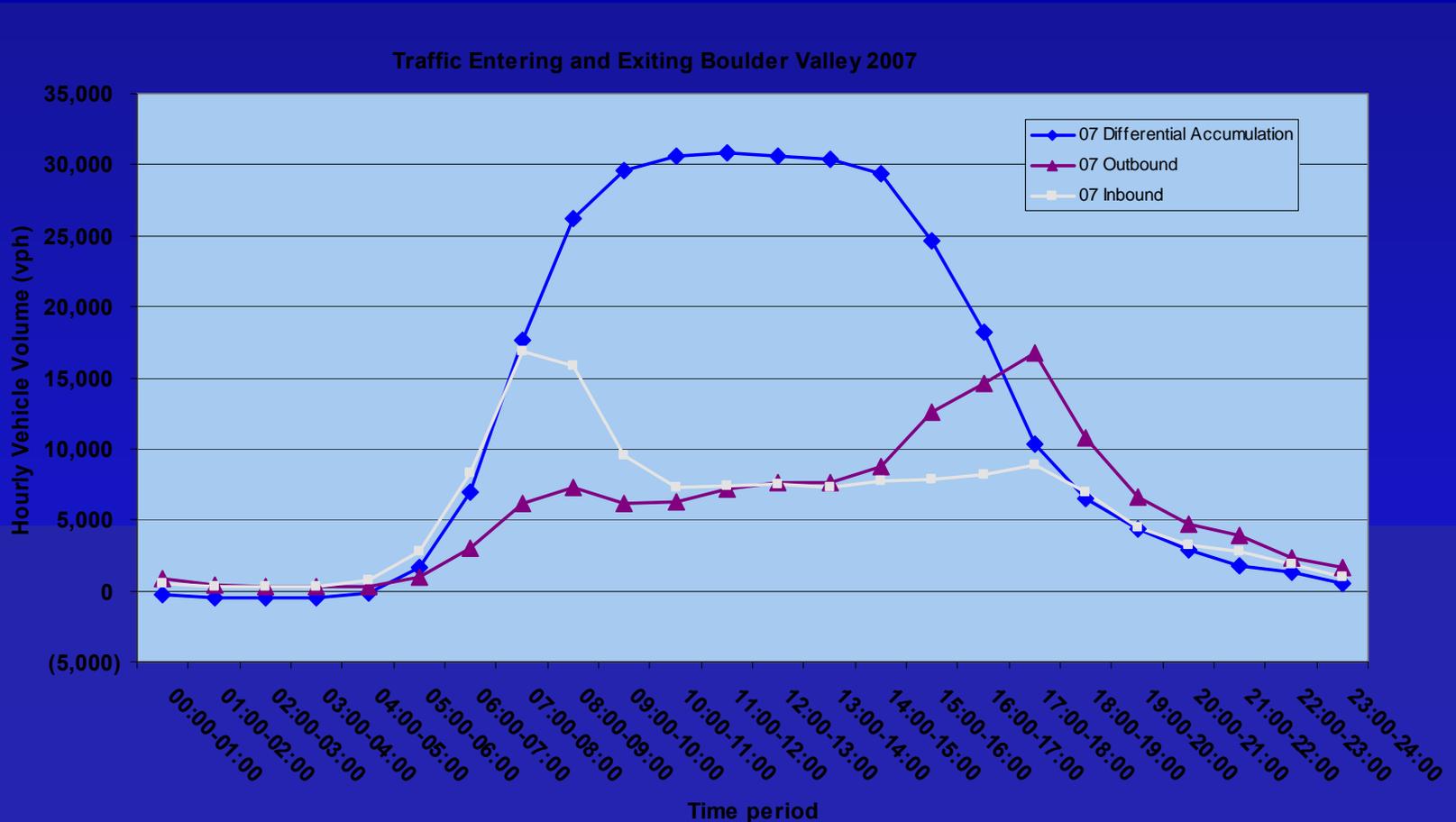


Metrics – Boulder Valley Travel Trends

- 275,000 vehicles daily enter/exit the city in 2007
- Every street morning inbound – evening outbound bias
- 2% Annual increase
- 25% more travel than 1994 levels

