I-25/Arapahoe Interchange

Environmental Assessment

Final Travel Forecasting Summary

May 2012

Travel Forecasting Summary

1 Introduction

A travel demand model for the study area was developed for the I-25/Arapahoe Road EA. A travel demand model is a planning tool for assessing alternative improvements to a transportation system, given projected future demand. It provides output in the form of estimated traffic volumes on the roadway system. The I-25/Arapahoe Road EA travel demand model was developed for the 2035 planning horizon and provides traffic volume forecasts for each scenario.

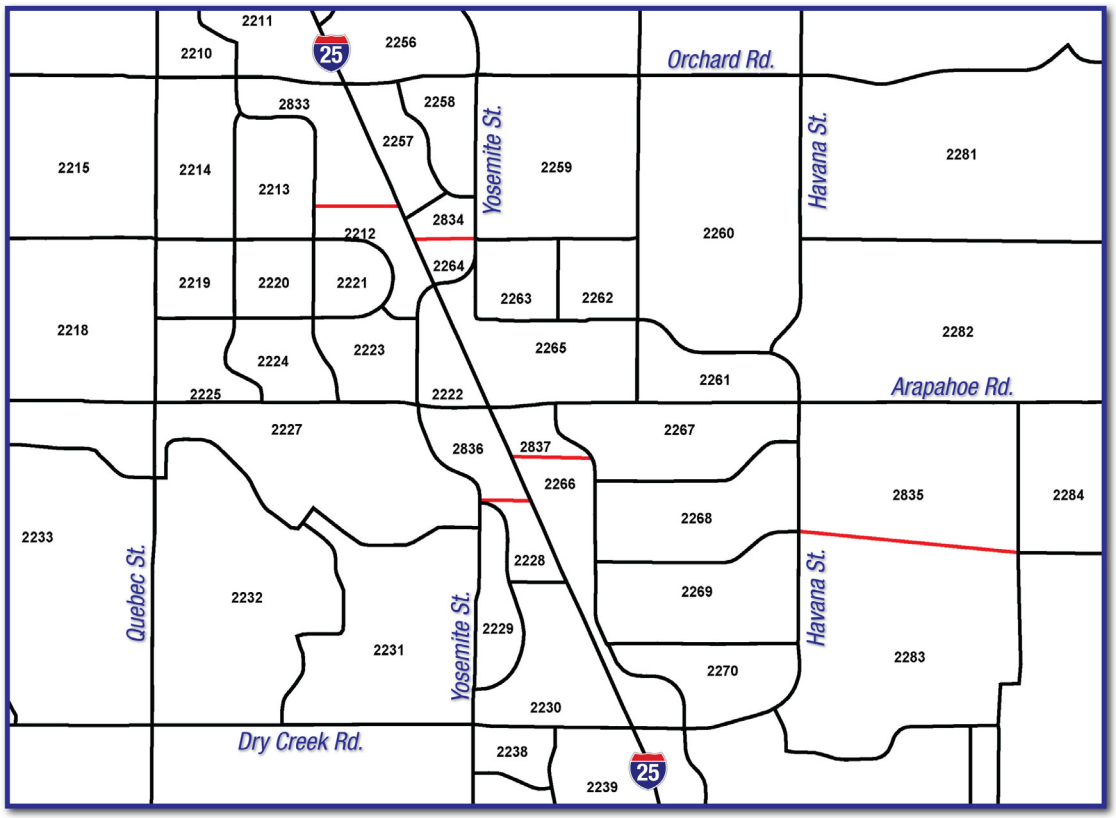
2 Methodology

The most current version of the Denver Regional Council of Governments' (DRCOG's) regional travel demand forecasting model, Compass 4.0 (Cycle 2, 2009), was used as a basis for developing traffic forecasts.

2.1 Traffic Analysis Zones

The DRCOG Traffic Analysis Zone (TAZ) system was refined to provide sufficient zonal definition for the study area surrounding the I-25/Arapahoe Road interchange. These TAZ splits were needed to better reflect differing development characteristics as shown in **Figure 1**.

