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Date	June 9, 2016
Attention	Clarence Daugherty
From	Jeremy Wyndham
Subject	**Addendum to the Collin County Mobility Plan 2014 Update**
Copies to	Tracy Homfeld

Introduction:

This document represents revisions to the Collin County Mobility Plan 2014 Update. The introduction and methodology describe the process used to update the original document. The addendum shows the insertions and deletions to the original sections of the document.

The Collin County Mobility Plan 2014 Update was completed in August 2014. As part of the update, a build-out forecast for population and employment was developed. This build-out scenario included constraints that influenced the population and employment projections for the eastern and northern parts of Collin County. These constraints included the following growth-limiting factors:

- State Highway 78 is currently the only major north/south roadway for the eastern part of the county;
- east/west access is limited across and around Lake Lavon;
- water and wastewater infrastructure has not been planned for the eastern and northern parts of the county; and
- residents and leadership in the northern and eastern portions of the county have historically wanted only more rural development and have opposed suburban development.

Based on the above growth-limiting factors, the build-out scenario predicted a total population of 2.1M for Collin County.

Following the completion of the plan update, the Collin County Court asked what the build-out forecast would look like if the growth-limiting factors did not exist. There was also more discussion about impacts if the eastern half of the county develops like the western half of the county has developed. Also, some cities have recently updated their comprehensive plans to include development at greater densities then previously included. This lead to the development of a new build-out scenario that removes the previous constraints and includes the

revisions that cities have made to their comprehensive plans. This alternate build-out scenario is addressed in this addendum to the Collin County Mobility Plan 2014 Update.

In addition to developing the alternate build-out scenario, there were questions about how the thoroughfare plan would accommodate the traffic generated for both the original build-out scenario as well as the alternate build-out scenario. The Collin County Mobility Plan 2014 Update included travel demand model runs for 2020 and 2035, but did not include a travel demand model run for the build-out scenario. Also, none of the model runs included the full thoroughfare plan in the roadway network. This addendum includes the results from running both the previously-developed build-out scenario and the new alternate build-out scenario in the travel demand model, with the full thoroughfare plan coded into the roadway network.

Methodology:

Demographic Forecasts

The demographic forecasts followed a bottom-up method. The forecasts did not start with an end number in mind, but followed a two phase process. First modifying the demographics based on updated city plans, and second making land-use assumptions for the east side of the county. Meetings were held with the cities of Celina, McKinney, Plano, and Frisco to get updates on their city plans. City plan updates were also collected from Allen, Celina, Fairview, Frisco, Melissa, Plano, and Princeton. The city plans were followed where they existed, with some adjustments made to Farmersville and Mellissa to accommodate the proposed Collin County Outer Loop. For the east side of the county, the development assumptions included the construction of the Collin County Outer Loop and the availability of utilities like water and wastewater; then best planning assumptions were used for areas without plans. These best planning assumptions included 6 Dwelling Units per Acre (DUA) for residential urban and 24 DUA for mixed use. Mixed use consisted of two categories, mixed use residential (MUR) and mixed use nonresidential (MUN). The MUR was calculated at a ratio of 70% (residential at DUA) to 30% (nonresidential). The MUN was calculated at a ratio of 30% (residential at 24 DUA) to 70% (nonresidential). The results of the new alternate demographic forecasts are a population of 3.44 million and employment of 1.60 million for Collin County.

Travel Demand Modeling

The build-out demographics for both build-out scenarios were provided to NCTCOG to run the regional travel demand model and develop trip tables. As part of this development, NCTCOG increased the demographics through the rest of the region to correspond to the increased demographics in Collin County. NCTCOG then provided the results of the build-out model runs on the 2035 network. The corresponding Level of Service is shown in Figures A1 and A2.

Jacobs modified the NCTCOG 2035 model network to include all of the proposed roads and improvements in the Collin County Thoroughfare Plan. The trip tables provided by NCTCOG for the two build-out scenarios were then used to run the model on the revised roadway network

that included the thoroughfare plan. The results of these model runs are included in this addendum. An additional unconstrained or all-or-nothing model run was done for each of the build-out scenarios. This unconstrained model run allowed trips in the model to use the shortest or fastest route between their origin and destination, regardless of the congestion levels. The results from these unconstrained model runs show the main routes that traffic would take if road capacity was not a constraint.

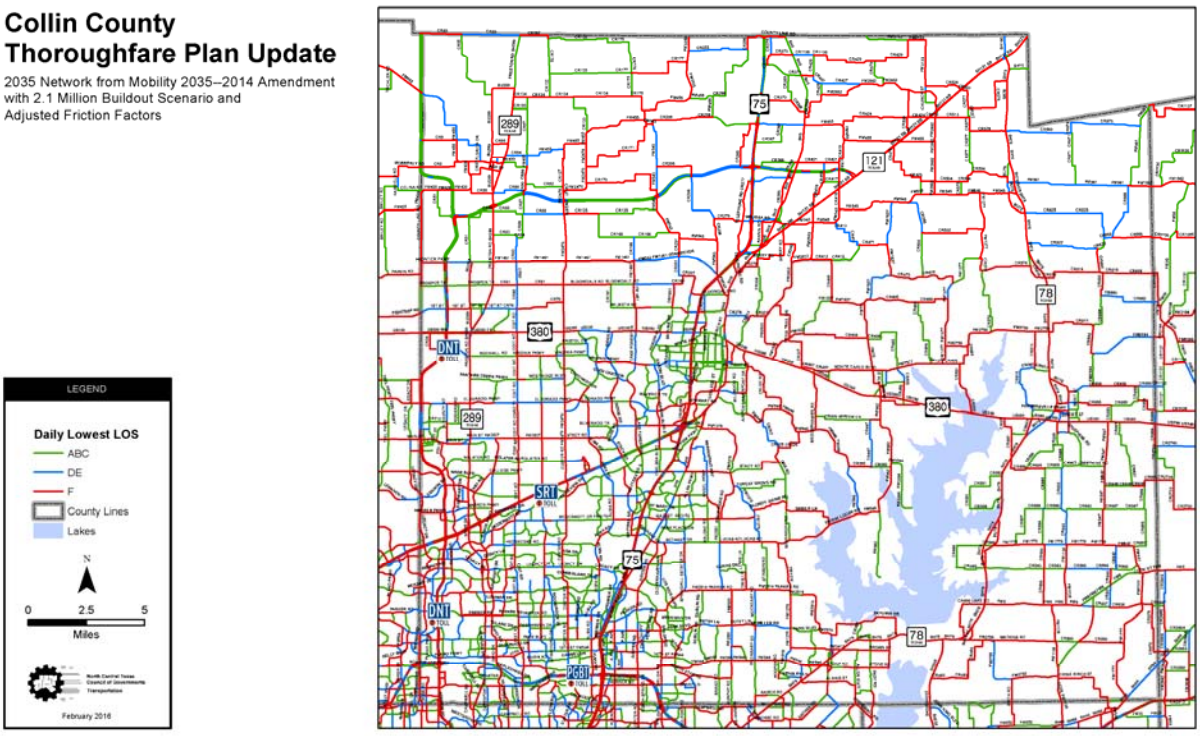

Figure A1: 2.1M Build-Out Level of Service on 2035 Network
Source: The North Central Texas Council of Governments

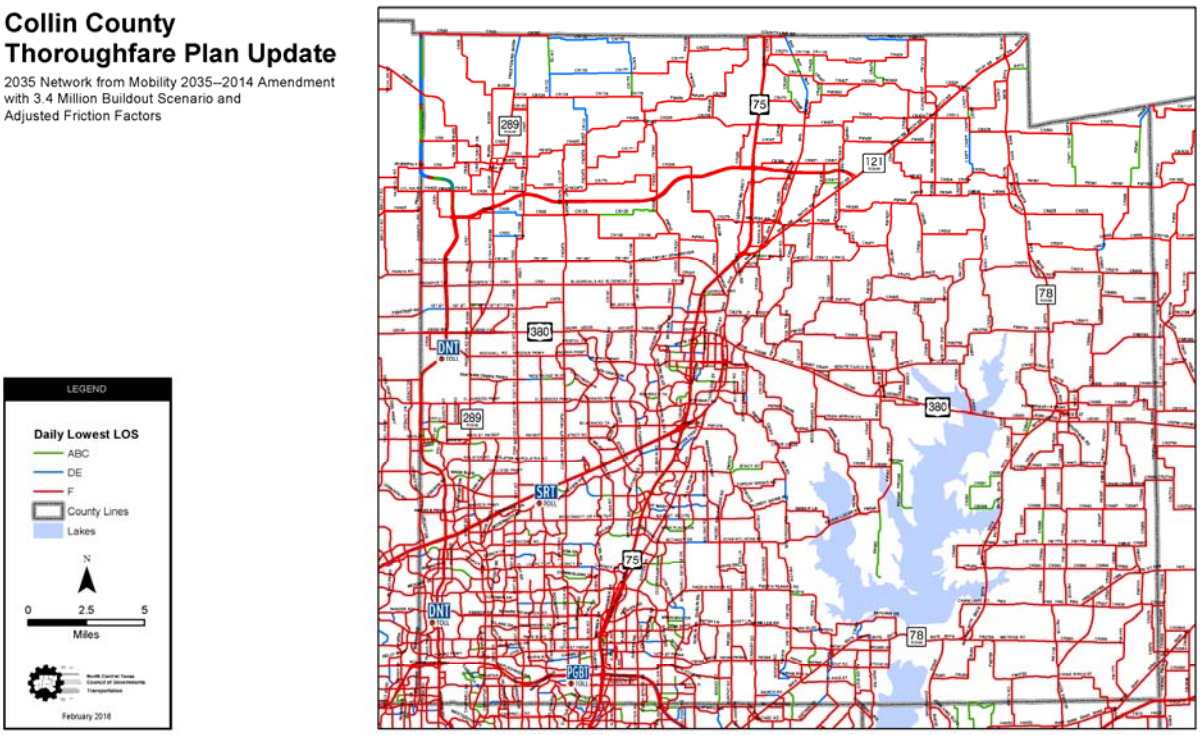

Figure A2: 3.4M Build-Out Level of Service on 2035 Network
Source: The North Central Texas Council of Governments

Addendum:

Based on the methodology and analysis performed, the following sections of the Collin County Mobility Plan (CCMP) 2014 Update have been updated, with additions and revisions shown in red.

DRAFT
Addendum to the Collin County Mobility Plan
2014 Update

Prepared for

Collin County Department of Engineering
4690 Community Ave., Suite 200, McKinney, TX 75071

Prepared by

Jacobs Engineering Group Inc.

In association with

Freese and Nichols, Inc.

June 2016

4.1.3. City Land Use and Transportation Plans

Many Texas jurisdictions, including cities and incorporated towns within Collin County, have adopted plans for future land use and improvements to the transportation network within their corporate limits and extraterritorial jurisdiction (ETJ). Each local jurisdiction within the county with a population of 5,000 or more, as well as some of the smaller jurisdictions, has developed a Comprehensive Plan to guide further land use development activity, and a Thoroughfare Plan to serve the travel needs of area residents. Of the 30 jurisdictions in Collin County, at least 20 have adopted plans. The Jacobs team assembled the existing Comprehensive Plans, Land Use Plans, and Transportation Plans for the various local jurisdictions. **Table 3** lists all cities that made their plans available for review and consideration. For the cities that did not either have the data available or did not provide the data, reasonable planning assumptions were developed and incorporated into the database. The future land use plan assumes ~~ultimate~~ build-out as identified in the cities' comprehensive plans, as shown in **Figure 15A**. An alternate build-out scenario was also developed that included additional growth in the low or rural density areas of the county and the future land use for this scenario is shown in **Figure 15B**.

Typically, the thoroughfare system map indicates whether the existing rights-of-way for thoroughfares have sufficient existing width or need to be widened, and shows the planned extensions of thoroughfares on new alignments where right-of-way needs to be acquired in the future. Thoroughfare Plans also include typical roadway cross sections (shown in section 7.1.2), indicating the desired number of lanes, right-of-way and pavement widths, and other dimensional criteria for city streets.

The principles of cross-county connectivity and coordinated planning are especially significant to the mobility planning process. Therefore, this 2014 CCMP Update has taken the thoroughfare plans adopted by municipalities into consideration. The adopted land use and transportation plans for the municipalities provided the basis for developing population and employment projections, as well as coordinating planned thoroughfares.

Table 3: Cities and Documents provided for Review

Municipality	Documents
Allen	Comprehensive Plan, Traffic Volumes
Anna	Land Use Plan
Carrollton	Comprehensive Plan
Celina	Comprehensive Plan
Dallas	Thoroughfare Plan
Fairview	Comprehensive Plan
Farmersville	Thoroughfare Plan, Future Land Use Plan
Frisco	Comprehensive Plan
Garland	Comprehensive Plan
Lucas	Comprehensive Plan
McKinney	Comprehensive Plan
Melissa	Transportation Plan
Murphy	Future Land Use
Nevada	Comprehensive Plan
Parker	Comprehensive Plan
Plano	Comprehensive Plan
Princeton	Comprehensive Plan
Prosper	Master Thoroughfare Plan, Future Land Use Plan
Richardson	Comprehensive Plan
Sachse	Comprehensive Plan
Weston	Thoroughfare Plan
Wylie	Thoroughfare Plan