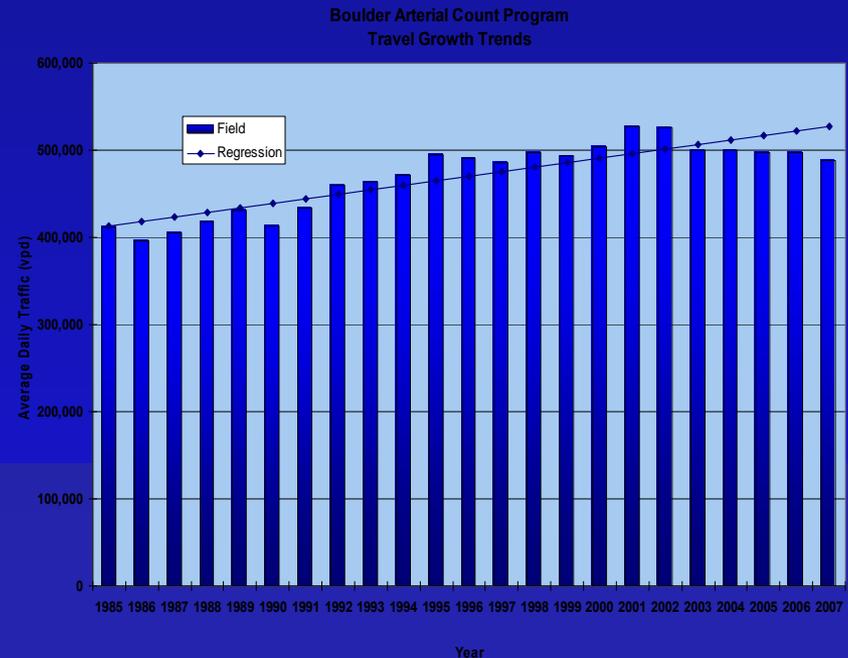


Metrics - Boulder Valley Travel - Accumulation Curve

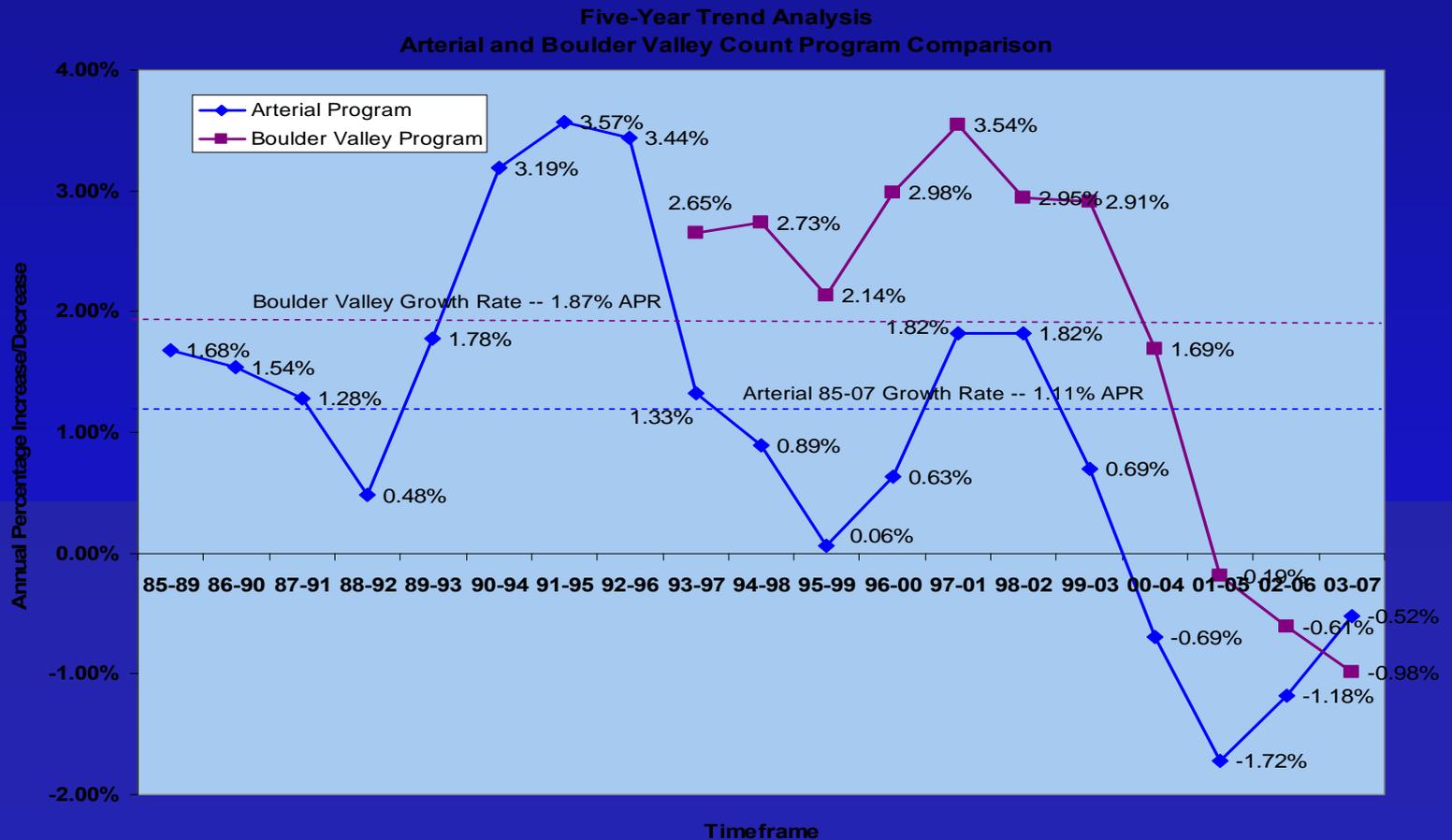


Metrics – Arterial Travel Trends

- 1% annual increase
- ½ growth rate in Boulder Valley travel (2%)
- ¼ growth rate in regional travel (4%)
- 2001 peak traffic year
- 7% more travel than 1994 levels

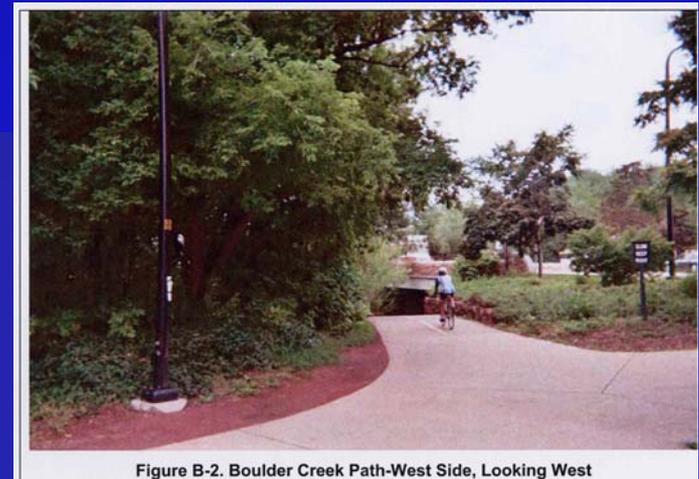


Metrics - Arterial Travel Trends



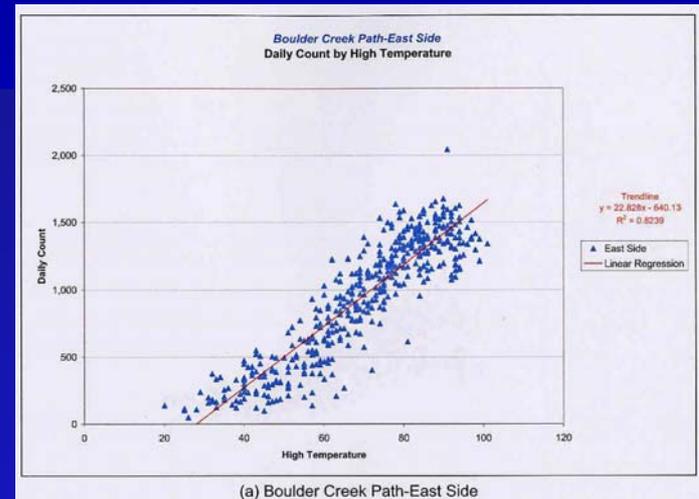
Metrics – Bicycle Counts

- Analysis and understanding in infancy
- 12 multiuse path count stations
- Data since 1998
- Bike travel characteristics different from vehicles

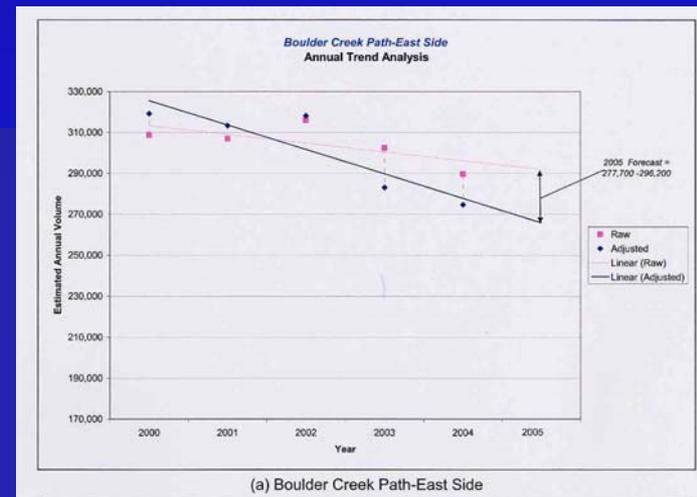


Metrics – Bike Counts

- Tuesday peak day for bike travel
- Jul./Aug. peak months
- Dec./Feb. low months
- Bike use <--> daytime temperature correlated
- Boulder Creek Station bike use down slightly over last 5 years



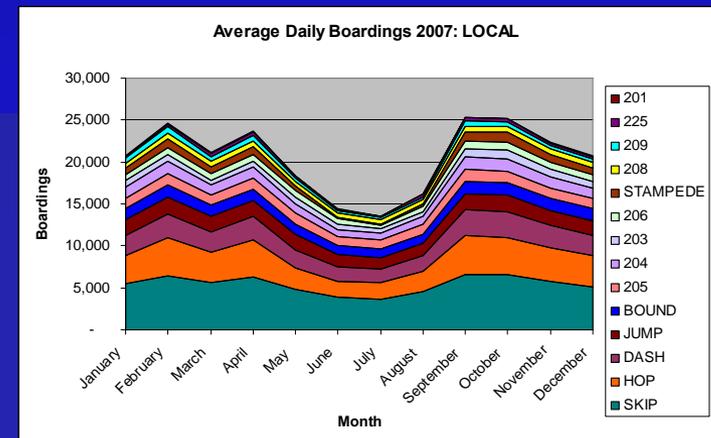
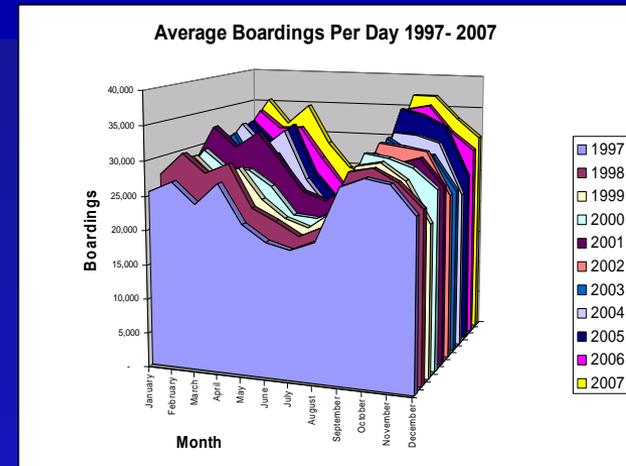
(a) Boulder Creek Path-East Side