Figure 1. Project TAZ Splits



2.2 Land Use Data

The land use data contained within the DRCOG base models were reviewed. The DRCOG land use forecasts were provided to the City of Centennial, the City of Greenwood Village, and Arapahoe County staff for review and recommendations. The focus of the land use data review was the TAZs bounded by Quebec Street on the west, Havana Street on the east, Orchard Road on the north, and Dry Creek Road on the south. After review by each responsible municipality, land use changes were incorporated into the models and the results were provided to DRCOG for review. With concurrence from DRCOG staff, the recommended land use changes were adopted and have been used as the basis for all modeling completed for the I-25/Arapahoe Road EA. The land use changes resulted in the transfer of population and employment between TAZs with a net result of an 11% reduction in population and a 2% reduction in study area employment during the 2035 planning horizon compared with DRCOG baseline forecasts. The I-25/Arapahoe Road EA 2010 and 2035 land use data is summarized in **Tables 1 and 2**.

Table 1. Project 2010 and 2035 Land Use - Households

TAZ	2010	2035
1686	892	2,870
1693	280	1,986
2209	271	271
2210	0	0
2211	0	255
2212	3	24
2213	0	0
2214	0	0
2219	458	458
2220	5	44
2221	0	0
2222	0	0
2223	0	0
2224	0	400
2225	291	291
2227	358	358
2228	0	347
2229	0	0
2230	0	0
2231	815	815
2232	697	697
2238	246	246
2239	0	0
2240	0	0
2241	0	0
2242	84	168
2243	0	0
2257	0	0
2258	242	344
2259	465	615
2260	1,411	1,411
2261	168	168
2262	282	485
2263	277	493
2264	0	0
2265	1	1
2266	0	0
2267	3	4
2268	0	0
2269	0	0
2270	0	0
2833	5	42
2834	0	400
2836	0	0
2837	0	0
Total	7,254	13,193

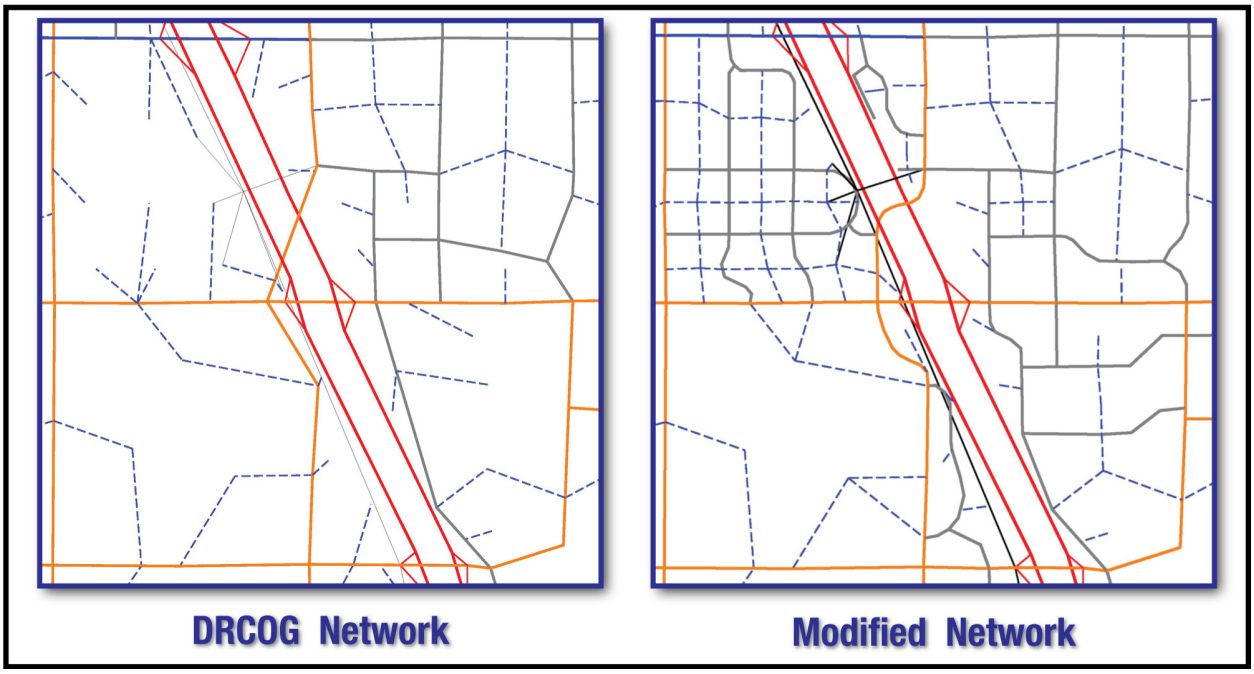
Table 2. Project 2010 and 2035 Land Use - Employment