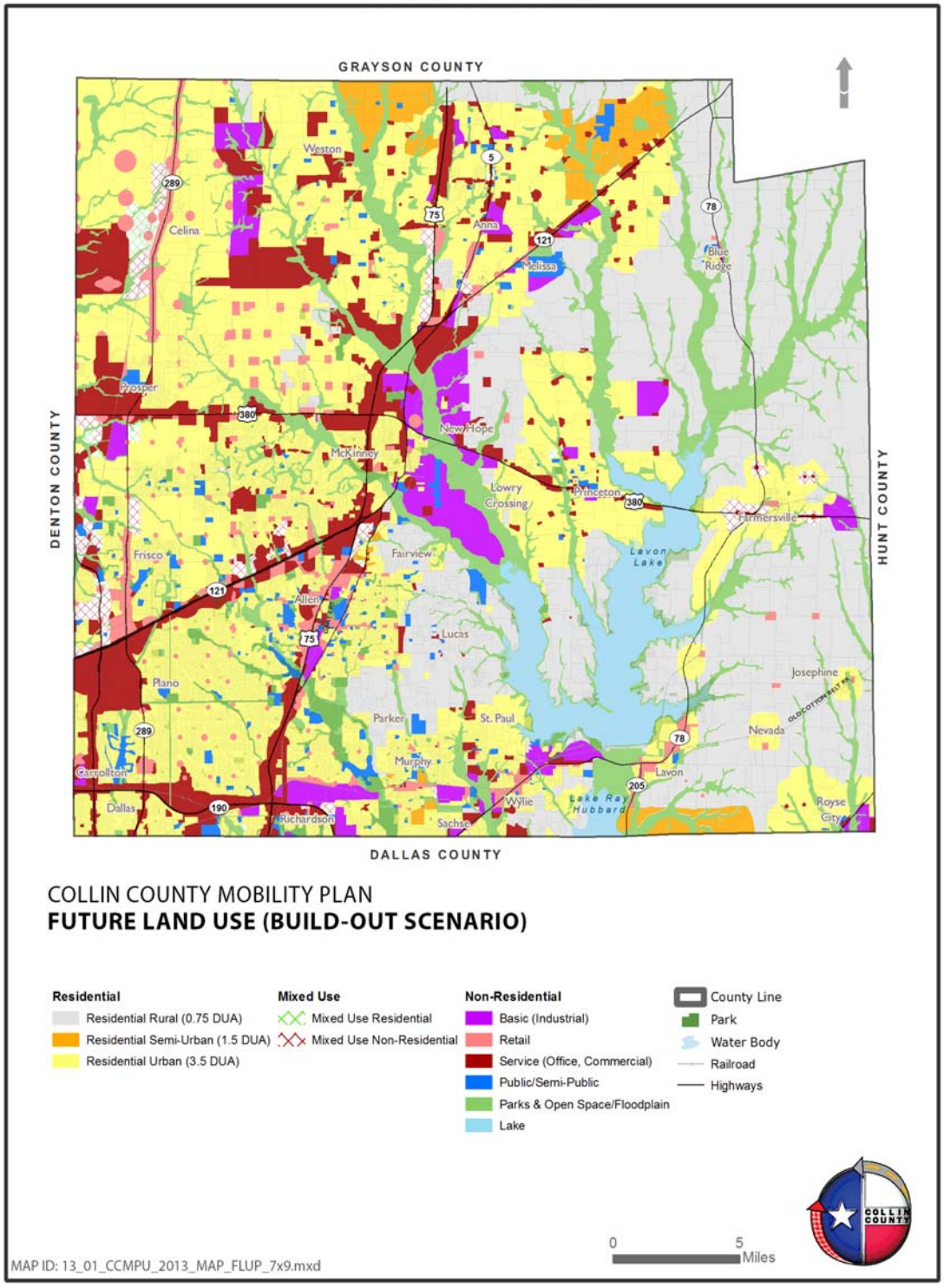

Figure 15A: Collin County Future Land Use Plan Map (Build-Out)

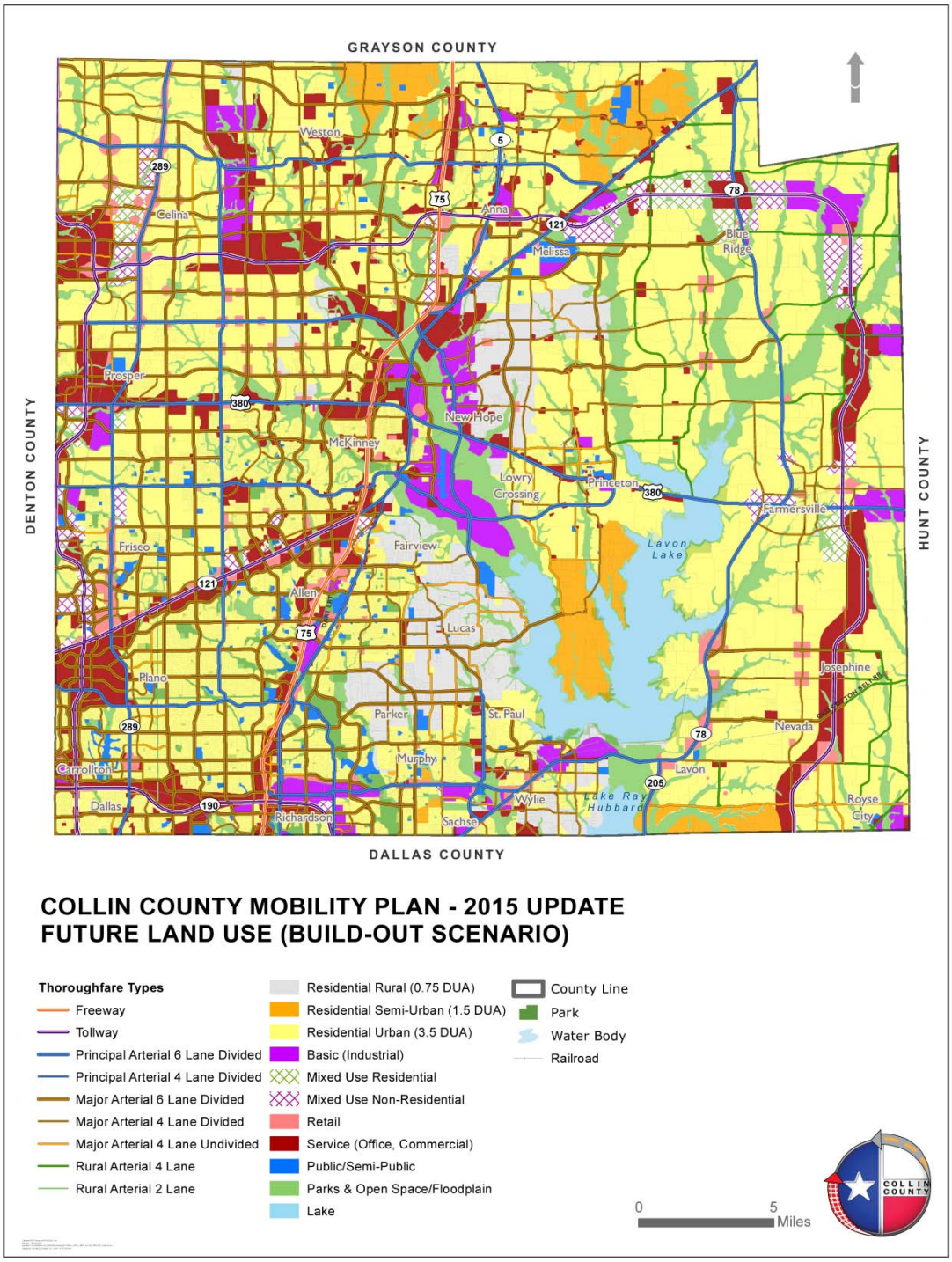

Figure 15B: Collin County Future Land Use Plan Map (Alternate Build-Out)

4.1.4. Demographic and Land Use Forecasts

For the purpose of the CCMP Update, population and employment projections were developed for the interim year (2020), the horizon year (2035), ~~and the~~ a build-out scenario (estimated to be around 2054), and an alternate build-out scenario (estimated to be around 2077). The build-out projections reflect the population and employment that will occur if the various local jurisdictions build out according to their existing adopted plans.

The county has two build-out scenarios, a projection that includes current constraints related to infrastructure local preferences, and an alternate projection that assumes that these constraints are overcome in time. The first scenario projects the east side of the county at a low or rural density due to lack of public infrastructure and the political desire for rural development. The second scenario assumes any constraints to growth are removed and the eastern area of the county will develop in a similar suburban pattern to the west half of the county. In both build-out scenarios, municipal comprehensive plans were used to establish build-out projections in the related municipal planning areas.

A Traffic Survey Zone (TSZ) was used as the smallest geographical unit. A TSZ is a geographical area based on the geography, population size, land use, and transportation facilities. The TSZs are typically bounded by roadways or other natural features, such as lakes or streams. NCTCOG has divided the ~~twelve~~ sixteen-county DFW Area into 6,399 TSZs. Collin County consists of 453 of these TSZs, each of which was assigned to a city area or to the county. Boundaries of TSZs rarely follow city limits, so it was necessary to assign TSZs to a city area that comprises the dominant portion of each TSZ.

These combinations of TSZs are referred to as "City Areas" for purposes of this analysis. City Areas do not equate to the incorporated area of a municipality. ~~A total of 438 TSZs were assigned to the City Areas and the remaining 15 TAZs were assigned to the county.~~ **Figure 16** shows the geographic distribution of each of the 453 TSZs ~~and the~~ into the City Areas. TSZs were assigned to City Areas ~~based on the TSZs in the county. The TSZs were assigned to the City Areas if they meet~~ per the following conditions:

1. ~~A~~ If a TSZ boundary coincided with, or exceeded beyond, a city boundary, then it was assigned to the corresponding TSZ;
2. If the TSZ boundary spanned more than one city, ~~The~~ then the TSZ was assigned to the City Area that comprised the greater portion of the TSZ; and

~~A TSZ boundary more~~ or ~~less, if not exactly, followed a city boundary. Consequently demographic values for some of the City Areas are either higher or lower than those for the city actual because of this effect.~~

3. If any portion of the TSZ was covered by a city boundary, then the TSZ was assigned to that City Area.

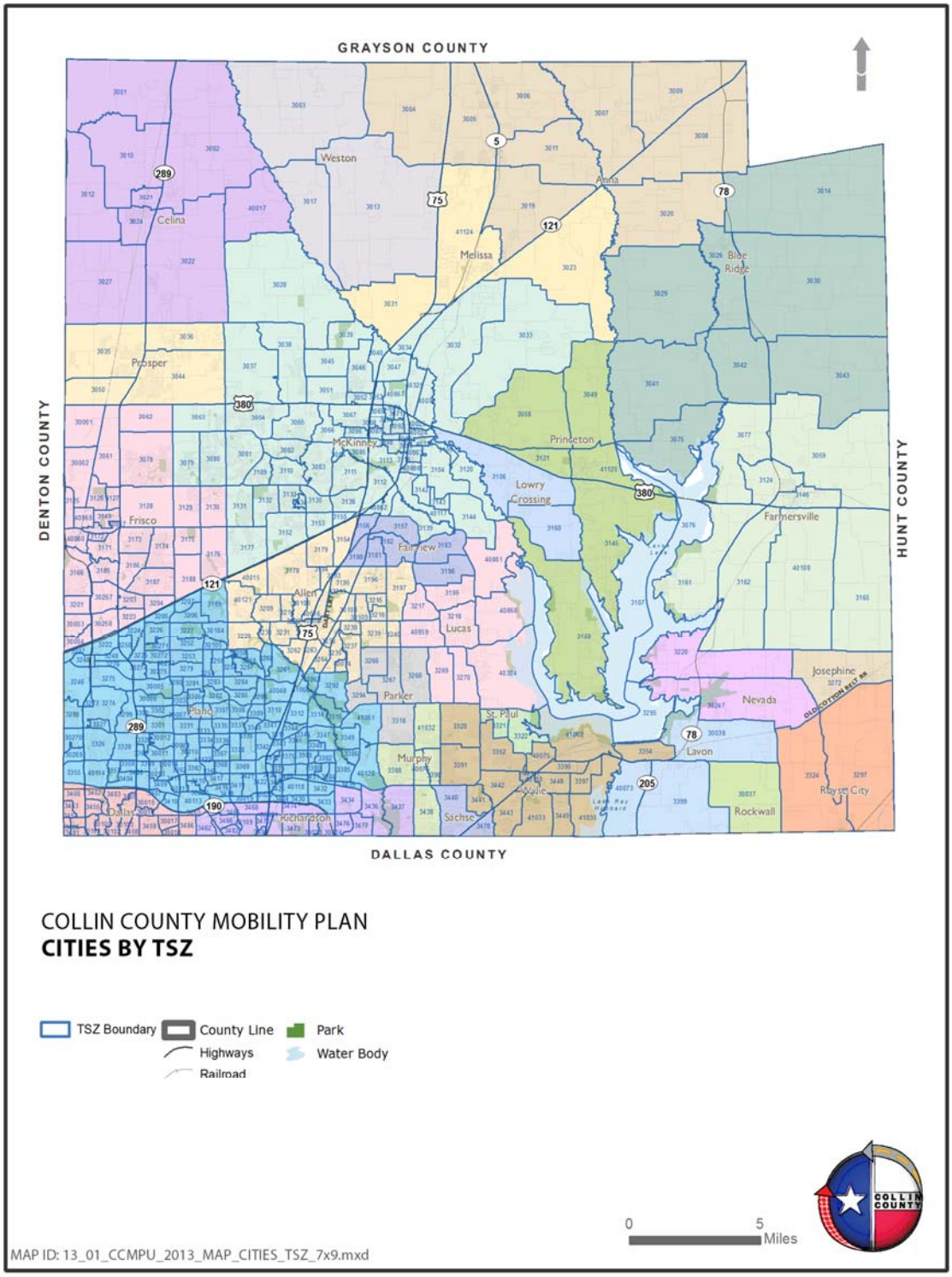

Figure 16: Collin County Traffic Survey Zones and City Areas
Note: TSZs are identified by number and City Areas are identified by color
Source: The North Central Texas Council of Governments

As part of the 2014 Collin County Mobility Plan Update, an accurate and updated estimate (control total) for Collin County's 2014 population and employment was required. Therefore, NCTCOG 2012 population and employment data was used as a starting or reference point. The NCTCOG 2012 data was reviewed for accuracy, and consequently updated to form the 2014 estimates for the 2014 CCMP. Specifically, using NCTCOG's aerials and visual site inspections (for selected properties), each TSZ and associated data were either confirmed or revised. Revisions to NCTCOG 2012 data were made on an as-needed basis using a detailed, parcel-by-parcel analysis in each TSZ. Additionally, Texas Work Force Commission data and U.S. Census (2010) data were used in establishing control totals.

Once the NCTCOG 2012 data was either confirmed or revised, comprehensive plans, future land use plans (FLUPs), and general planning assumptions were applied to vacant land to determine the build-out population and employment for each of the 453 TSZs. If density information was provided in a municipal comprehensive plan, then that density was used instead of the standards listed below. The following factors were used in calculating demographics for areas where density information was not available from municipal comprehensive plans (largely in the eastern part of the county):

- Density for Population
  - Low Density Urban – 3.50 Dwelling Units per Acre (Build-out Scenario represents larger lot suburban development)
  - Urban – 6.00 Dwelling Units per Acre (Alternate Build-out Scenario represents the existing development of the west side of the county)
  - Semi-Urban – 1.50 Dwelling Units per Acre
  - Rural – 0.75 Dwelling Units per Acre
- Density for Employment
  - Retail – 0.25 Floor Area Ratio (F.A.R.) – 350 S.F. per employee
  - Service – 0.25 F.A.R. – 450 S.F. per Employee
  - Basic – 0.10 F.A.R. – 1,000 S.F. per Employee
- Population (General)
  - A 10 percent reduction was applied to vacant residential land of 500 acres or greater to accommodate roads and other public and semi-public land uses.
- Population (Households)
  - A 93.4 percent occupancy rate was used to determine the amount of future households. However, if a City cited a different number, then the city's

number was used. The 93.4 percent occupancy rate was reported in the 2005 U.S. Census for Collin County.

- Population (Persons)
  - The number of persons in each TSZ was calculated by using each TSZs person per household and multiplying by the number of households.