(a) Boulder Creek Path-East Side

Metrics – Transit Ridership

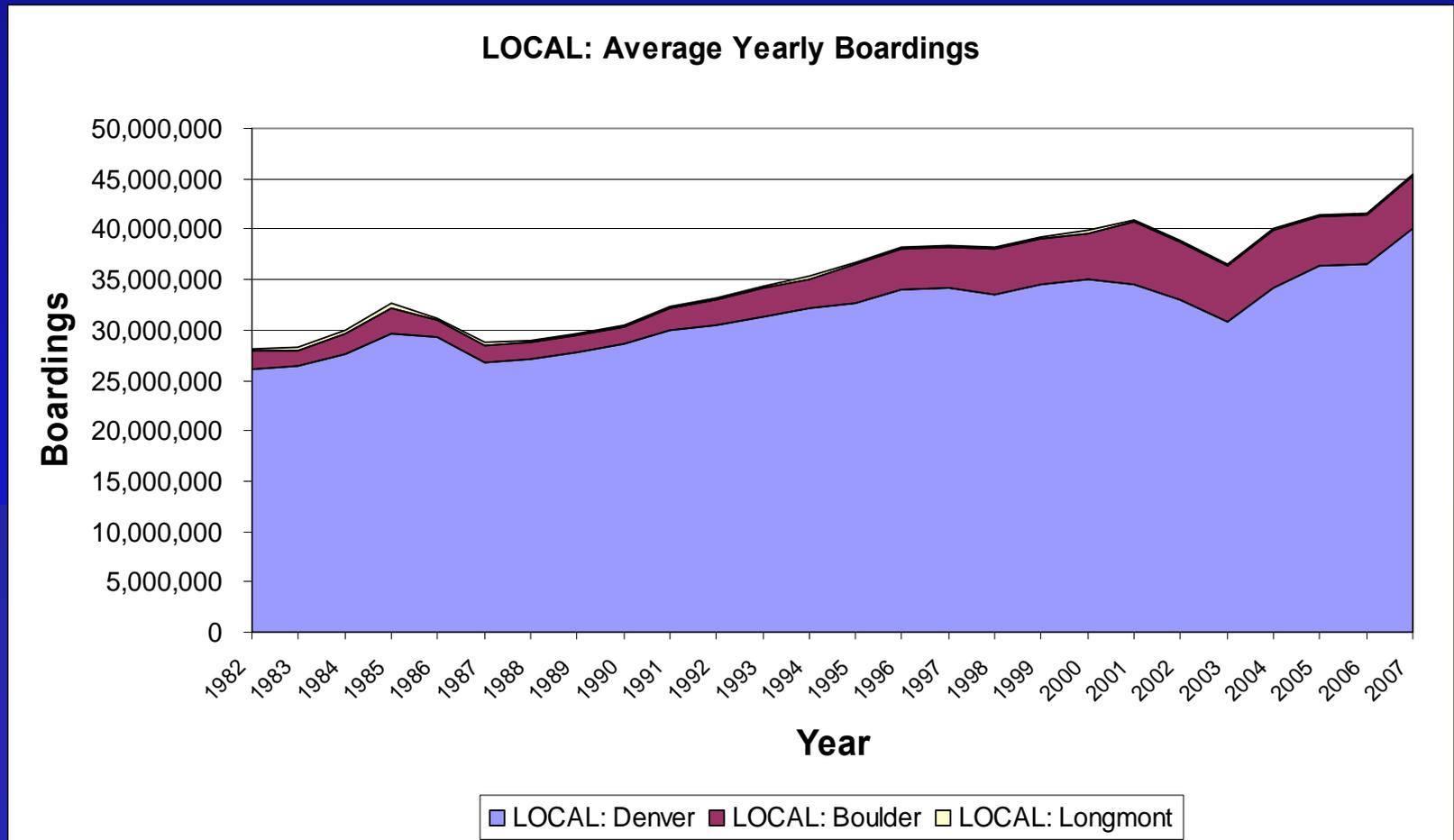
- Ridership Counts
 - Monthly cumulative totals by service type 1981-Present
 - Average daily riders by route 1997-Present
- Ride Checks
 - Detailed rider surveys performed periodically on specific routes as requested.
 - Boardings and alightings per route according to time and location



Metrics – Transit Ridership

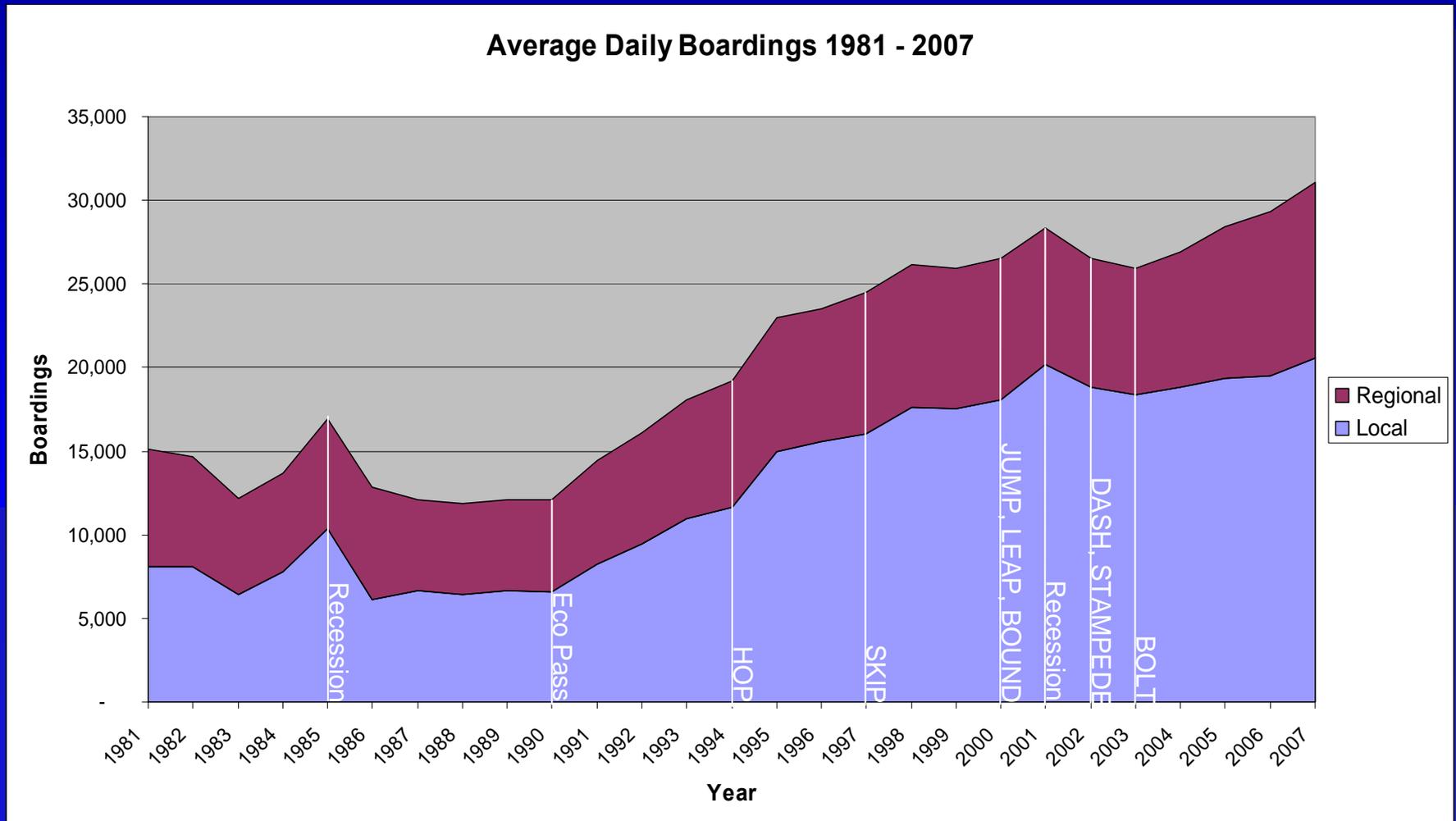
RTD Local Services: Yearly Boardings

Denver Metro, Boulder, Longmont



Metrics – Transit Ridership

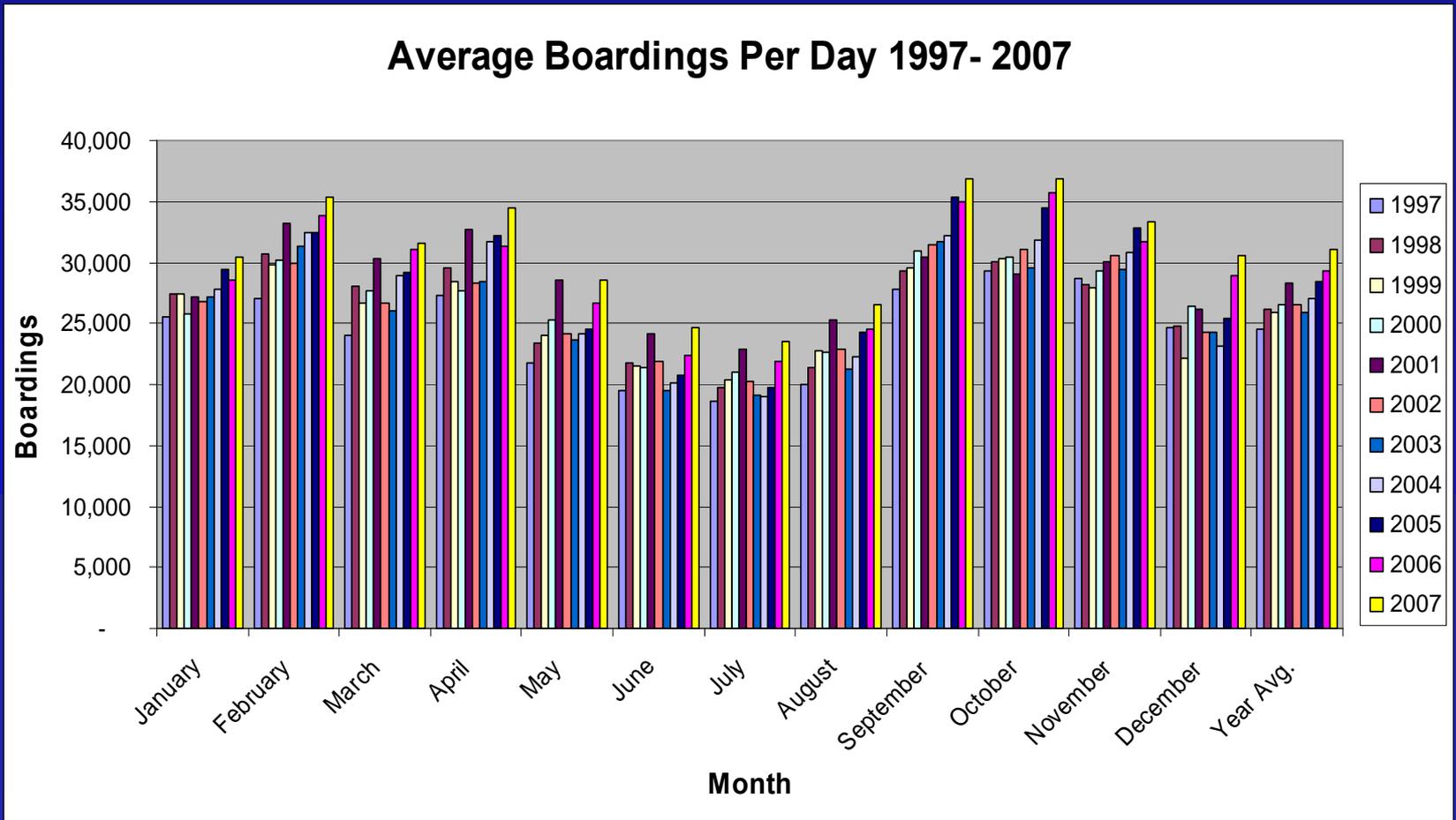
Boulder: Daily Boardings – Local and Regional