EMPLOYMENT								
TAZ	2010				2035			
	Prod/Dist	Retail	Service	Total	Prod/Dist	Retail	Service	Total
1686	479	213	816	1,508	1,005	447	1,713	3,165
1693	3	47	193	243	56	932	3,809	4,797
2209	237	306	1,375	1,918	386	499	2,240	3,125
2210	67	243	2,575	2,885	102	368	3,900	4,370
2211	257	145	779	1,181	693	393	2,104	3,190
2212	312	109	532	953	1,046	365	1,748	3,159
2213	289	187	1,613	2,089	588	298	2,998	3,884
2214	183	221	2,404	2,808	307	371	4,036	4,714
2219	149	65	586	800	206	90	809	1,105
2220	96	18	1,044	1,158	96	18	2,387	2,501
2221	43	64	811	918	99	148	1,866	2,113
2222	17	112	149	278	42	283	377	702
2223	124	218	679	1,021	269	470	1,465	2,204
2224	2	177	329	508	2	177	2,329	2,508
2225	7	186	202	395	10	257	280	547
2227	165	119	1,594	1,878	251	181	2,427	2,859
2228	330	0	724	1,054	390	0	856	1,246
2229	68	73	563	704	68	73	563	704
2230	598	176	885	1,659	598	176	885	1,659
2231	32	36	70	138	32	36	70	138
2232	8	6	91	105	11	9	128	148
2238	30	20	922	972	33	22	1,030	1,085
2239	28	122	951	1,101	34	105	1,591	1,730
2240	0	44	2,028	2,072	140	319	3,535	3,994
2241	381	198	1,280	1,859	458	238	1,541	2,237
2242	371	246	1,389	2,006	448	298	1,679	2,425
2243	0	534	166	700	57	657	593	1,307
2257	147	139	777	1,063	267	253	1,415	1,935
2258	32	92	1,830	1,954	36	104	2,079	2,219
2259	14	4	16	34	19	5	22	46
2260	44	16	208	268	44	16	208	268
2261	32	253	79	364	48	386	120	554
2262	1	24	284	309	1	30	352	383
2263	0	4	19	23	2	30	151	183
2264	0	0	0	0	0	0	0	0
2265	168	648	1,070	1,886	236	908	1,499	2,643
2266	29	0	491	520	45	0	774	819
2267	131	445	931	1,507	131	445	1,231	1,807
2268	181	91	274	546	304	152	460	916
2269	55	78	382	515	55	78	382	515
2270	121	68	403	592	212	120	709	1,041
2833	508	177	867	1,552	1,706	595	2,911	5,212
2834	0	0	0	0	43	260	1,843	2,146
2836	329	180	0	509	0	1,040	2,972	4,012
2837	0	557	0	557	0	877	0	877
Total				45,110				87,192

2.3 Road Network

The road network files in the DRCOG model were reviewed to determine where network changes or additions were necessary. Significant road network changes were made to the base model to incorporate the road network in commercial portions of the study area. During editing to the road network, roadway curvature within the study area was adjusted to better reflect actual geometric configurations. In addition, transit routes were adjusted within the commercial areas to accurately reflect transit circulation in the study area. The changes to the road network within the immediate study area are shown in **Figure 2** between the 2035 DRCOG model and the 2035 I-25/ Arapahoe Road EA model.