In order to project 2020 and 2035 population and employment, growth rates were determined for each TSZ based on the municipal comprehensive plans and observed growth patterns in each TSZ or city area. The complete listings of the 2020, 2035 and ultimate build-out population and employment figures for each of the TSZs are shown in **Figure 17**.

In general, Collin County is developing or growing from the southwest (e.g., Dallas, Plano, and Richardson) to the northeast/east portion of the county (e.g., Anna, Melissa, Blue Ridge, Farmersville, and Josephine). Furthermore, cities in the southwestern portion of the county will reach build-out earlier than cities in the northeastern/eastern portion.

2.1M Build-Out Scenario:

As a whole, if the northern and eastern portions of the county continue to develop in a rural nature, the county is projected to reach its build-out ~~or ultimate~~ population of approximately 2,088,000 people in 2054. This would be 2.6 times the base year 2012 population of approximately 808,830. In 2013, the estimated population of Collin County was 854,788. The county will reach its build-out ~~or ultimate~~ employment in the year 2055 with approximately 1,168,000 jobs within the county. This would be 3.6 times the base year 2012 employment of 325,177.

3.4M Build-Out Scenario:

Alternatively, if the northern and eastern portions of the county develop in a manner similar to the western and southern portions of the county, the build-out scenario produces an ultimate population of 3,440,682 persons and ultimate employment of 1,598,020 jobs.

The resulting population and employment projections are shown graphically in **Figure 17**. The population forecasts for 2012, 2020, 2035, and build-out are illustrated by the population density maps showing in **Figures 18, 19, 20A, ~~and~~ 20B, and 21**. Each dot represents 250 residents.

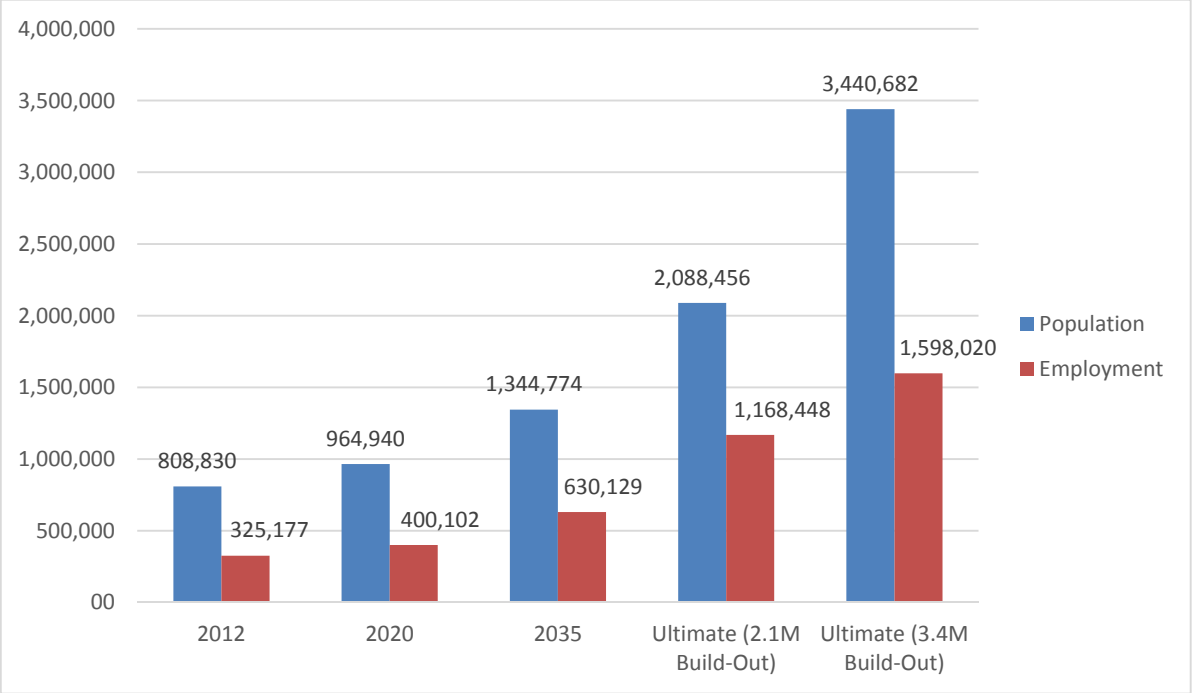

Figure 17: Collin County Population and Employment Forecasts

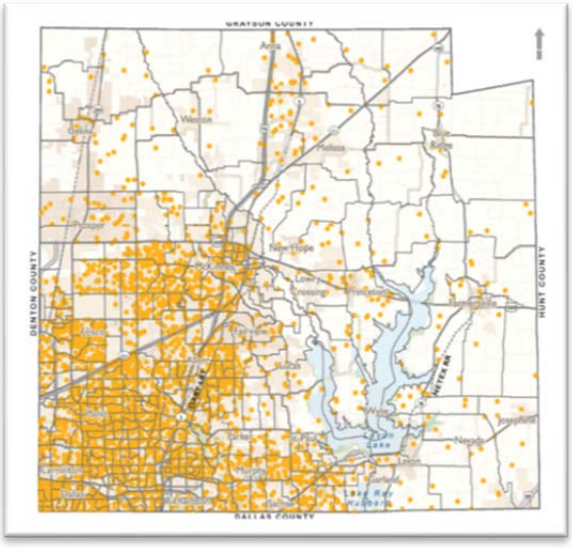

Figure 18: Collin County Population Estimate – 2012
(1 dot = 250 residents)
Source: Freese and Nichols, Inc.

Figure 19: Collin County Population Estimate – 2020
(1 dot = 250 residents)
Source: Freese and Nichols, Inc.

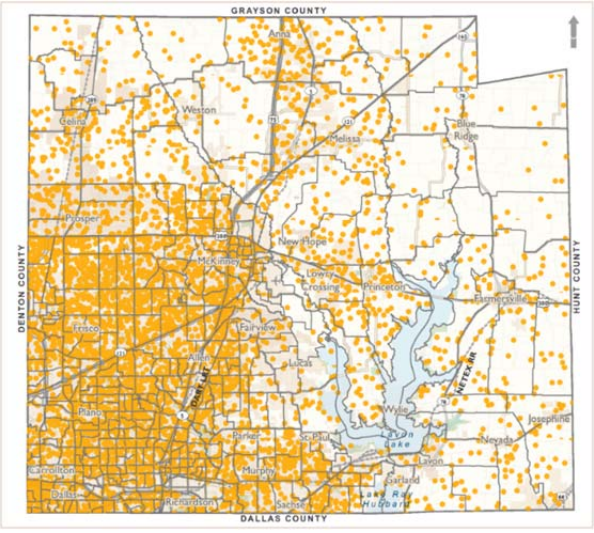

Figure 20 A: Collin County Population Estimate – 2035
(1 dot = 250 residents)
Source: Freese and Nichols, Inc.

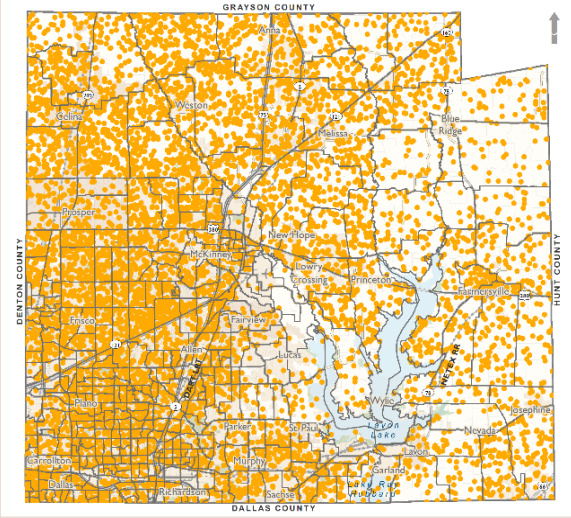

Figure 20 B: Collin County Population (2.1M Scenario Build-Out)
(1 dot = 250 residents)
Source: Freese and Nichols, Inc.

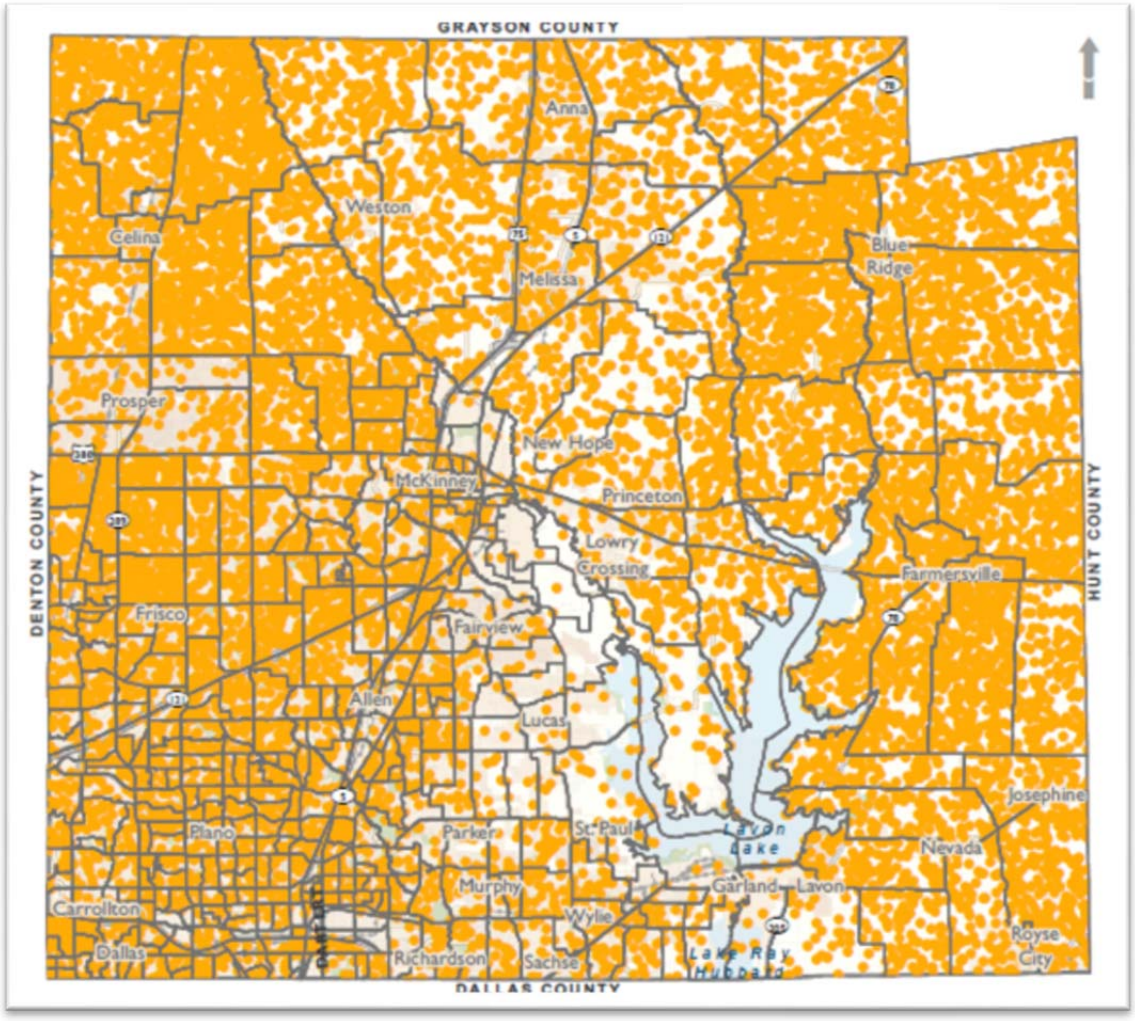

Figure 21. Collin County Population (3.4M Scenario Build-out)
(1 dot = 250 residents)
Source: Freese and Nichols, Inc

In some areas, particularly in the southwestern portion of the county, build-out may occur prior to 2025. In other areas, such as in the northeast, build-out may occur after 2025. For example, the City of Plano is projected to build-out within the next ten years. However, the Cities of Allen and Frisco are projected to build-out within the next 15 years, while the City of McKinney may not build-out for 25 years. ~~The~~ For the 2.1M Scenario, the greatest concentration of population and employment will be located on the west side of the county. This area stretches from Plano northward to Celina and also includes the cities of Allen, Frisco, McKinney, and Wylie. This area reflects the county's urbanized area with residential development consisting of a variety of housing types and densities. Area non-residential development ranges from local retail to manufacturing. For the 3.4M Scenario, population and employment are more evenly distributed since the development pattern in eastern Collin County matches closely with the development pattern in western Collin County.

The employment forecasts for 2012, 2020, 2035, and build-out are shown in **Figures ~~21,~~ 22, 23~~A, and 23B~~, 24A, 24B, and 25.** Each dot represents 250 employees. The population and employment forecasts for city groups of TSZs are listed in **Tables 4** and **5**. The City Areas listed in these tables do not coincide with the incorporated areas of the respective municipalities. The City Areas are groupings of TSZs that roughly associate with the location of the cities. Consequently the population and employment projections for City Areas do not represent forecasts for each of the cities referenced in **Tables 4** and **5**.

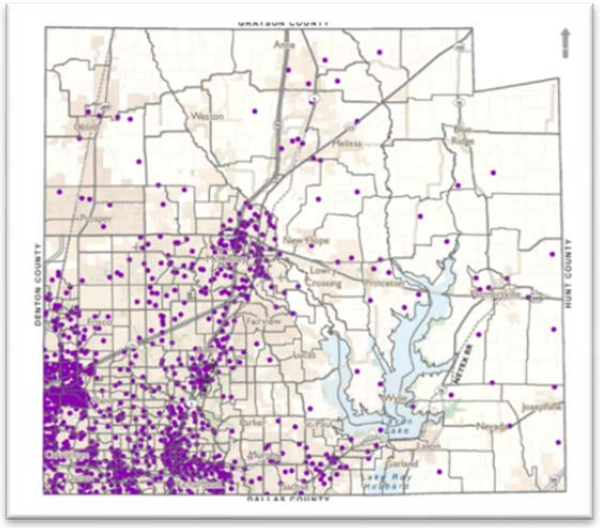

Figure 2~~1~~2: Collin County Employment Estimate – 2012
(1 dot = 250 employees)
Source: Freese and Nichols, Inc.

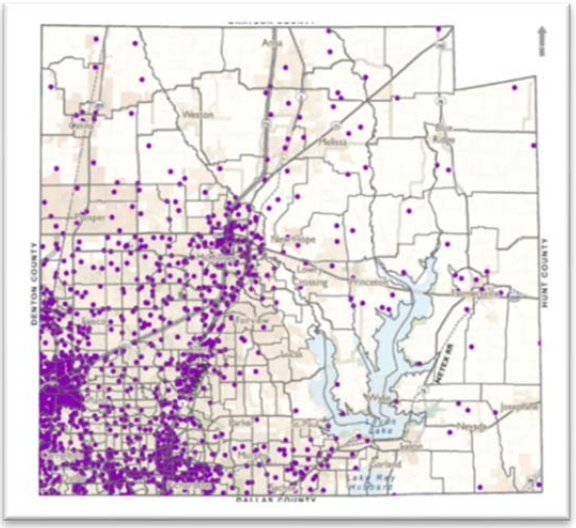

Figure 2~~2~~3: Collin County Employment Estimate – 2020
(1 dot = 250 employees)
Source: Freese and Nichols, Inc.