Metrics - Transit Ridership

Boulder: Local and Regional Services

Average Daily Boardings per Month: 1997 - Present



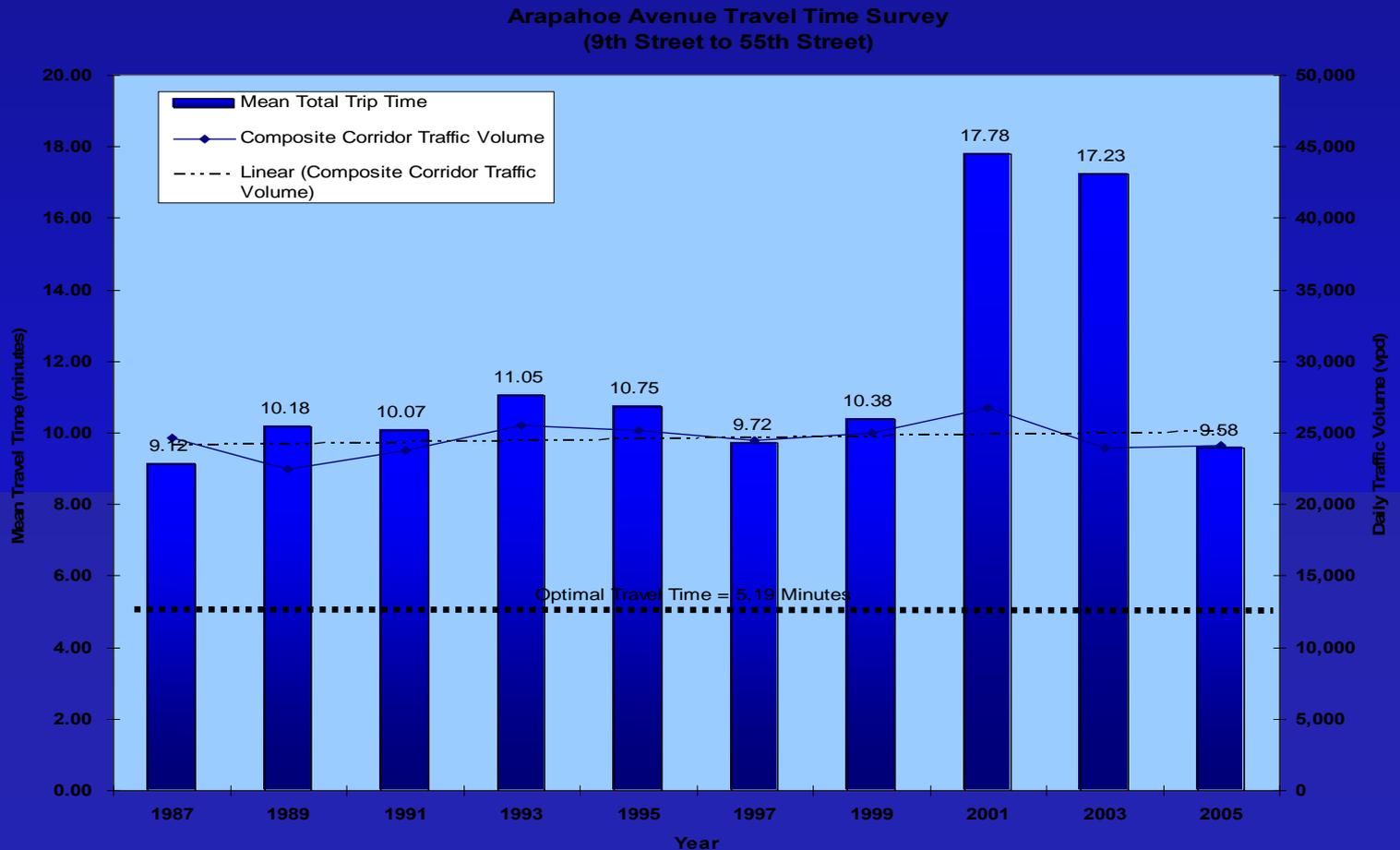
Metrics – Travel time study

How long is forever?

- Travel time study initiated 1986
- Five corridors
 - Three north-south → 28th, Broadway, Foothills
 - Two east-west → Valmont/Edgewood, Arapahoe
- Citizen perspective → It takes forever to get across town . . .
- The reality is 10 to 15 minutes

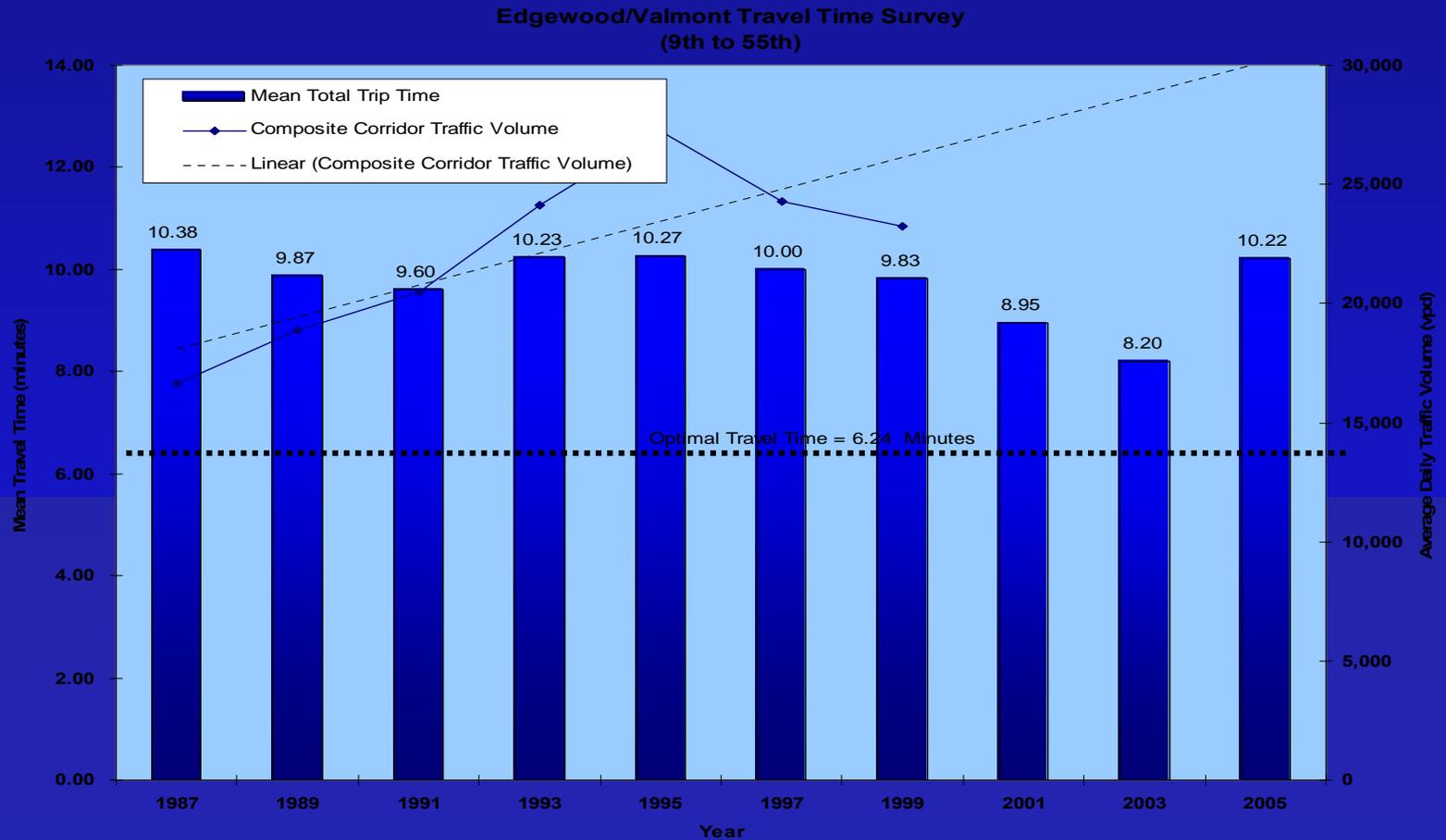
Metrics - Travel time

Arapahoe Ave. (9th to 55th)