Figure 2. 2035 Model Road Network



2.4 Post Processing

After performing the TAZ disaggregation, modifying the land use, and editing the road network files for each model scenario, the models were run and the results calibrated. Due to the complexity of real-world driver behavior and individual roadway characteristics, travel demand forecasting models cannot be expected to result in precise representations of traffic volumes on each roadway segment. A common technique used to improve the reliability of travel demand forecasts is referred to as post-processing adjustment. This technique uses comparisons of the base year (2010) model's predicted traffic volumes versus actual traffic counts. These comparisons provide estimates of the error associated with the model's representation of travel conditions. The model-produced forecasts are then adjusted to provide more reliable forecasts. This post-processing adjustment process, as described in the Transportation Research Board's publication NCHRP 255, was applied to the I-25/Arapahoe Road Base forecasts.

3 Daily Forecasts

Figure 3 provides the existing count data and 2035 I-25/Arapahoe Road EA daily traffic forecasts.

Based on these forecasts, the following observations can be made about anticipated traffic growth within the study area.

- Total volumes entering the I-25/Arapahoe Road interchange are expected to increase by approximately 30% in 2035.
- Arapahoe Road traffic volumes are expected to increase between 15% and 45% west of the interchange and between 25% and 35% east of the interchange by 2035.
- I-25 traffic volumes are expected to increase approximately 40% north of the Arapahoe Road interchange and 50% south of the Arapahoe Road interchange by 2035.

4 Peak Hour Forecasts

Forecasted peak hour turning movements were developed for year 2035 at the major intersections within the study area. Turning movement forecasts were developed using a combination of data from existing traffic counts and forecasted daily traffic. The methodology is based on an iterative procedure described in NCHRP 255.

Turning movement counts were collected at each intersection for AM and PM peak hours in December 2010 and March 2011. The turning movement counts were adjusted when necessary in order to balance the traffic volumes between adjacent intersections. These balanced existing traffic counts, summarized in **Figure 4**, formed the basis for future year forecasted turning movements.

Future peak hour volumes were estimated based on the forecasted growth in daily volumes. Daily growth factors for each roadway segment were calculated from the existing roadway counts and future daily forecasts. The growth factors were applied to peak hour roadway segment volumes. No significant change in the peak hour percentage of daily traffic was assumed from the existing year to the future year of 2035. Existing peak hour percentages generally fluctuate from 6% to 9% throughout the study area. These existing peak hour percentages are fairly low by comparison to other roadways across the metro area, so lowering the peak hour percentage in the future due to "peak hour spreading" was not deemed to be warranted.

Utilizing the roadway growth factors, future peak hour segment volumes were calculated for each intersection. Using these future year segment volumes and the existing turning movement counts, future turning movement volumes were estimated based on procedures described in NCHRP 255. These procedures alternatively balance intersection inflow and intersection outflow until reaching convergence.

Once future turning movement volumes at each intersection were established, traffic volumes were balanced between adjacent intersections. The final future intersection turning movement volumes are depicted in **Figure 5**.