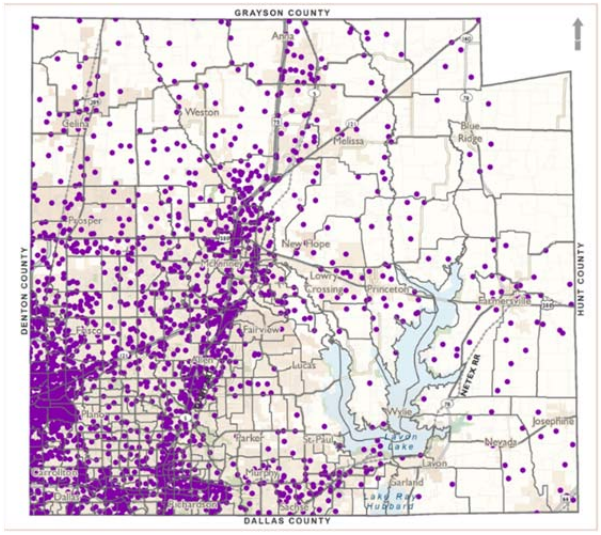

Figure 2~~3~~4 A: Collin County Employment Estimate – 2035
(1 dot = 250 employees)
Source: Freese and Nichols, Inc.

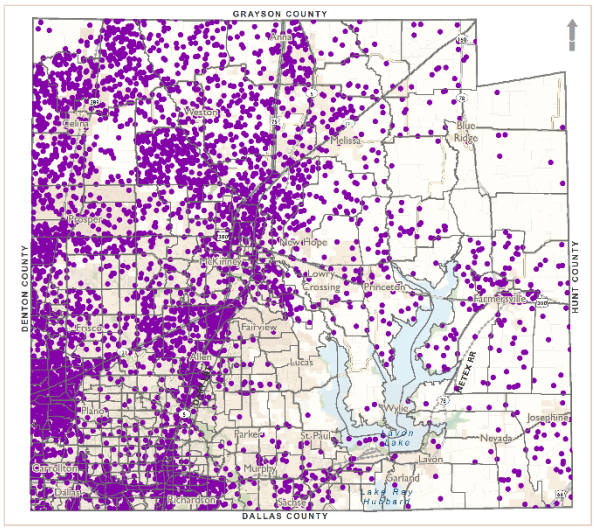

Figure 2~~3~~4 B: Collin County Employment (2.1M Scenario Build-Out)
(1 dot = 250 employees)
Source: Freese and Nichols, Inc.

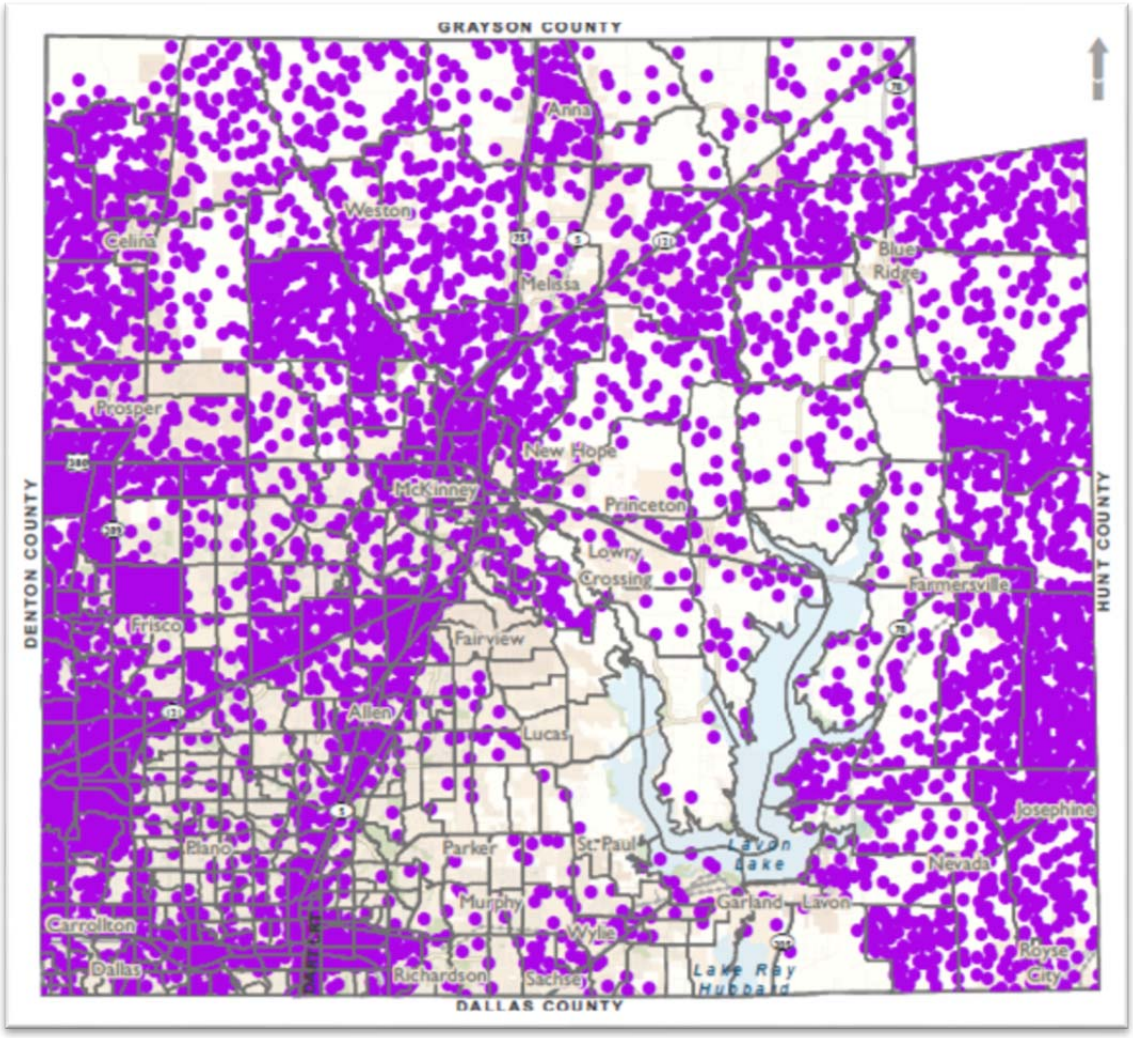

Figure 25. Collin County Employment (3.4M Scenario Build-out)
(1 dot = 250 employees)
Source: Freese and Nichols, Inc

Table 4: Collin County Population Projections for City Area Groupings of TSZs

Population						
City Area	2012	2020	2035	CAGR	Ultimate (2.1M Scenario)	Ultimate (3.4M Scenario)
Allen	78,950	87,506	94,781	**0.80%**	94,781	110,365
Anna	9,228	19,928	48,505	**7.48%**	146,017	285,736
Blue Ridge	4,144	4,849	14,372	**5.56%**	62,581	413,041
Carrollton	Classified Under Plano					
Celina	7,417	15,002	50,954	**8.74%**	189,199	421,000
Dallas	70,085	71,320	74,169	**0.25%**	74,169	74,169
Fairview	8,672	12,010	20,025	**3.71%**	20,025	20,135
Farmersville	6,625	8,660	29,808	**6.76%**	106,002	371,188
Frisco	70,723	105,501	183,592	**4.23%**	183,592	275,814
Garland	Classified Under Richardson					
Josephine	754	1,584	3,169	**6.44%**	6,338	22,763
Lavon	2,224	5,179	10,357	**6.92%**	20,715	41,779
Lowry Crossing	2,984	4,663	13,955	**6.94%**	23,146	23,146
Lucas	6,130	6,494	10,219	**2.25%**	13,406	13,406
McKinney	133,055	180,175	244,530	**2.68%**	350,279	403,968
Melissa	6,090	8,752	26,009	**6.52%**	71,793	77,901
Murphy	14,952	17,014	18,072	**0.83%**	18,072	18,072
Nevada	2,946	3,625	6,567	**3.55%**	11,770	56,767
New Hope	Classified Under McKinney					
Parker	6,604	7,316	12,417	**2.78%**	12,417	12,417
Plano	271,970	278,029	284,656	**0.20%**	284,656	301,168
Princeton	12,511	15,189	40,164	**5.20%**	78,304	106,943
Prosper	10,515	20,004	32,031	**4.96%**	35,058	35,058
Richardson	33,765	35,700	41,761	**0.93%**	45,151	45,151
Rockwall	656	1,133	2,834	**6.57%**	5,667	23,746
Royse City	2,060	2,735	10,226	**7.22%**	40,906	87,084
Sachse	4,477	5,110	6,227	**1.44%**	7,122	7,122
Saint Paul	1,856	1,965	2,400	**1.12%**	2,666	2,666
Van Alstyne	Classified Under Anna					
Weston	1,285	3,370	9,053	**8.86%**	127,026	132,477
Wylie	38,153	42,126	53,919	**1.52%**	57,599	57,599
Totals	**808,830**	**964,940**	**1,344,774**	**2.24%**	**2,088,456**	**3,440,682**
Compound Annual Growth Rates	Years 2012-2020			**2.230%**		
	Years 2020-2035			**2.237%**		

Note: City Areas are based on TSZ boundaries as described in Section 4.1.2

Source: Projections by Freese and Nichols updated for the 2014 Collin County Mobility Plan Update

Table 5: Collin County Employment Projections for City Area Groupings of TSZs

Employment						
City Area	2012	2020	2035	CAGR	Ultimate (2.1M Scenario)	Ultimate (3.4M Scenario)
Allen	21,076	27,320	47,171	3.56%	62,142	54,024
Anna	1,731	3,275	12,914	9.13%	48,899	85,347
Blue Ridge	1,274	1,444	3,263	4.17%	9,385	139,667
Carrollton	Classified Under Plano					
Celina	2,159	4,221	12,900	8.08%	136,411	113,595
Dallas	16,290	18,073	19,216	0.72%	19,216	19,216
Fairview	1,574	3,003	13,820	9.91%	13,820	13,820
Farmersville	2,772	3,092	9,225	5.37%	34,250	151,125
Frisco	33,488	51,576	92,322	4.51%	132,284	175,257
Garland	Classified Under Richardson					
Josephine	149	209	350	3.78%	450	32,017
Lavon	353	552	995	4.61%	2,270	11,325
Lowry Crossing	346	624	2,049	8.04%	4,031	4,031
Lucas	604	842	1,731	4.68%	2,605	2,605
McKinney	43,105	58,905	98,748	3.67%	246,487	246,487
Melissa	1,438	2,570	14,639	10.62%	28,284	53,442
Murphy	1,623	2,249	3,231	3.04%	3,231	3,231
Nevada	609	765	1,242	3.15%	1,888	26,216
New Hope	Classified Under McKinney					
Parker	499	513	561	0.51%	1,432	1,432
Plano	160,916	176,819	212,429	1.21%	230,533	228,888
Princeton	2,924	3,554	9,378	5.20%	19,570	18,982
Prosper	1,262	2,948	10,222	9.52%	34,996	34,996
Richardson	20,953	24,698	33,770	2.10%	39,362	39,362
Rockwall	89	89	89	0.00%	89	18,108
Royse City	416	472	2,672	8.42%	10,316	38,352
Sachse	1,395	2,022	4,732	5.45%	5,547	5,547
Saint Paul	113	113	113	0.00%	113	113
Van Alstyne	Classified Under Anna					
Weston	287	435	6,794	14.75%	64,366	64,366
Wylie	7,732	9,718	15,554	3.09%	16,468	16,468
Totals	**325,177**	**400,102**	**630,129**	**2.92%**	**1,168,448**	**1,598,020**
Compound Annual Growth Rates	Years 2012-2020			**2.626%**		
	Years 2020-2035			**3.074%**		

Note: City Areas are based on TSZ boundaries as described in Section 4.1.2

Source: Projections by Freese and Nichols updated for the 2014 Collin County Mobility Plan Update

4.2. Forecasting Process

4.2.1. The Travel Demand Forecasting Process

The travel demand forecasting process for the 2014 Collin County Mobility Plan Update was a collaborative effort between the Jacobs team and NCTCOG. The forecasting process used the Dallas-Fort Worth Regional Travel Model for the Expanded Area (DFX), customized for Collin County to address the demographic forecasts and transportation network in the county. ~~NCTCOG model coordination and analysis.~~

Since the early 1960s, travel demand forecasting models have been used as a tool in the transportation decision making process. These models simulate existing and future traffic on the transportation network and measure the impact of possible changes or additions. The projected Levels of Service (LOS) for the Collin County thoroughfare networks in 2020 and 2035 are shown in **Figure 24A** and **Figure 24B** on the following pages. The basic steps in the travel demand forecasting process include the following four steps:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

In general, person trips are generated based on established relationships for trip-making activity; distributed between zones based on their relative attractiveness; converted to vehicle trips by adjusting for auto occupancy and transit ridership; and then assigned to the roadway network according to the shortest time path between each origin and destination, while taking into consideration the constraining effect of individual roadway capacities.