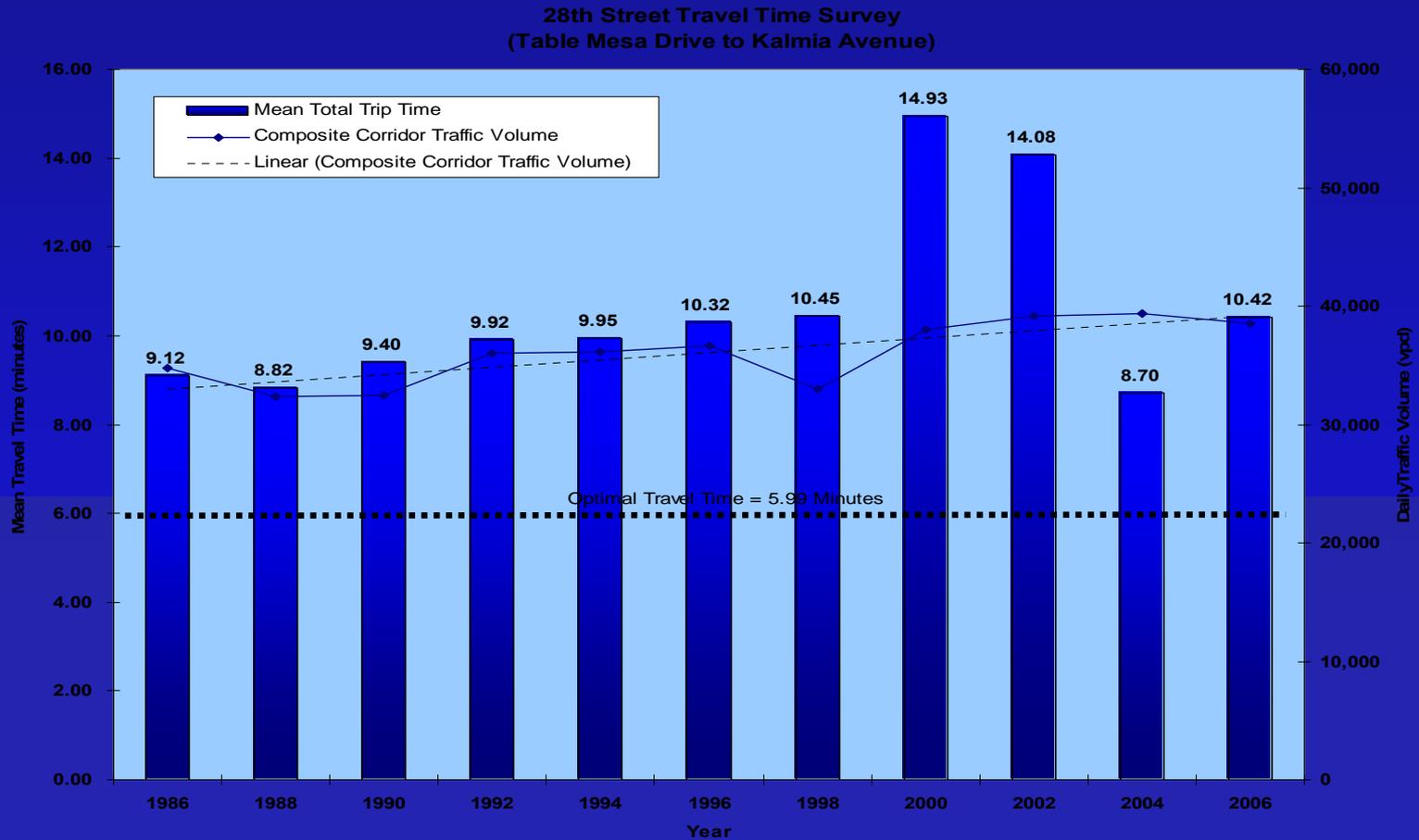
Metrics - Travel Time

Balsam/Valmont (9th to 55th)



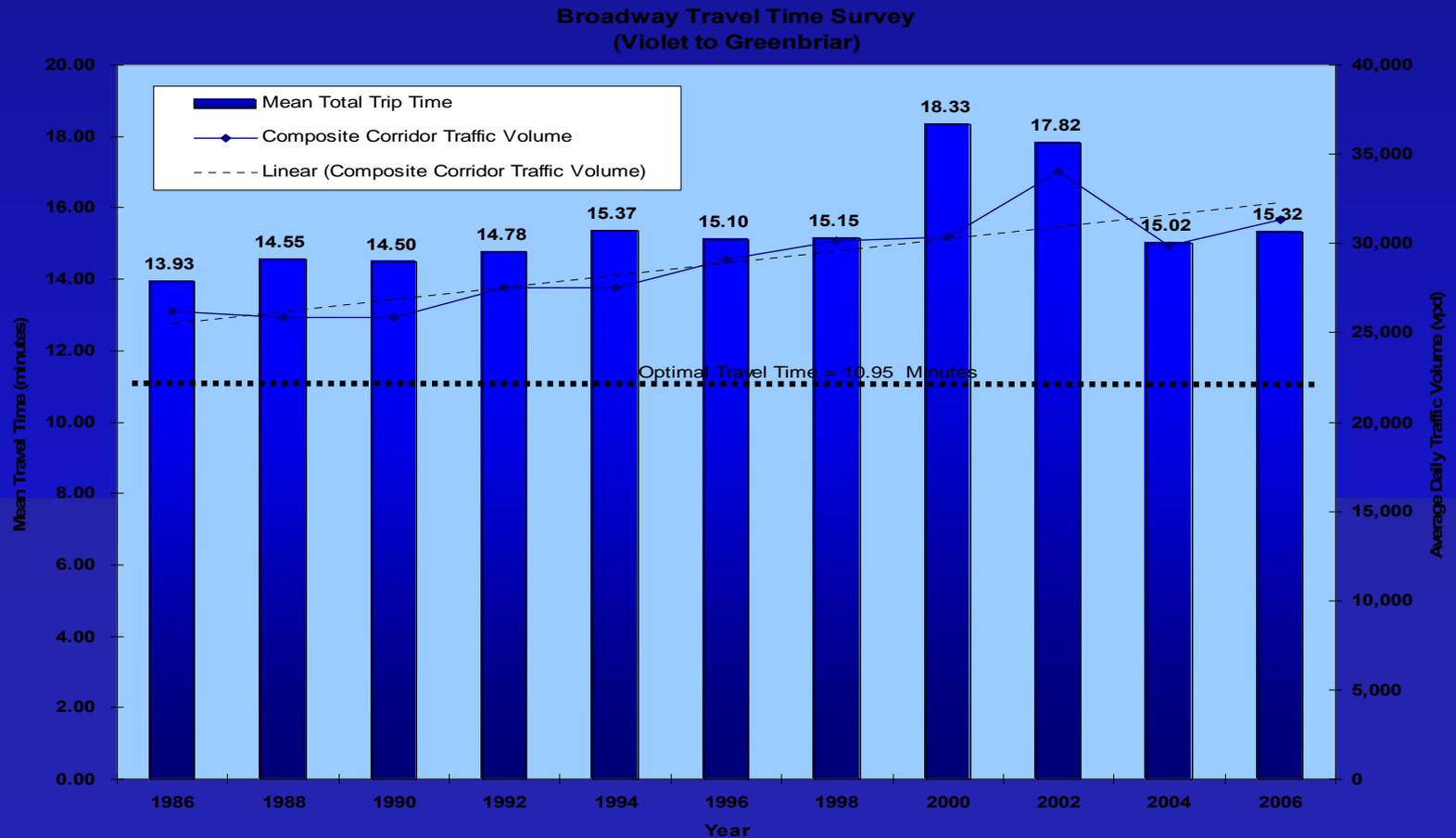
Metrics - Travel time

28th Street (TMesa to Kalmia)