Figure 3. Existing and 2035 Base Daily Traffic Volume Forecasts

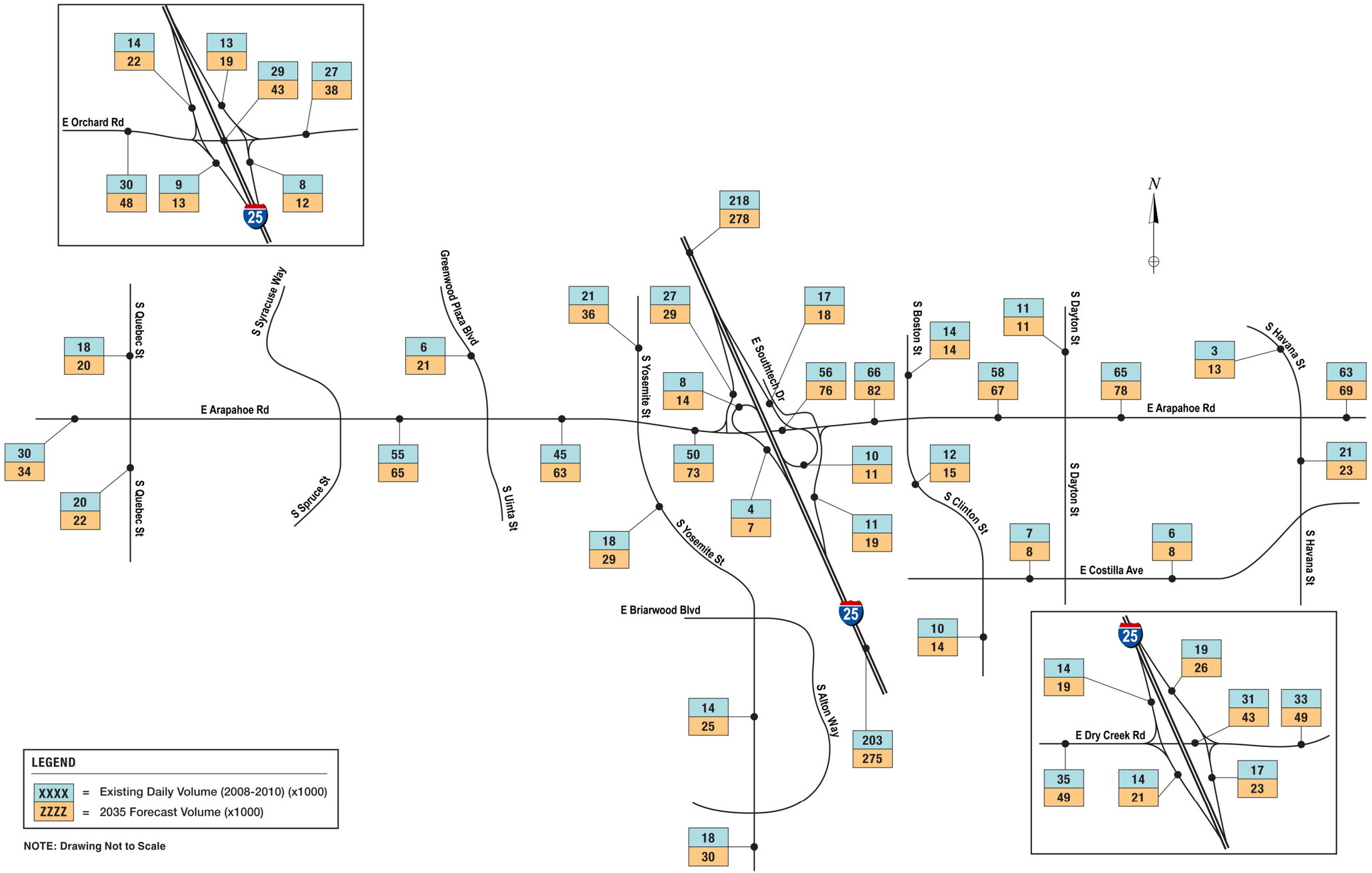
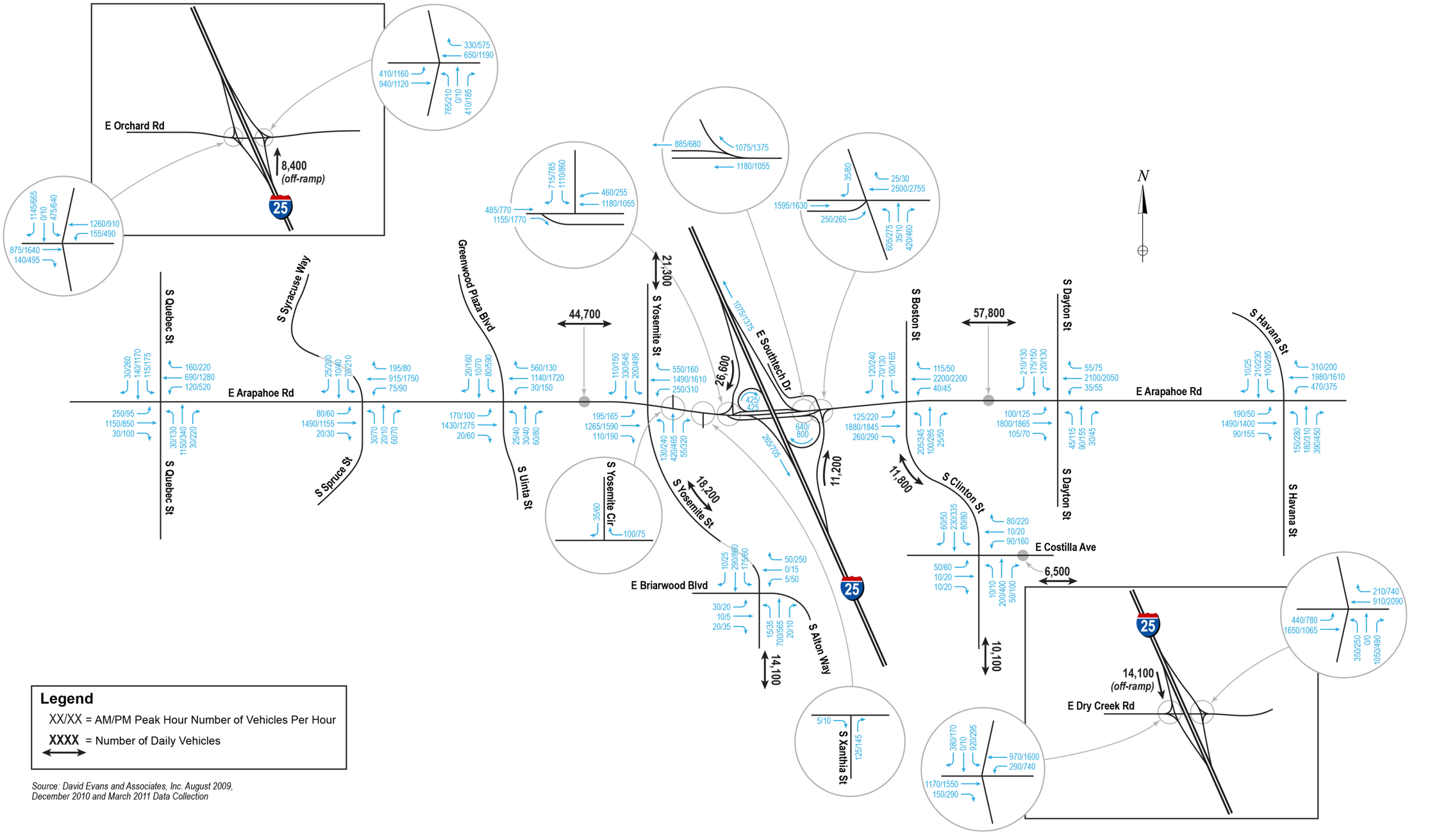