As a part of the modeling process for Collin County, traffic assignments were prepared for the interim year (2020), and the horizon year (2035). Additional traffic assignments were also prepared for two build-out scenarios for Collin County. The projected LOS for the Collin County thoroughfare network for the two build out scenarios are shown in **Figure 24C** and **Figure 24D.**

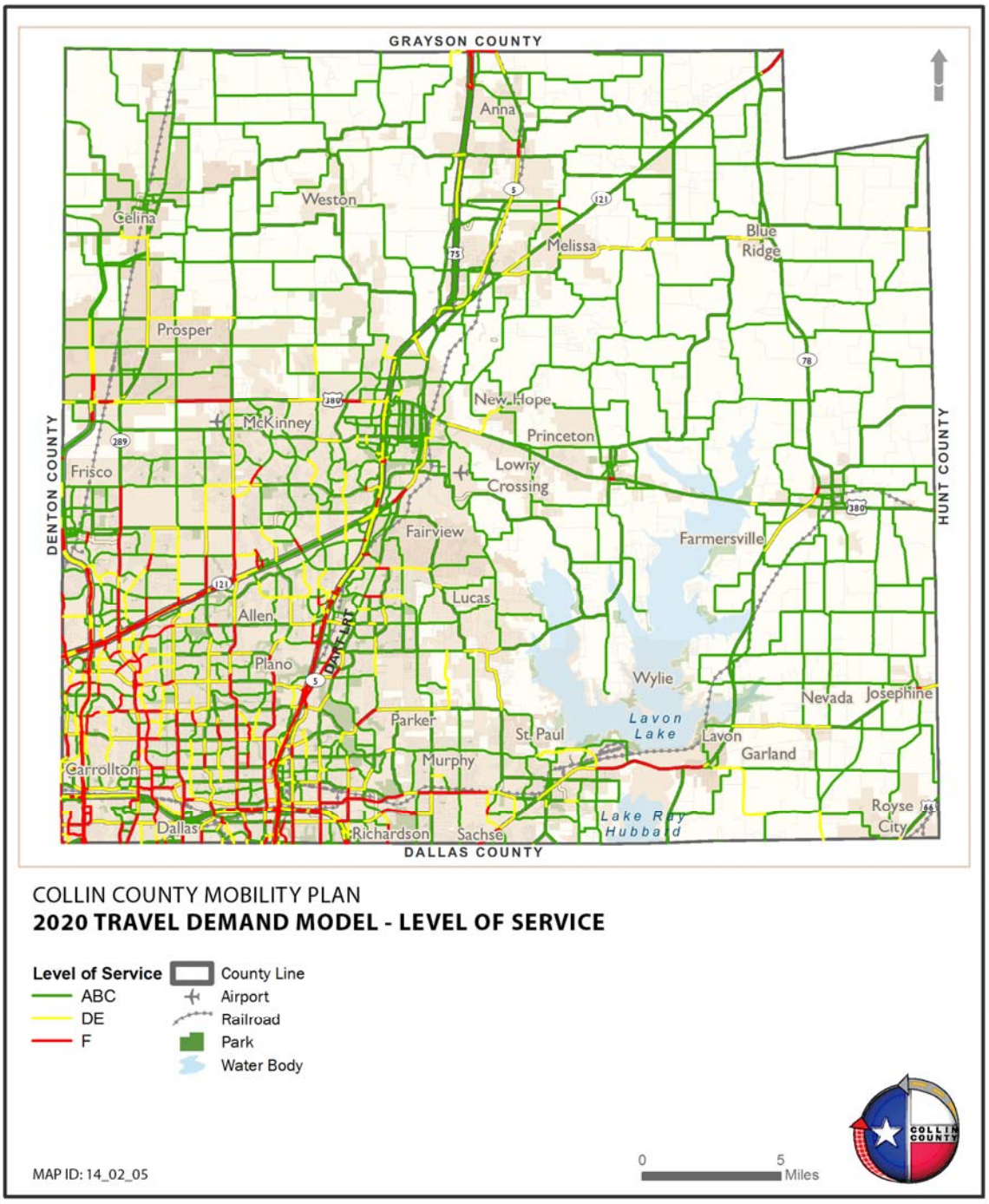

Figure 24A: 2020 Level of Service

Note:
Red segments identify roadways with LOS F
Yellow segments identify roadways with LOS D or E
Green segments identify roadways with LOS A, B, or C

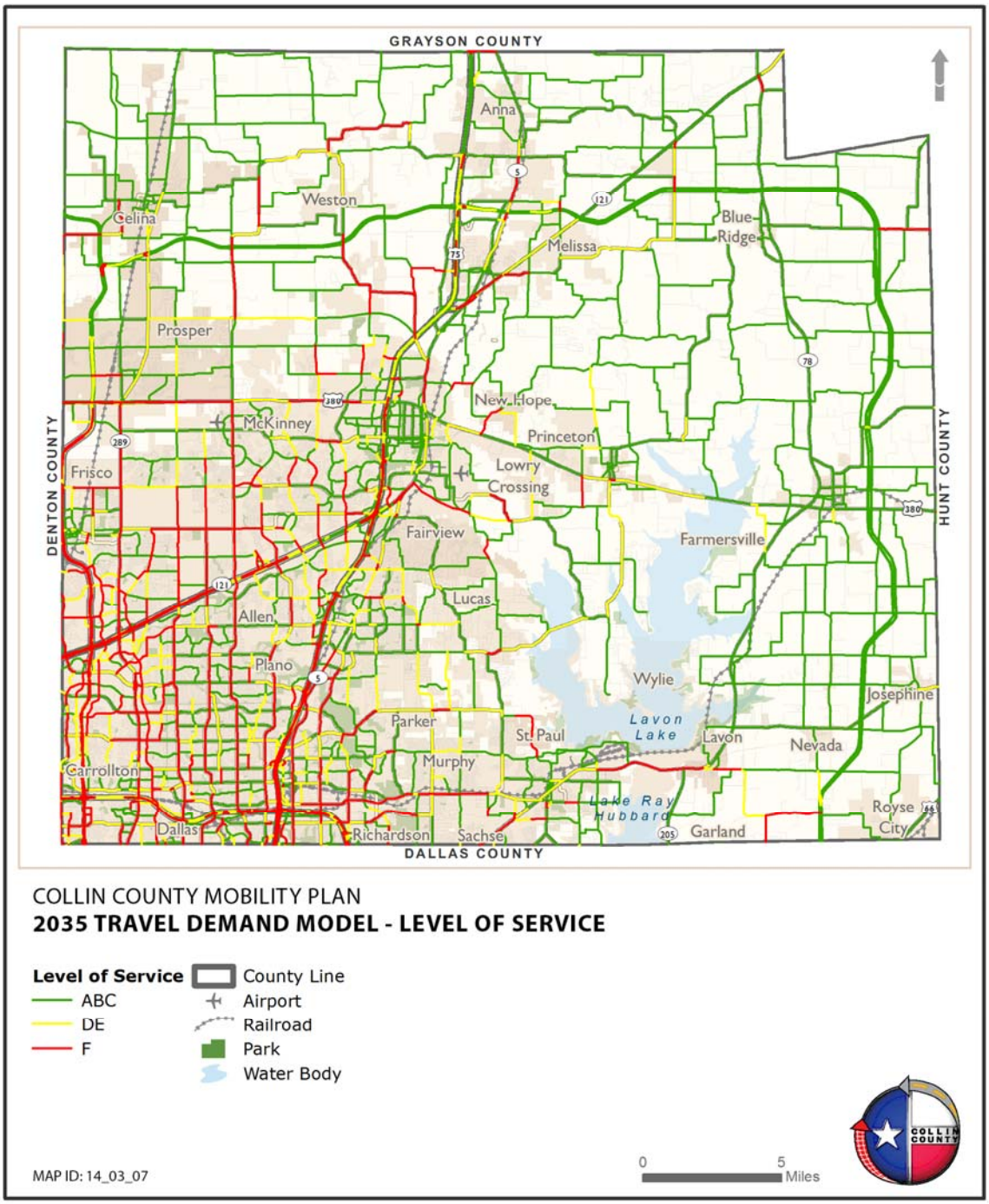

Figure 24B: 2035 Level of Service

Note:
Red segments identify roadways with LOS F
Yellow segments identify roadways with LOS D or E
Green segments identify roadways with LOS A, B, or C

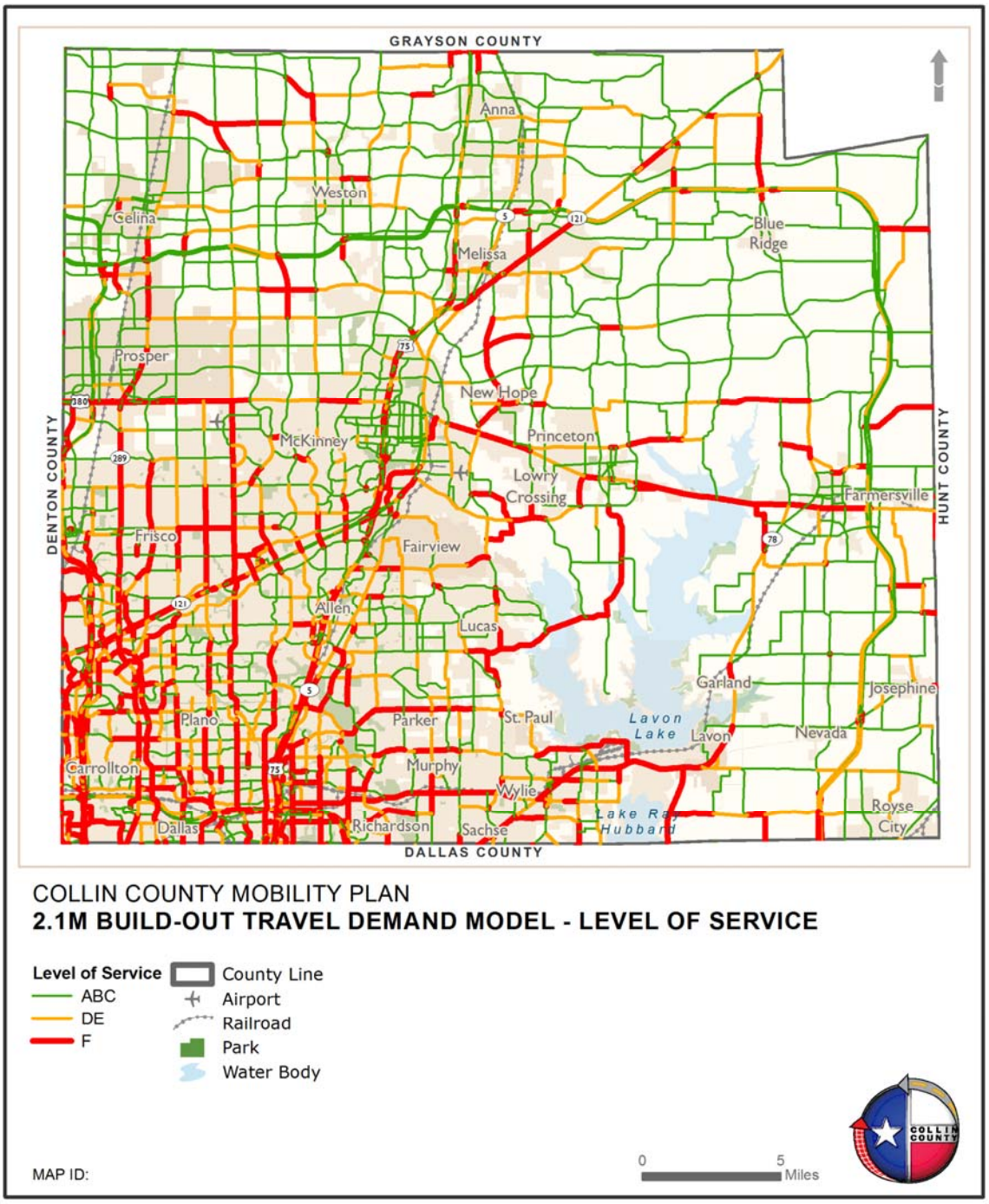

Figure 24C: 2.1M Build-Out Level of Service

Note:
Red segments identify roadways with LOS F
Yellow segments identify roadways with LOS D or E
Green segments identify roadways with LOS A, B, or C

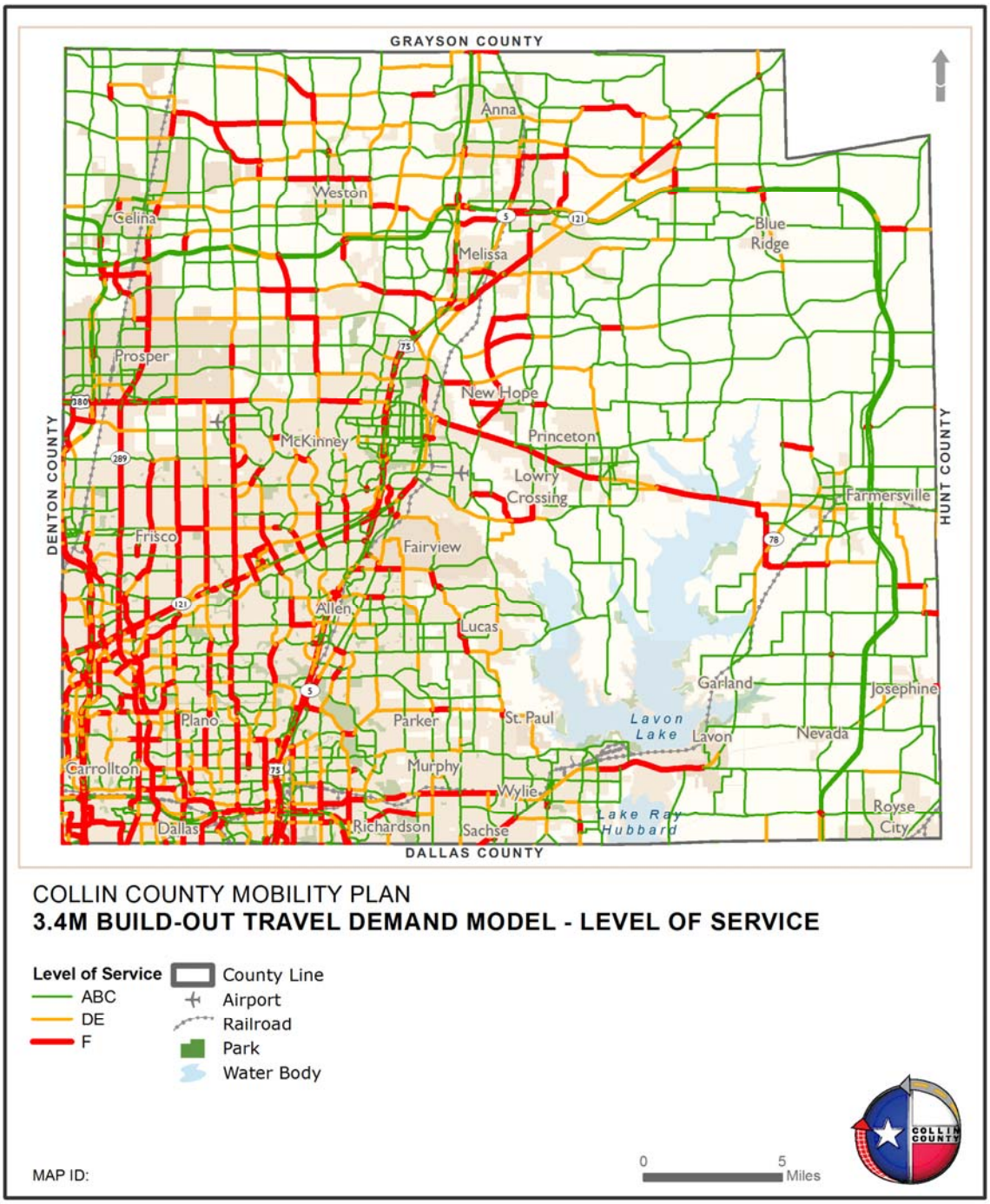

Figure 24D: 3.4M Build-Out Level of Service

Note:
Red segments identify roadways with LOS F
Yellow segments identify roadways with LOS D or E
Green segments identify roadways with LOS A, B, or C

4.2.2. Transportation Networks

The Dallas-Fort Worth Regional Travel Demand Model for the Expanded Area (DFX), developed by NCTCOG, was used for the forecasting process. The transportation networks within the model were verified and updated by the Jacobs team to include existing and funded projects. Traffic assignments were then performed by the Jacobs team for 2020 and 2035 using the updated transportation networks. The traffic assignments were based on:

4. The ultimate projections for population and employment within the County, as determined from the local Comprehensive Plans;
5. The currently projected ultimate population and employment for the DFW Area, as estimated by NCTCOG; and
6. The roadway and transit improvements recommended in NCTCOG's 2035 Regional Mobility Plan.