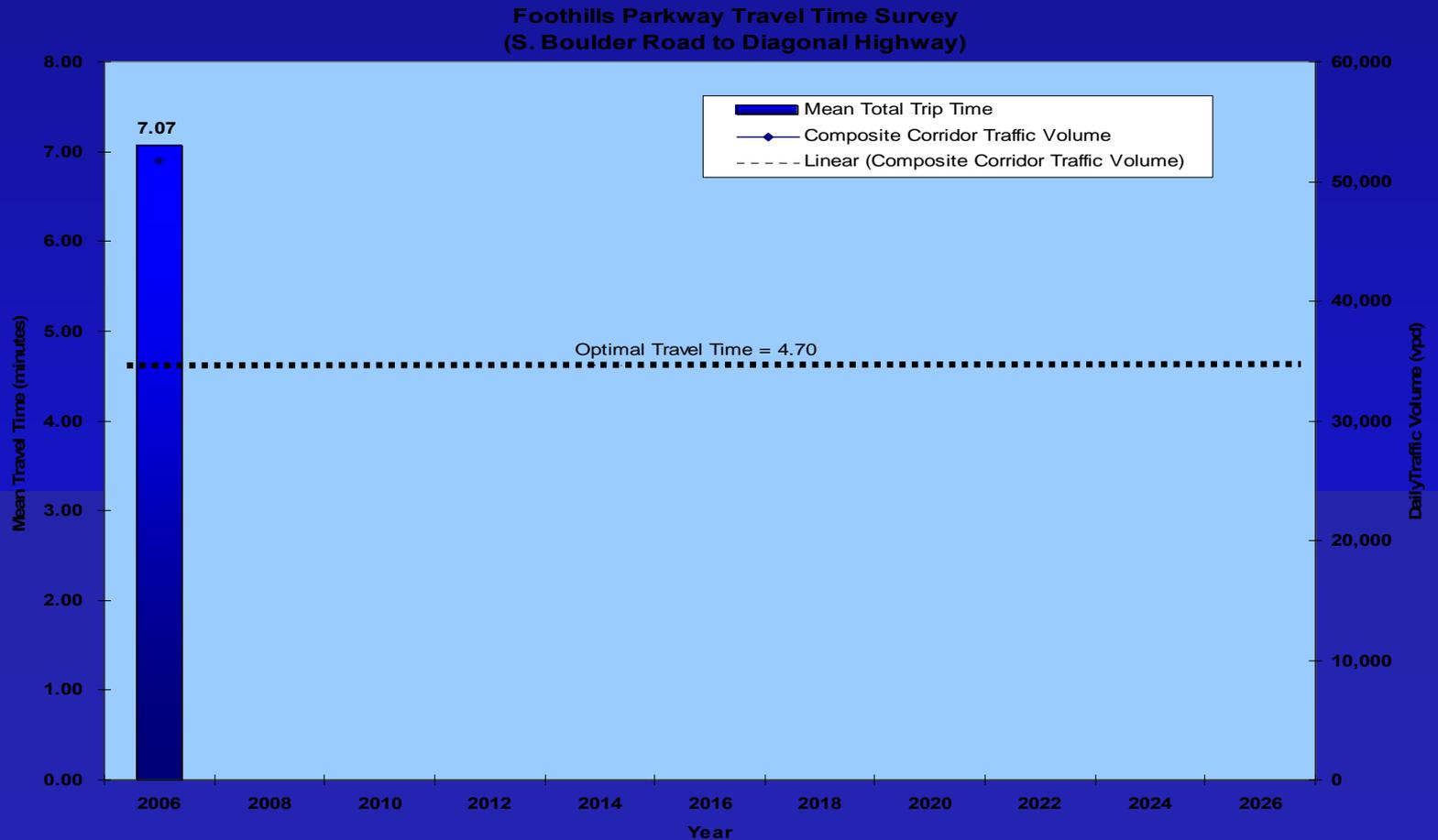
Metrics - Travel time

Broadway (Violet to Greenbriar)

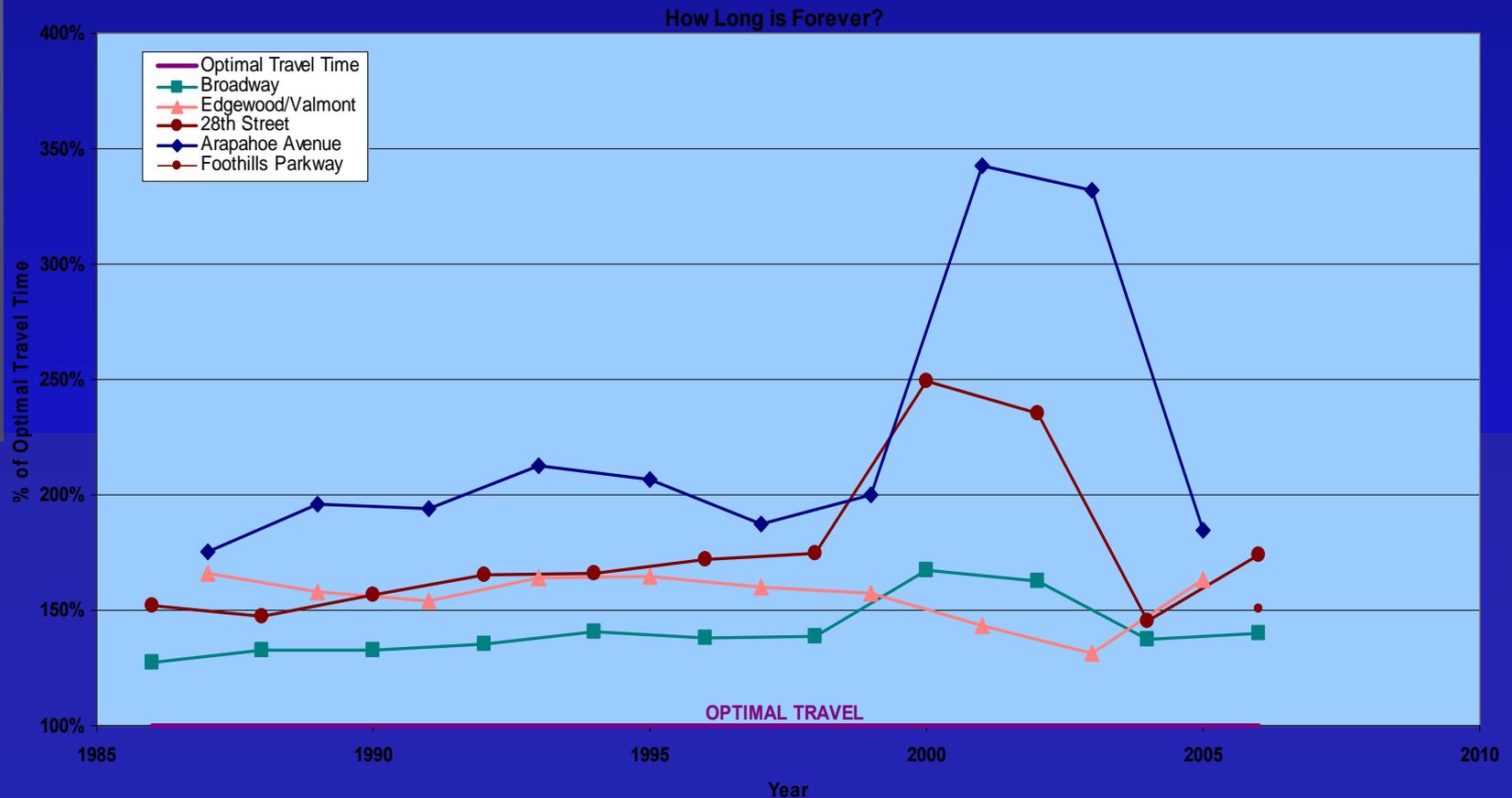


Metrics – Travel time

Foothills (S Bldr Rd to Diagonal)