Figure 4. Existing Weekday Traffic Volumes with Current Improvements Completed



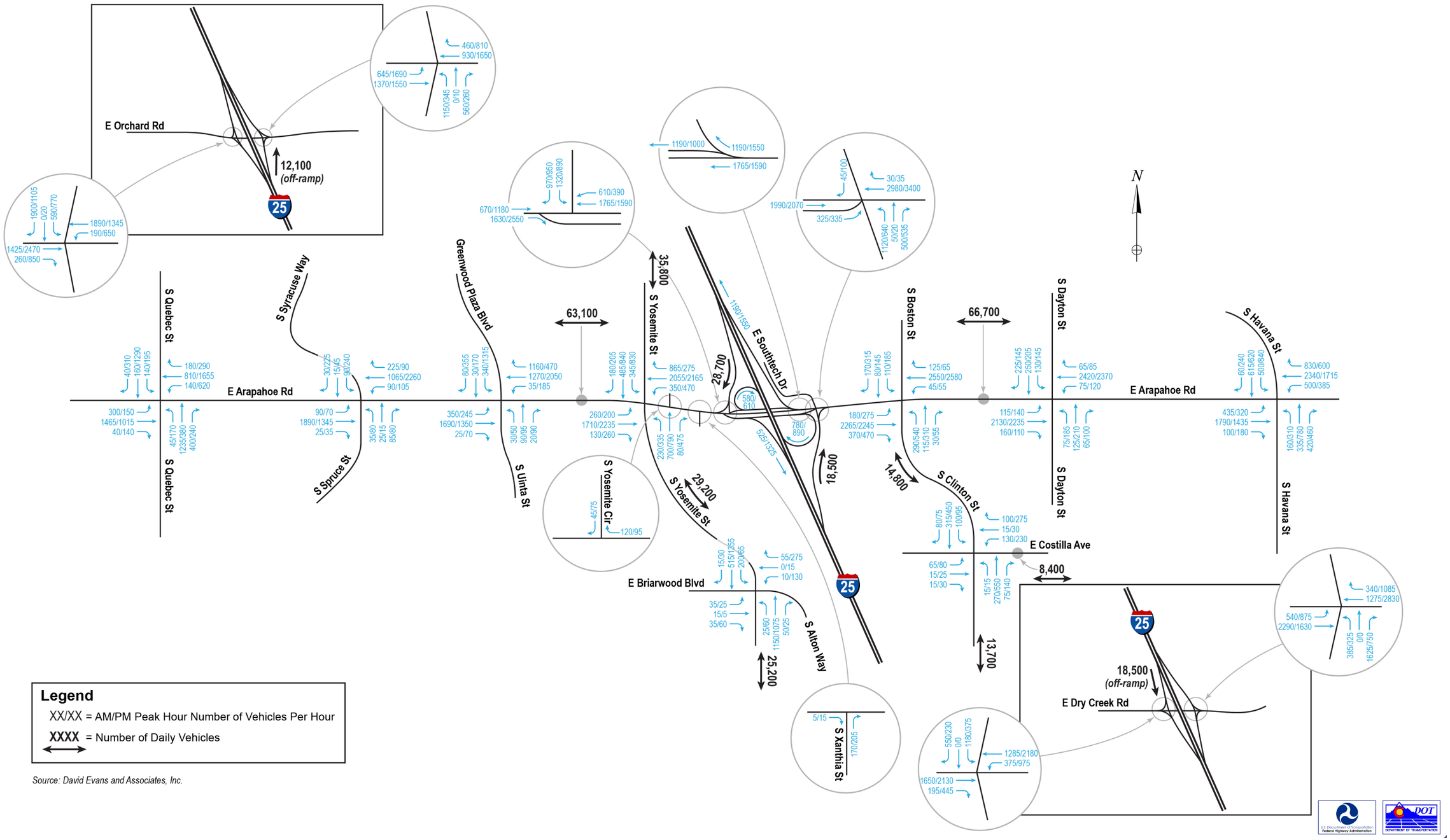
Legend

XX/XX = AM/PM Peak Hour Number of Vehicles Per Hour

XXXX = Number of Daily Vehicles

Source: David Evans and Associates, Inc. August 2009, December 2010 and March 2011 Data Collection

Figure 5. 2035 No Action Traffic Volumes



Legend

XX/XX = AM/PM Peak Hour Number of Vehicles Per Hour

XXXX = Number of Daily Vehicles

Source: David Evans and Associates, Inc.