Following review of the resulting traffic volume projections, additional refinements were made to the model network in order to identify a transportation system that would sufficiently accommodate projected travel demand over the next 20-25 years. The resulting networks for 2020 and 2035 include the number of traffic lanes which are shown in **Figure 25A** and **Figure 25B**.

For the Build-Out Scenario analysis, the complete Collin County thoroughfare plan was coded into the model network. A connection from the Collin County Outer Loop to I-35 was also added to the network following previously studied alignments through Denton County. The resulting network for the Build-Out scenario includes the number of traffic lanes which are shown in **Figure 25C**.

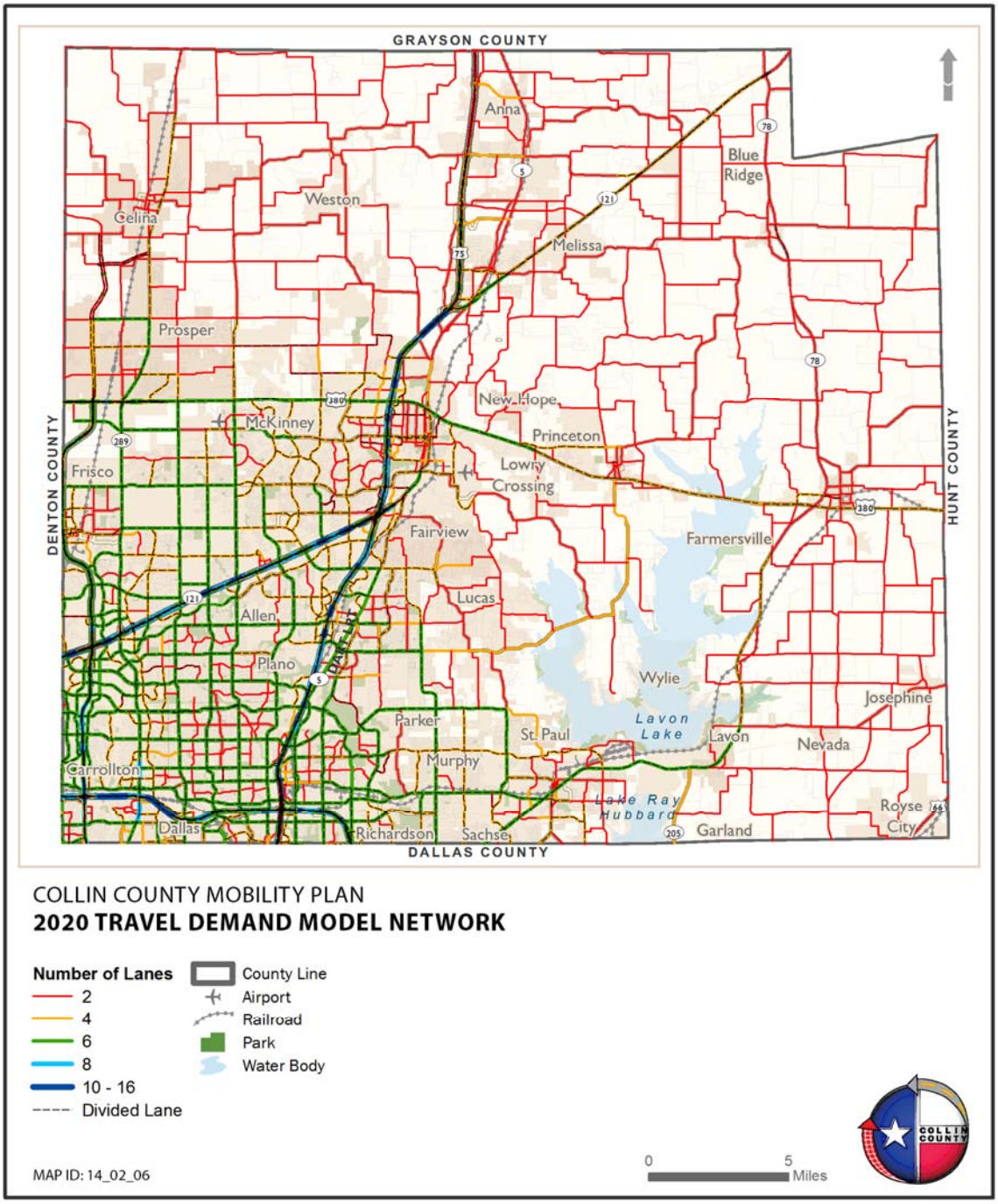

Figure 25A: 2020 Network Number of Lanes

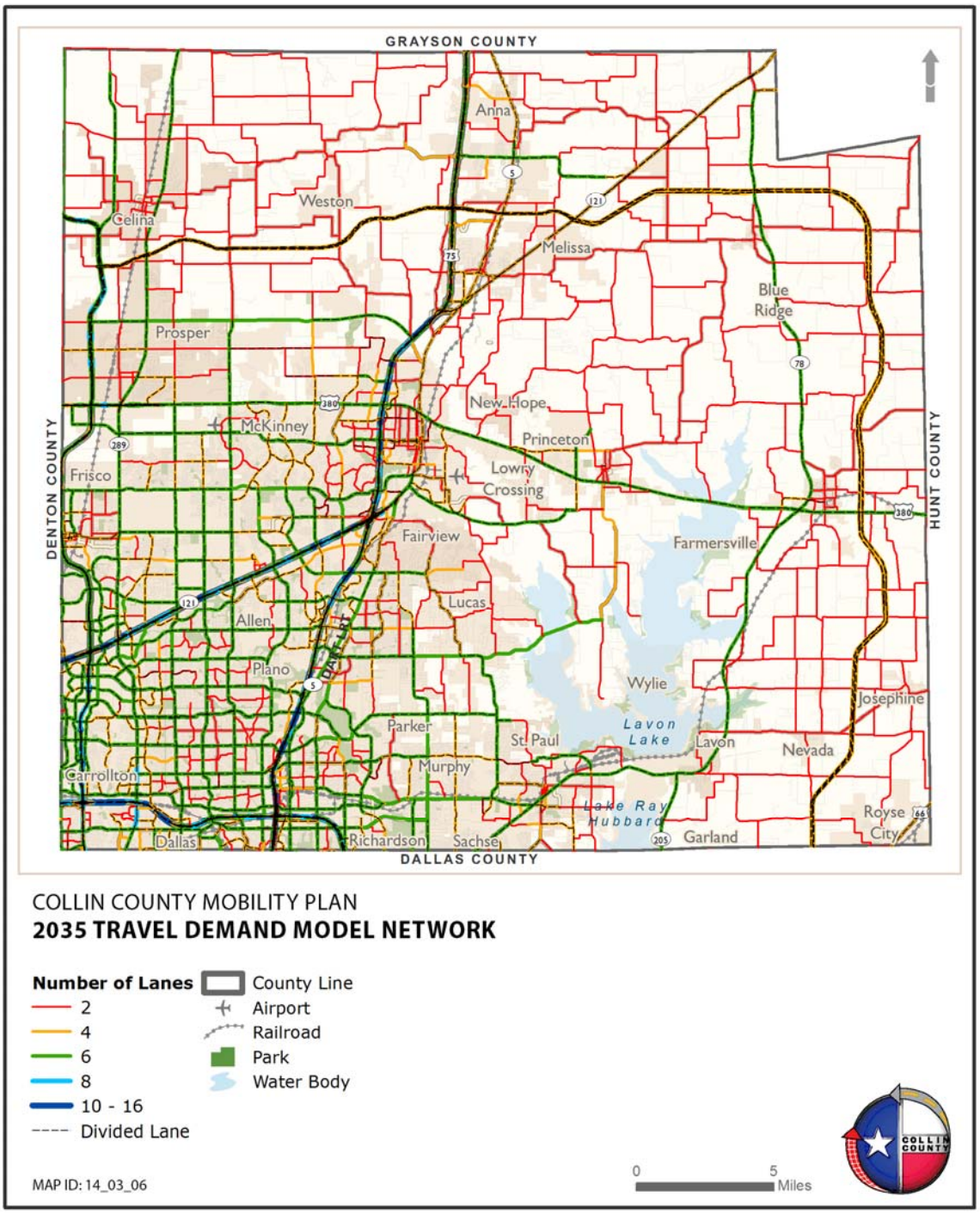

Figure 25B: 2035 Network Number of Lanes

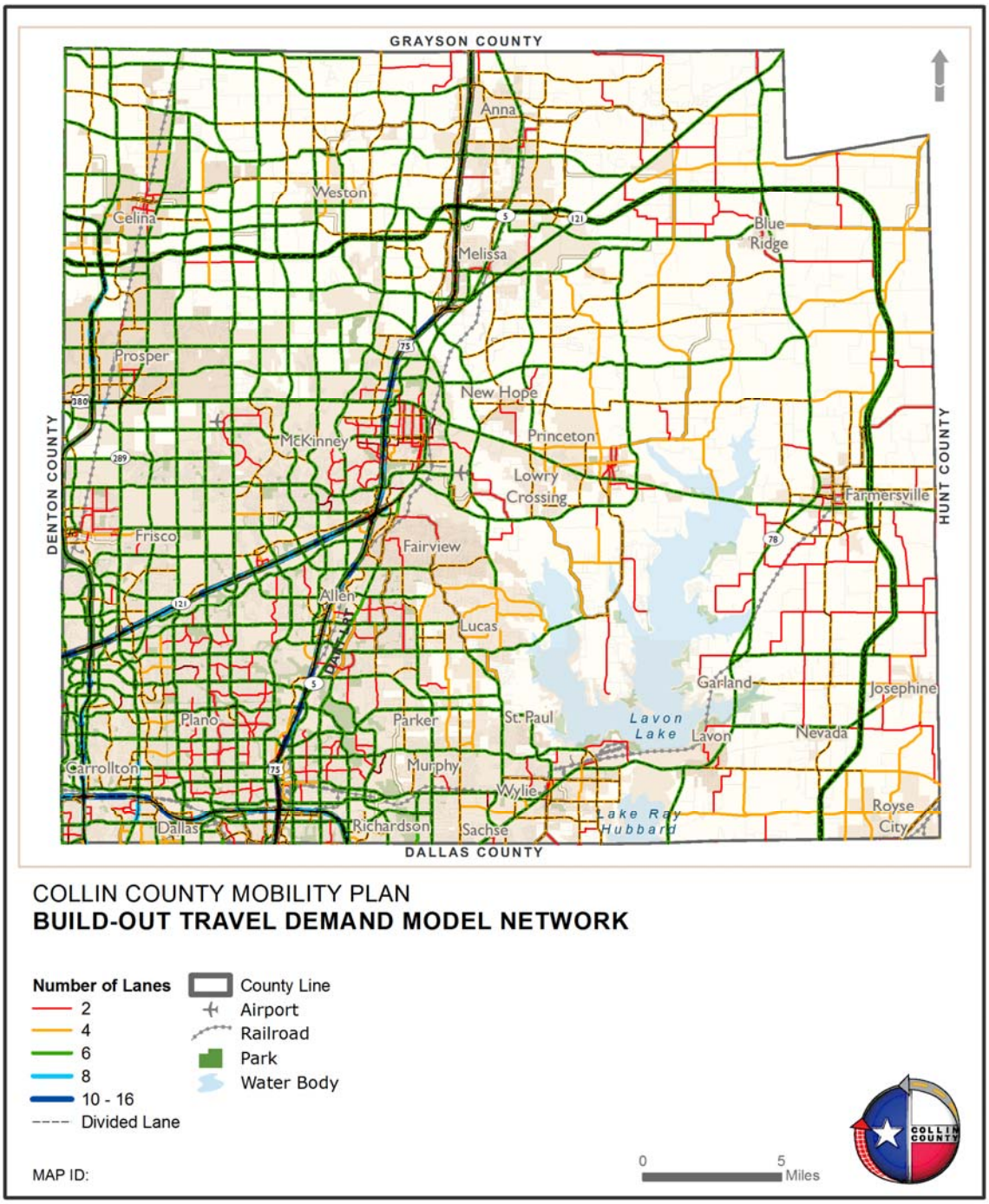

Figure 25C: Build-Out Network Number of Lanes

4.2.3. Regional Travel Model

Travel models use input data consisting of demographic and employment variables combined with a detailed description of the transportation system to determine how many trips will be generated, how these trips will be distributed across the study area, what mode of travel (auto, carpool, transit, etc.) travelers will use, and what routes trip makers will select (based on travel delay and other constraints) to reach their destination.

DFX is a four-step trip-based travel demand model that covers approximately 105,000 square miles in the North Central Texas Region. The referenced modeling area includes the counties of Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise. To focus the travel model on Collin County and to customize the modal data and transportation system networks to address the assumptions being applied for the 2014 CCMP Update, revisions were made to the model input data and transportation system networks. These revisions included an update of the demographic and employment forecasts of anticipated growth in Collin County for the milestone years 2020 and 2035 as well as for two (2) full build out scenarios of the county. The data representing daily traffic volumes for 2012 and 2035 are shown in **Figure 26A** and **Figure 26B**. The data representing daily traffic volumes for the build out scenarios are shown in **Figure 26C** and **Figure 26D**.