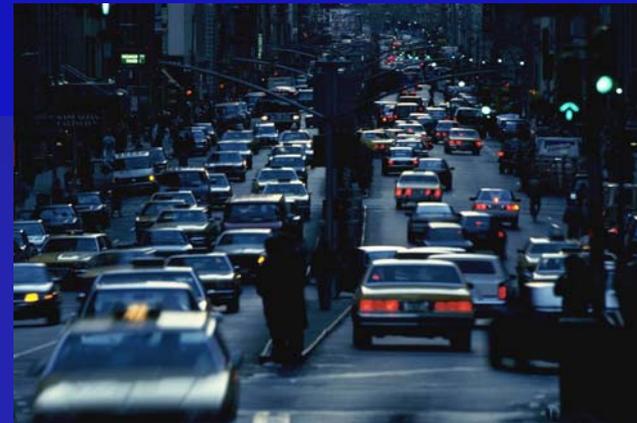


Metrics - Travel Time Corridor Comparison



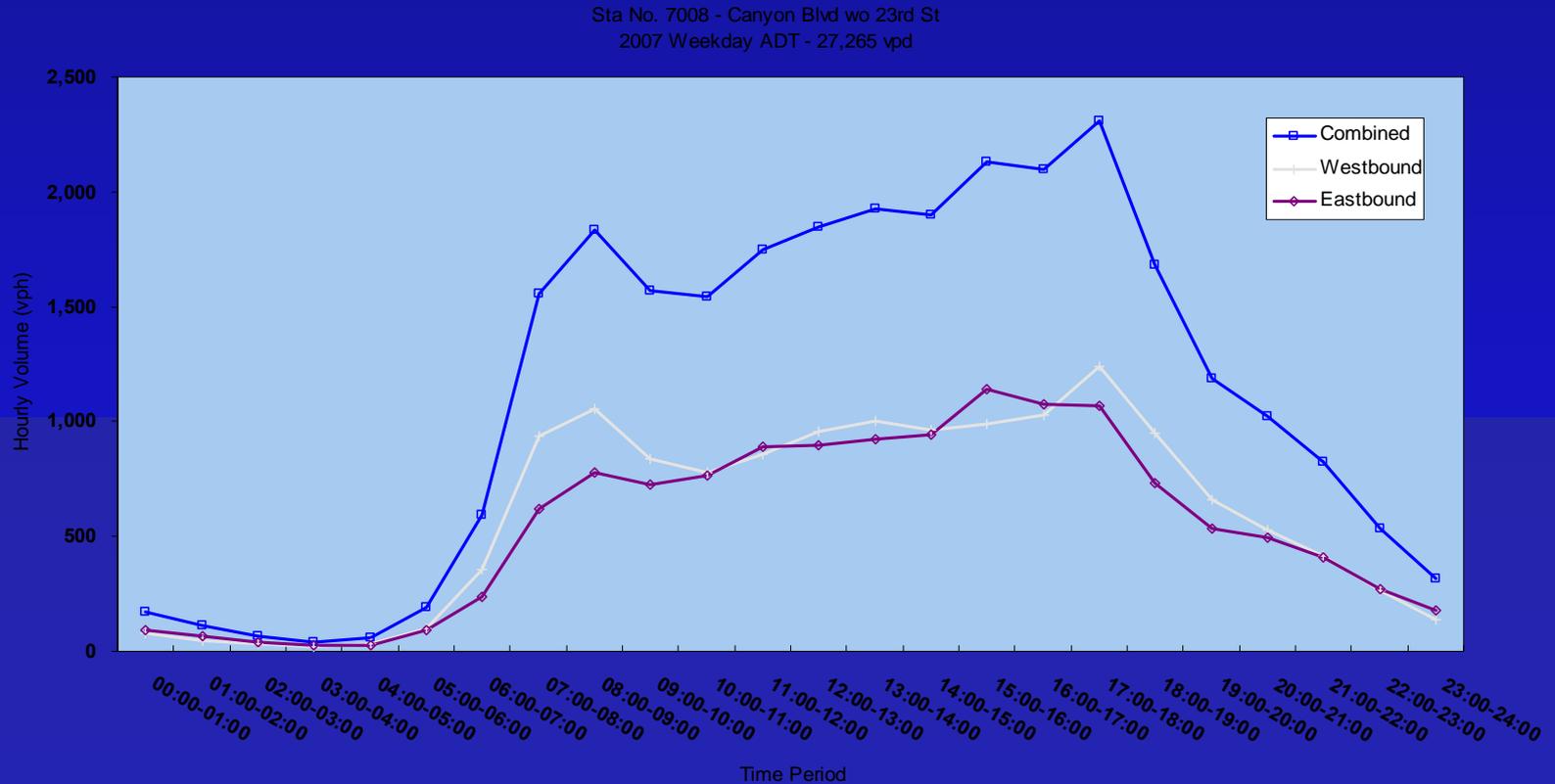
Metrics – City-wide Level of Service Analysis

- Peak hour traffic monitored at all traffic signals
- 131 signalized intersections
- TMP standard -- limit congestion to 1994 levels = 20 % of system



Metrics – City-wide Level of Service Analysis

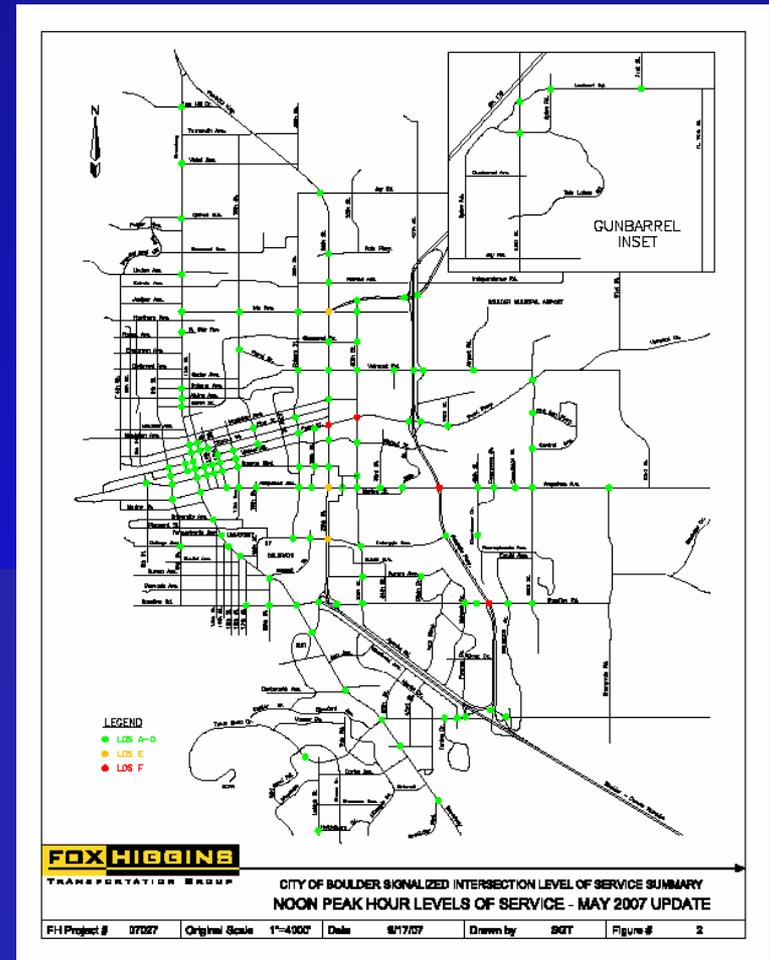
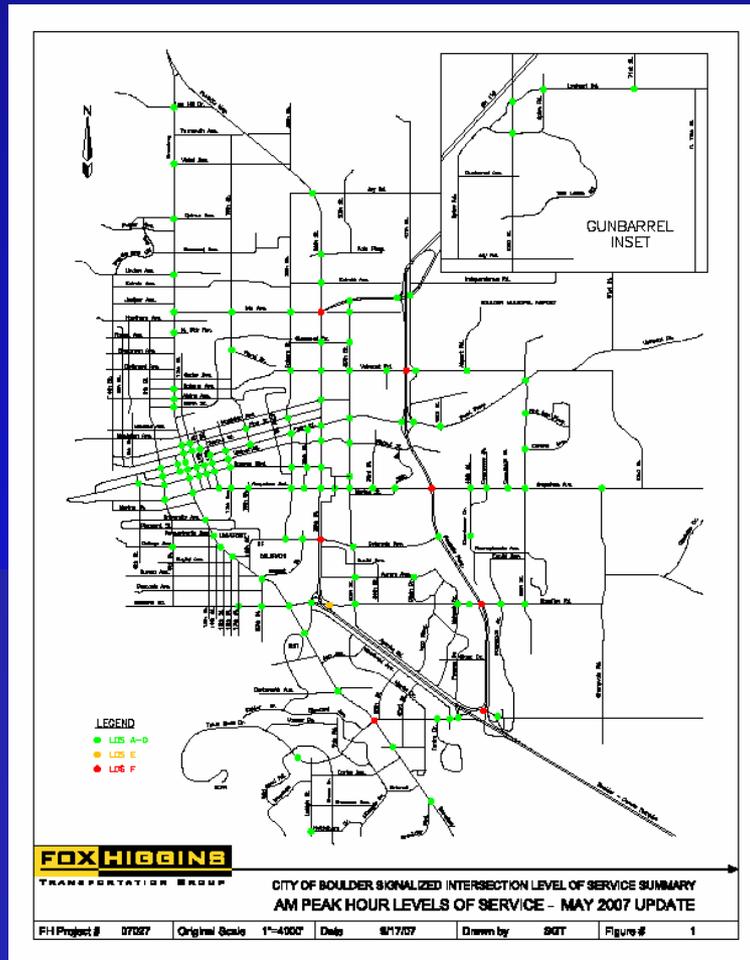
Boulder's Building Traffic Pattern



Metrics – Level of Service

AM Peak

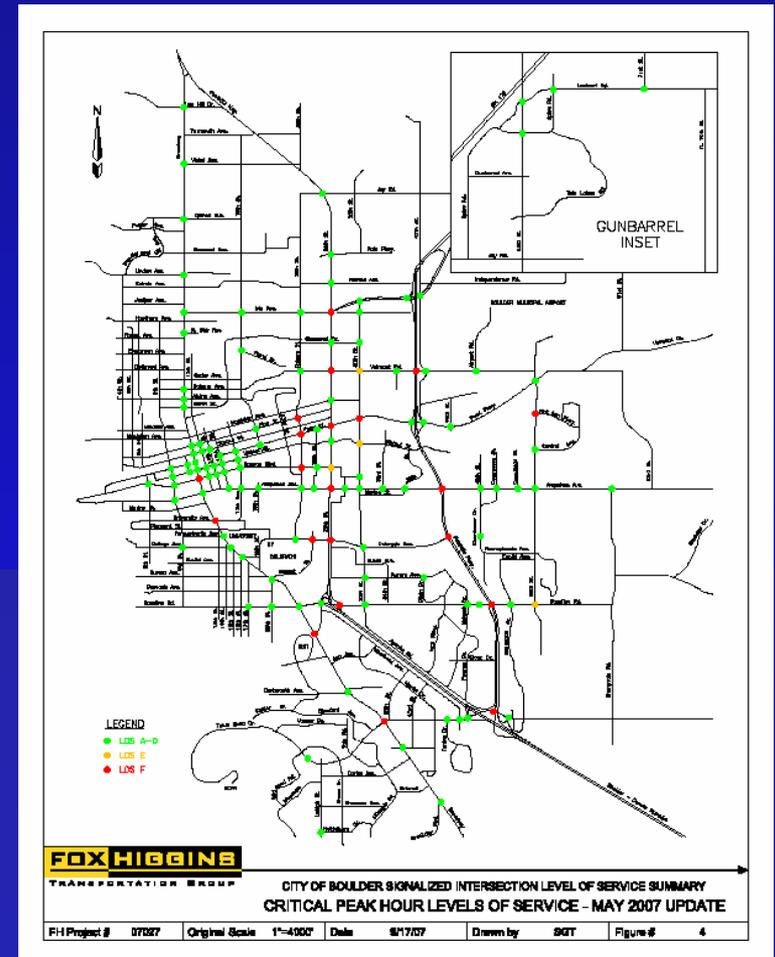
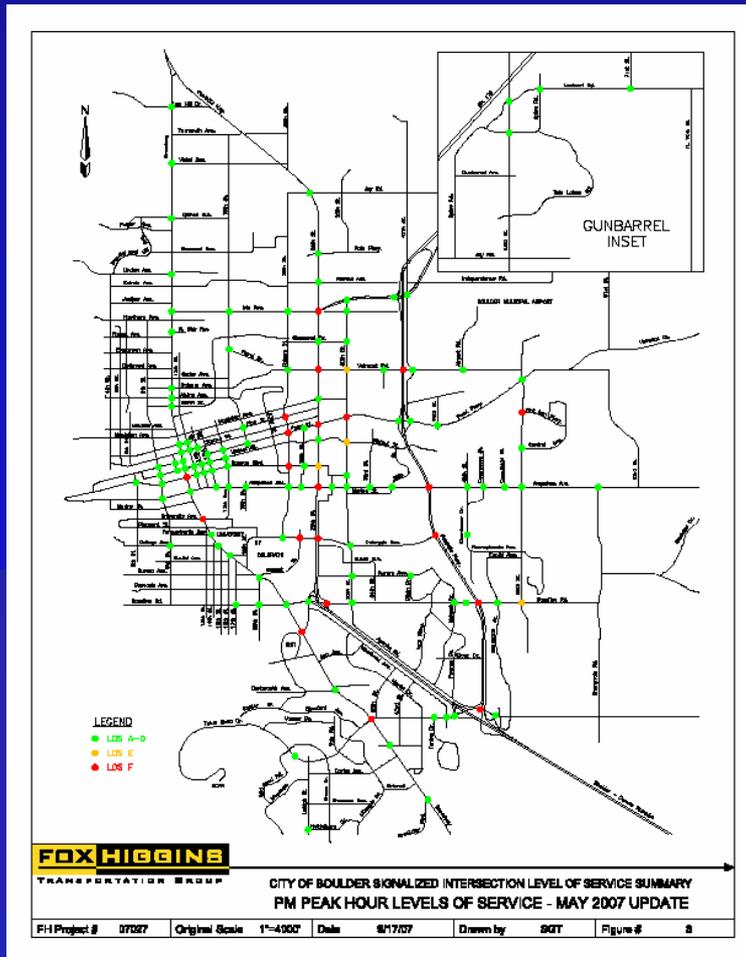
Noon Peak



Metrics – Level of Service

PM Peak

Critical Peak



Metrics – Level of Service

| Intersection Data | | | | | | | | | | |
|-------------------|---------|----------------------------------|------------|---------------------------------|------------|-----------------------------------|------------|---------------------------------|------------|-------------------|
| Data Year | Total # | # at LOS E or F in Any Peak Hour | % of Total | # at LOS E or F in AM Peak Hour | % of Total | # at LOS E or F in Noon Peak Hour | % of Total | # at LOS E or F in PM Peak Hour | % of Total | LOS Software Used |
| 1998 | 126 | 29 | 23% | 9 | 7% | 11 | 9% | 27 | 21% | TEAPAC/Signal97 |
| 1999 | 126 | 32 | 25% | 11 | 9% | 12 | 10% | 30 | 24% | TEAPAC/Signal97 |
| 2000 | 127 | 36 | 28% | 13 | 10% | 16 | 13% | 33 | 26% | TEAPAC/Signal2000 |
| 2001 | 129 | 35 | 27% | 13 | 10% | 11 | 9% | 31 | 24% | TEAPAC/Signal2000 |
| 2002 | 130 | 31 | 24% | 9 | 7% | 12 | 9% | 28 | 22% | Synchro 5 |
| 2003/2004 | 131 | 25 | 19% | 7 | 5% | 9 | 7% | 23 | 18% | Synchro 6 |
| May 2007 | 132 | 25 | 19% | 8 | 6% | 7 | 5% | 25 | 19% | Synchro 7 |

| Individual Movement Data | | | | | | | | | | |
|--------------------------|---------|----------------------------------|------------|---------------------------------|------------|-----------------------------------|------------|---------------------------------|------------|-------------------|
| Data Year | Total # | # at LOS E or F in Any Peak Hour | % of Total | # at LOS E or F in AM Peak Hour | % of Total | # at LOS E or F in Noon Peak Hour | % of Total | # at LOS E or F in PM Peak Hour | % of Total | LOS Software Used |
| 1998* | 908 | 194 | 21% | 67 | 7% | 86 | 9% | 166 | 18% | TEAPAC/Signal97 |
| 1999* | 908 | 208 | 23% | 68 | 7% | 87 | 10% | 180 | 20% | TEAPAC/Signal97 |
| 2000* | 913 | 222 | 24% | 82 | 9% | 95 | 10% | 185 | 20% | TEAPAC/Signal2000 |
| 2001* | 923 | 222 | 24% | 77 | 8% | 84 | 9% | 177 | 19% | TEAPAC/Signal2000 |
| 2002* | 919 | 249 | 27% | 87 | 9% | 98 | 11% | 203 | 22% | Synchro 5 |
| 2003/2004 | 967 | 233 | 24% | 73 | 8% | 87 | 9% | 193 | 20% | Synchro 6 |
| May 2007 | 971 | 250 | 26% | 81 | 8% | 89 | 9% | 212 | 22% | Synchro 7 |

Transportation Metrics – Synthesis



- Vehicle travel increasing, but at slower rate than the region (1% - 2% - 4%)
- Bicycle travel → need to better understand data and influences
- Transit travel experienced strong growth → 6%



Transportation Metrics – Synthesis

- Vehicle system performance maintained over last 20 years
- Performance maintained through more sophisticated timing strategies and strategic investments
- We need to develop performance monitoring for all modes