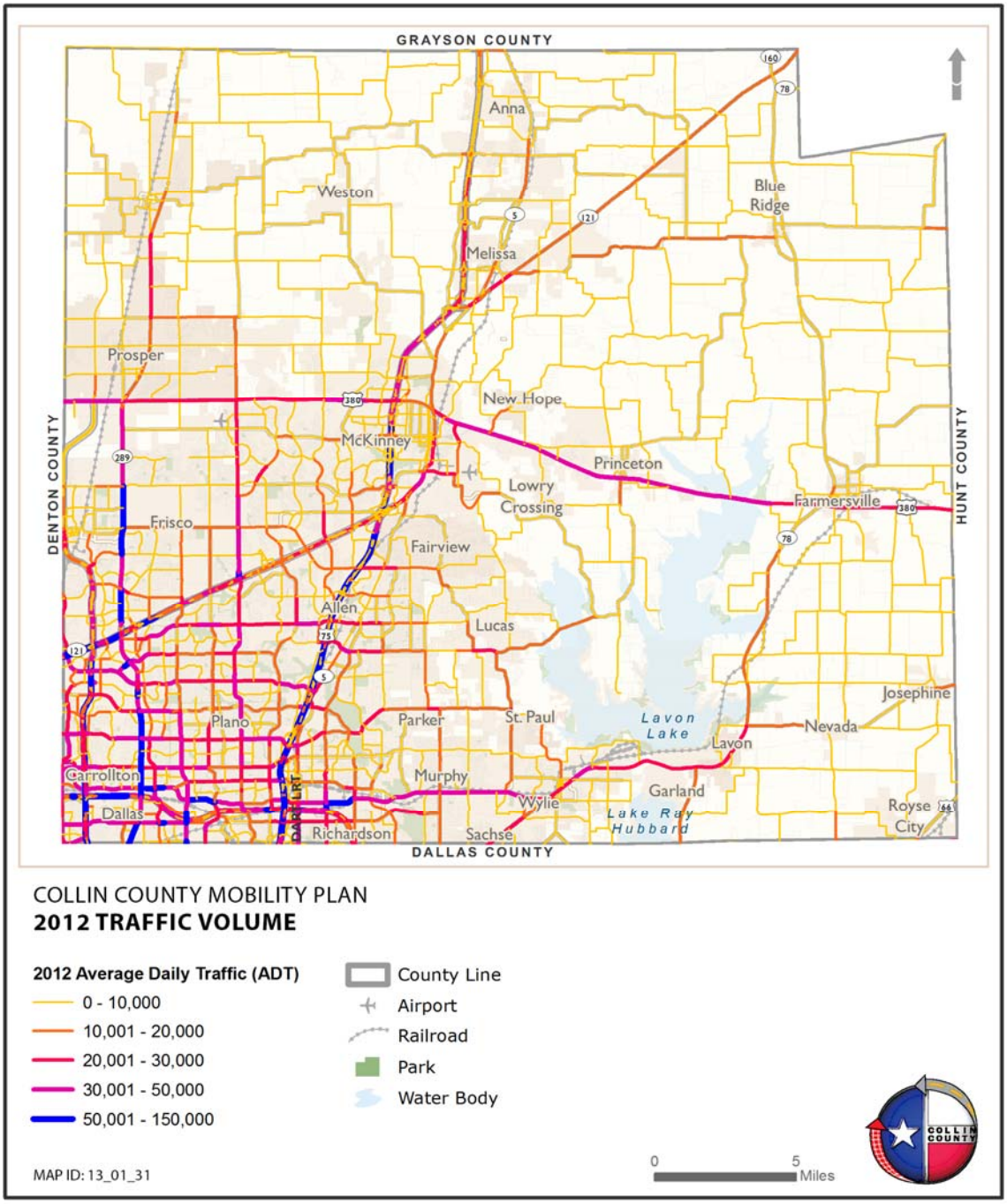

Figure 26A: 2012 Daily Traffic Volumes

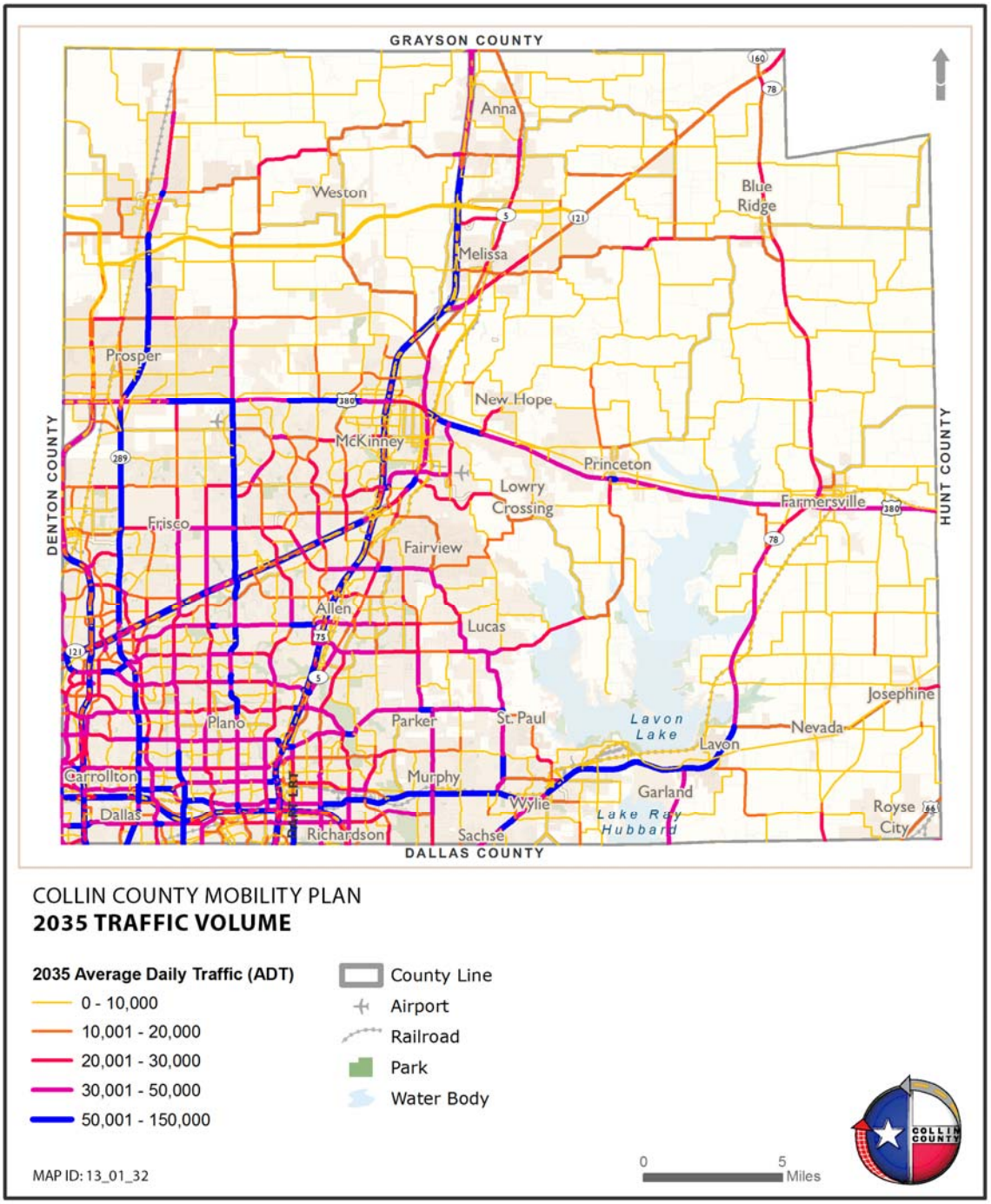

Figure 26B: 2035 Daily Traffic Volumes

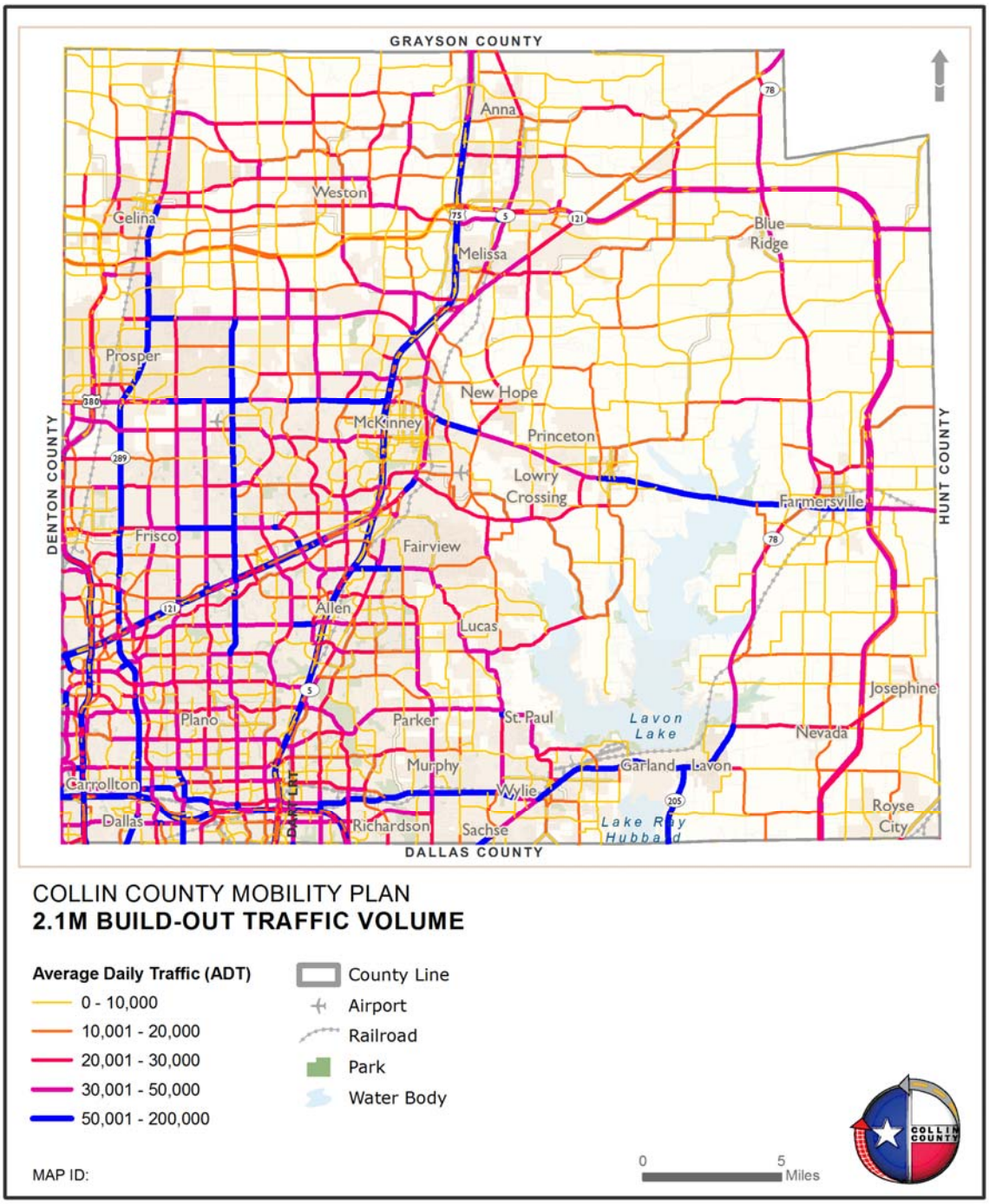

Figure 26C: 2.1M Build-Out Daily Traffic Volumes

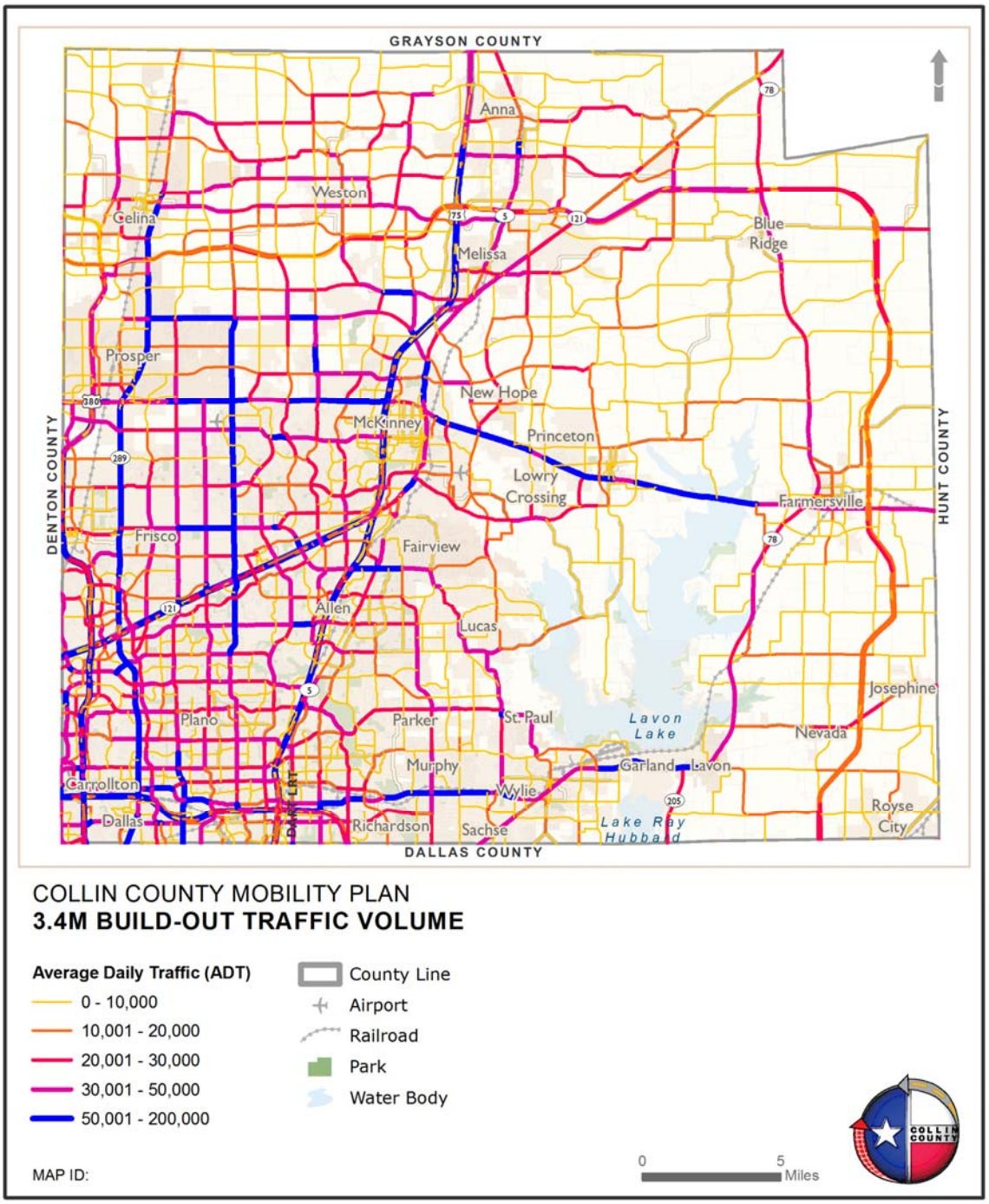

Figure 26D: 3.4M Build-Out Daily Traffic Volumes

NCTCOG highway networks were also modified to reflect committed and proposed roadway projects that were to be included in the CCMP Update, but were not included in the standard NCTCOG highway networks. These modified demographic inputs and highway network refinements were developed by the Jacobs team and provided to NCTCOG's Travel Model Development Group who coded the highway networks and performed the initial travel model runs using the adjusted demographics and network definition. The NCTCOG Travel Model Development Group performed initial model runs for ~~three~~ four scenarios:

1. Scenario Number 1 is a 2020 analysis that applied the anticipated 2020 demographic and employment growth to a transportation network consisting of existing and committed projects. Committed projects are those that are under construction or are fully and irrevocably funded for construction and are expected to be operational by the 2020 analysis year.

2. Scenario Number 2 is a 2035 analysis that applied the anticipated 2035 demographics and employment growth to a transportation network consisting of all of the existing, committed, and proposed projects included in the NCTCOG 2035 Regional Mobility Plan.

3. Scenario Number 3 is a 2.1 million population Build-Out analysis that applied the ~~full~~ build-out demographics to the transportation network representing the NCTCOG 2035 Regional Mobility Plan.

4. Scenario Number 4 is a 3.4 million population Build-Out analysis that applied the build-out demographics to the transportation network representing the NCTCOG 2035 Regional Mobility Plan.

NCTCOG provided the results of these initial travel model runs to the Jacobs team for interpretation, analysis, and reporting. To make the travel forecast results useful within the context of the CCMP update, the Jacobs team used the initial runs performed by NCTCOG to develop a statistical profile of each scenario based on a set of selected measures-of-effectiveness derived from the travel model output.

In addition to compiling the statistical profile of each scenario, the Jacobs team used trip tables and networks provided by NCTCOG to perform additional travel model runs to

identify capacity deficiencies of the existing and committed network. The deficiency analysis consisted of applying the 2035 demographics to various 2035 alternative networks.

The results of this analysis were then compared in terms of Level-of-Service on the transportation system to the statistical profile of the travel forecasts for a build scenario contained in the 2035 Regional Mobility Plan. By comparing the planned improvements against the alternative scenarios, the benefits achieved by the capacity improvements identified in the CCMP can be measured and evaluated.

The Jacobs team used the future travel demand model for year 2020 to analyze portions of the thoroughfare network with projected severe capacity deficiencies (Level of Service F) and to identify potential additional mobility improvement projects for inclusion in the 2014 CCMP Update.

The Jacobs team used the build-out travel demand model scenarios to run the model with the full Collin County thoroughfare plan. This analysis provided an overview of the capability of the thoroughfare plan to accommodate the projected traffic from the build-out of Collin County.

An additional unconstrained or all-or-nothing model run was done for each of the build-out scenarios. This unconstrained model run allowed trips in the model to use the shortest or fastest route between their origin and destination, regardless of the level of congestion. The results from these unconstrained model runs are shown in **Figure 26E** and **Figure 26F**, and show the unconstrained traffic volumes on the network. These results show the main routes that traffic would take if road capacity was not a constraint. Caution should be used in interpreting these results as they are not constrained by capacity and by running the unconstrained analysis there is potentially a lot of variability in the model results.

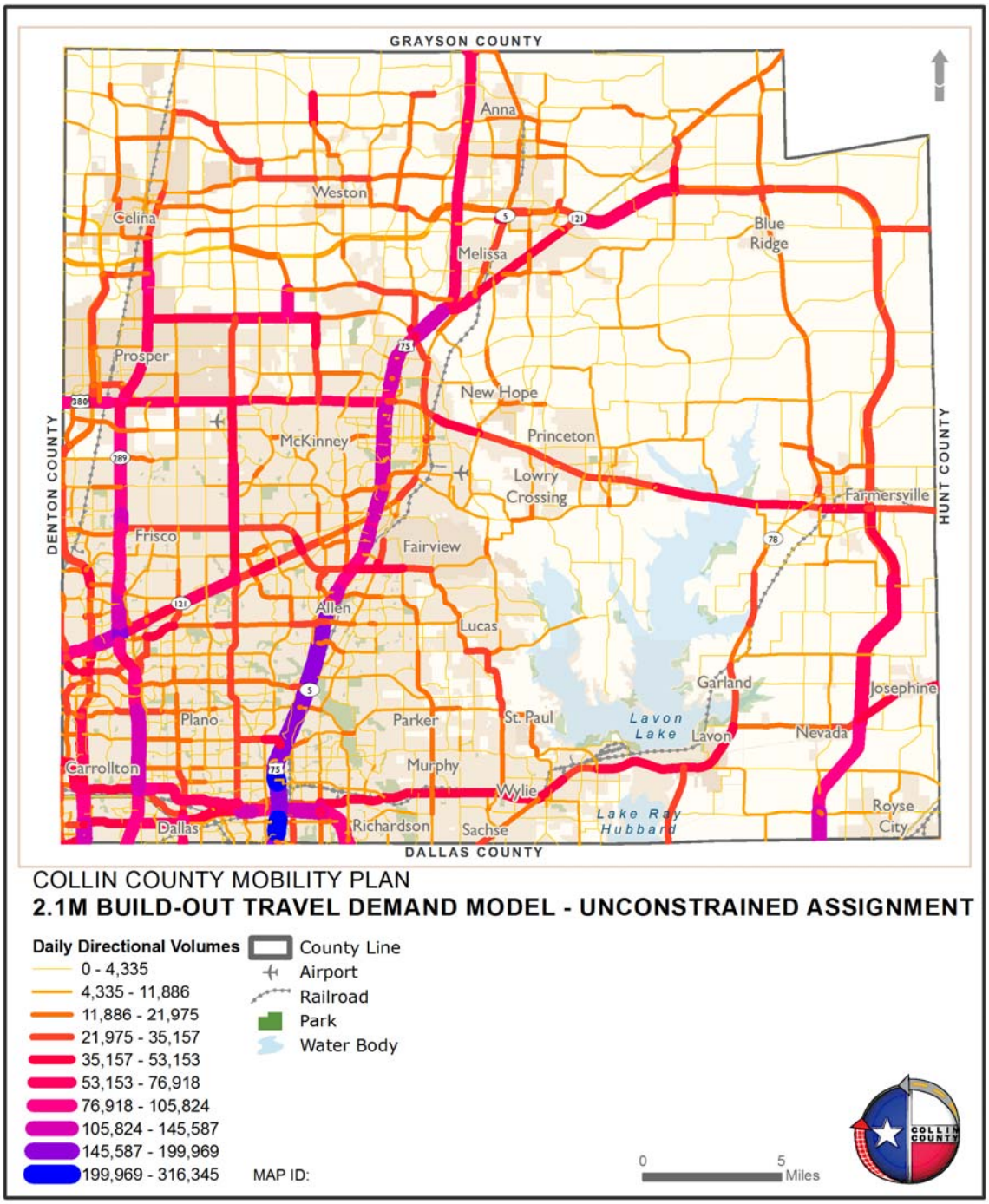

Figure 26E: 2.1M Build-Out Unconstrained Daily Traffic Volumes

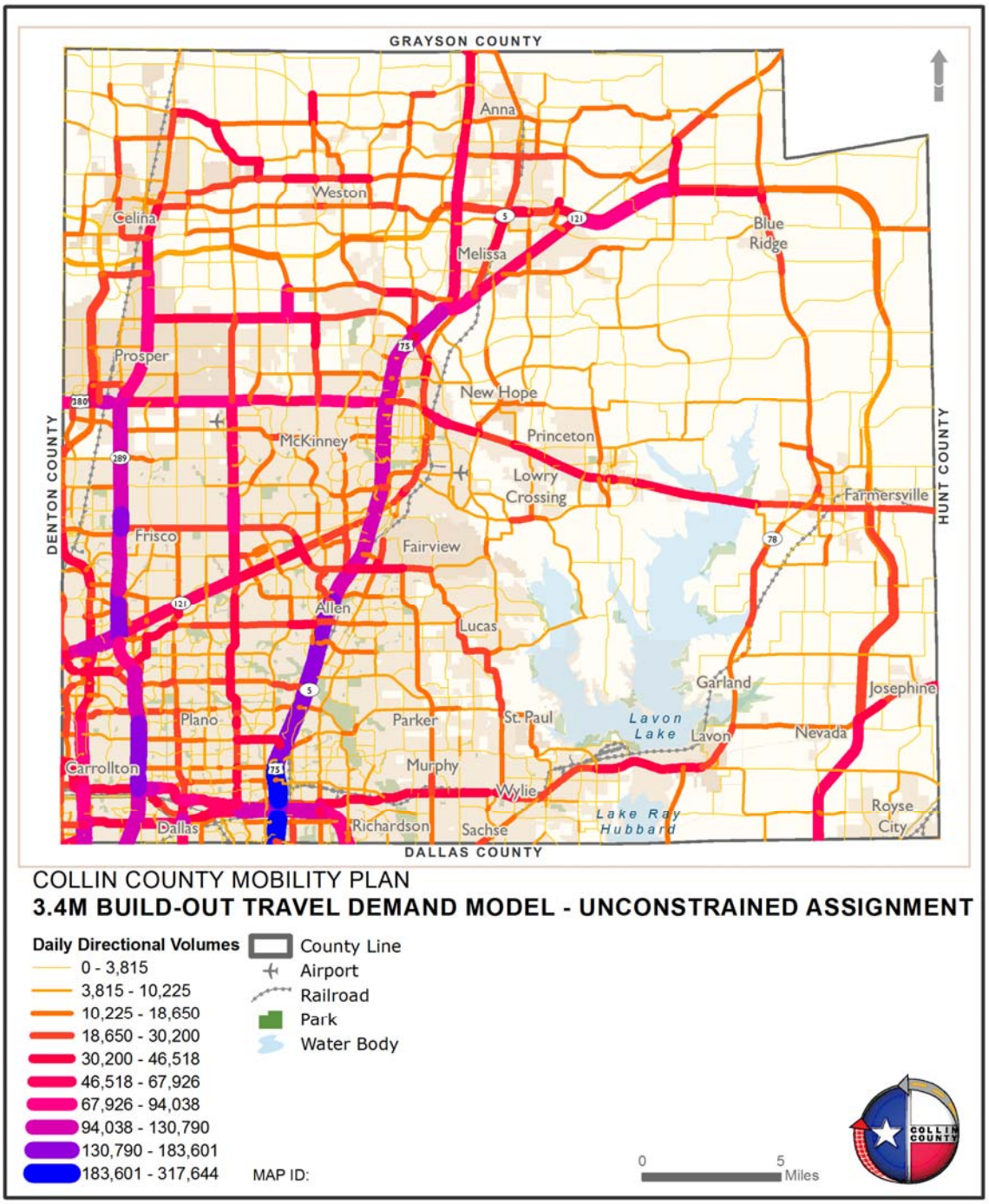

Figure 26F: 3.4M Build-Out Unconstrained Daily Traffic Volumes

The collaborative effort between the Jacobs team and the NCTCOG Travel Model Development Group to develop travel forecasts, statistical profiles, and comparative analysis of transportation system alternatives for the 2014 CCMP Update provides Collin County with the means to fully explore the various options being analyzed and to determine the best course of action to achieve community goals and optimize the county transportation-system.

8.2. Additional Studies Required

An observation that one can make when reviewing the elements of the CCMP is that there are many roadway segments in the 2035 Level of Service map that are projected to operate at a Level of Service F - basically “gridlock”. These projected deficiencies indicate it is not feasible to build enough roadway lane miles to relieve all future congestion. As unacceptable as this may seem, it is a predictable result of continued growth of Collin County and the DFW Area. However, the scope of this study was limited to analyzing improvements within “traditional” standards. For example typical thoroughfares are limited to a maximum of six lanes with signalized at-grade intersections. The 2035 travel demand model (as well as the 2020 model) indicates that the traffic on many of the roadways will simply be more than the capacity of the roadways. These roadways continue to be congested even in the build out scenarios when the full thoroughfare plan has been implemented. Therefore, it is recommended that additional studies be conducted to identify innovative solutions to this “over-capacity” problem. Roadways that should be studied further are:

- US 380, west of Airport Rd in McKinney
- SH 78, between Wylie and Lavon
- Preston Rd/SH 289, from the south county line to US 380

Although other thoroughfares are also projected to operate at LOS F in 2035, the conclusions drawn from studies of these thoroughfares should provide transferable recommendations. These thoroughfares are State facilities and they are within various cities; therefore the studies will have to be done in cooperation with the cities, NCTCOG, and TxDOT.

In addition to these areas that are recommend for further study due to forecasted capacity constraints through 2035, Collin County would benefit from additional study for Limited Access Roads throughout the county. Major corridors including US 380, SH 78, Collin County Outer Loop, and a US 75 reliever route (north-south route east of US 75) will need further study and analysis to provide a complete roadway transportation system for the county.

There are also major portions of the various limited access highways, freeways, and tollways that are projected to operate at LOS F by 2035. Once again a cooperative effort among the appropriate transportation agencies in the County will be needed to study the potential for innovative transportation management options. Some progress is already being made in this area - TxDOT is currently studying the US 75 corridor for this very purpose.

There are several options that are possible solutions to these future capacity and congestion issues. Examples of options are discussed below:

- **Coordinated Signal Progression**. Signal progression is used on many thoroughfares in Collin County today. However, where it is not used, it is recommended that cities include this practice in their signal operations so that traffic flow is optimized. In addition, it is recommended that cities work closely together with each other, NCTCOG, and TxDOT to make sure that signal progression on thoroughfares continues through from one city to the next, not stopping at corporate limit lines. Since this is basically a city function, the county may be limited to encouraging the cities and others on this matter. However, the county may be able to determine and provide some incentives to the cities.
- **Grade-Separated Intersections**. Intersections are the most significant impediment to good traffic flow. Separating the legs of an intersection vertically removes the need for signals for the "through" traffic and dramatically improves traffic flow. "Overpasses" are very unpopular with surrounding businesses and residents, so the likelihood of a city being willing to solve the problem using overpasses is low. An option that might be more palatable is the use of "underpasses". This eliminates the visual issue of a bridge being high above the surface, although it does not totally eliminate all the concerns that businesses have with grade-separated intersections.
- **Parallel Routes**. In most cases, adding another route parallel to or close to a congested thoroughfare is just not realistic. The surrounding land is already developed or there already are parallel roadways. However, it is worth testing each congested thoroughfare to see if there is a potential for either improvements to adjacent, parallel thoroughfares, or the development

of a complete new thoroughfare. SH 78 is an example of a roadway that could possibly benefit from development of another roadway. There is enough undeveloped land south of SH 78 that could possibly accommodate a new roadway facility, and there is a utility corridor that might be used as well. More detailed study and cooperation with the city, landowners and utility company would be required to determine if this is feasible. There may be some opportunities for extension of rail transit on parallel routes beyond those addressed in this 2014 CCMP Update.

- **Turn Lanes and Intersection Configurations.** Sometimes redesigning the configuration of an intersection will increase the capacity of traffic that can proceed through the intersection. This can include the addition of left and/or right turn lanes to separate the turning movements from the thru movements. In locations where turn lanes already exist, additional turn lanes could be added if warranted. For locations where additional turn lanes will not meet the traffic demand, innovative or alternate intersection designs can be considered. Some examples of innovative or alternate intersection designs include displaced left turns, median U-turns, restricted crossing U-turns, and quadrant roadways. There are various additional names for these intersections and new ideas are being developed. As intersections are evaluated for improvements, these innovative or alternate intersection designs should be considered where appropriate.