



CITY OF DENTON TRAVEL DEMAND MODEL UPDATE FOR

Craver Ranch

Denton, Texas

OCTOBER 7, 2025

SUPPLEMENTAL STUDY

PREPARED BY:

Westwood

PROJECT 0059397.00

City of Denton Travel Demand Model Update For:

Craver Ranch

Denton, Denton County, Texas

SUPPLEMENTAL STUDY

Commissioned By: KFM Engineering & Design

For Submittal To: City of Denton

Reference: _____

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EXECUTIVE SUMMARY

This memorandum contains the findings of an alternative Travel Demand Model (TDM) analysis scenario requested by the City of Denton to evaluate traffic conditions without the proposed Denton County Outer Loop. This study supplements the prior study prepared by Westwood, dated September 8, 2025. The alternative scenario differs from the prior study in that it uses the 2016 roadway network and demographic conditions as the baseline year and excludes the proposed Denton County Outer Loop from the roadway network in the vicinity of the Craver Ranch project. To better represent the existing and planned roadway conditions, this analysis retains the modified analytical approach employed in the original study, including redefining the study area into 11 discrete Traffic Analysis Zones (TAZs), relocating zonal centroids, and modifying and adding centroid connectors accordingly. The model results are presented in this memo that correspond in content and sequence to those in the original study for convenience.

END

The services of **Westwood Professional Services** (“Westwood”) were retained by **KFM Engineering & Design** on behalf of the Applicant to prepare the supplemental update of the City of Denton Travel Demand Model for a proposed residential and commercial development located in the City of Denton, Denton County, Texas. The Project is referred to herein as *Craver Ranch* (the “Project”). The proposed Craver Ranch development contains approximately 2,500 acres located in the City of Denton and will be developed in several phases. An adjacent, 225-acre parcel consisting of approximately 115 proposed single-family lots is also included in this analysis, which is referred to herein as *Estates at Craver Ranch*. The supplemental study provides the findings of an alternative TDM analysis scenario requested by the City of Denton to evaluate traffic conditions without the proposed Denton County Outer Loop.

The study was conducted in accordance with the submitted City of Denton Travel Demand Model Update Report for Craver Ranch, dated September 8, 2025. The alternative scenario differs from the prior study in two ways: 1) it uses the 2016 roadway network and demographic conditions as the baseline year, and 2) it excludes the proposed Denton County Outer Loop from the roadway network in the vicinity of the Craver Ranch project. To better represent the existing and planned roadway conditions, this analysis retains the modified analytical approach employed in the original study, including redefining the study area into 11 discrete Traffic Analysis Zones (TAZs), identifying TAZ centroids, and modifying and adding centroid data. The assumptions or methodologies that have been introduced in this study are described in this memo.

TRAN 3.01: Provide a table summarizing all proposed land uses and their corresponding intensities, following the ITE Land Use Codes. Include details such as the number of single-family and multifamily units, commercial or retail acreage and/or square footage, and the number of schools and types. The table should reflect the full build-out of the development as evaluated in the model.

Land Use Update

The City’s original TDM was outlined by a single TAZ (TAZ ID#1500) for the study area, and its land use category is summarized in Table 1 below.

Table 1. Summary of Land Use Updates in Study Area TAZs

LAND USE CATEGORY	Baseline Condition (Acres)	With Project (Acres)
Agriculture	3780.1	1055.19
Commercial	0	163.49
Residential	0	2561.41
Rural Areas	1420.3	1402.3
Undeveloped	264	264
Total	5446.4	5446.4

In coordination with City staff, the study area zoning was redefined from the original configuration into eleven discrete TAZs. This refinement involved subdividing the original TAZ into smaller zones, with socioeconomic data (households, population, and employment) proportionately allocated to each new TAZ based on land area, and adding new socioeconomic data per the developments, which is shown in Tables 2, 3, and 4. Exhibit 1 shows the boundaries of the 11 TAZs within the study area in relation to the Craver Ranch and Estates at Craver Ranch development limits, and Exhibit 2 shows how the updated TAZs align with the conceptual site plan for the proposed developments.

Table 2. Land Use Updates in Study Area TAZs

LAND USE CATEGORY	#4145	#4146	#4147	#4148	#4149	#4150	#4151	#4152	#4153	#4154	#4155	Total
Baseline Condition Redistributed												
Agriculture	-	-	27.4	121.7	-	-	21.82	467.8	323	-	93.47	1055.19
Rural Areas	542.4	185.9	-	-	233	118.7	-	-	193	129.3	-	1402.3
Undeveloped	264	-	-	-	-	-	-	-	-	-	-	264
Craver Ranch and Estates at Craver Ranch Developments												
Commercial	-	28.75	10.05	26.82	11.9	11.55	45.97	11.2	17.25	-	-	163.49
Residential – Single Family	-	101.8	353.35	-	197.6	466.2	410.28	156.2	332.7	273.9	117.73	2409.75
Residential – Townhomes	-	10.75	5	-	11.9	11.55	9.85	11.2	17.25	-	-	77.5
Residential – Multi-Family	-	12	20.2	17.88	-	-	24.08	-	-	-	-	74.16
Total	806.4	339.2	416	166.4	454.4	608	512	646.4	883.2	403.2	211.2	5446.4

Table 3. Socio-Economic Data Distributed in Study Area TAZs – Baseline Conditions

SOCIOECONOMIC DATA	#1500 (2016 Base)	#4145	#4146	#4147	#4148	#4149	#4150	#4151	#4152	#4153	#4154	#4155
Total Households	329	49	20	25	10	27	37	31	39	53	24	13
Total Population	894	132	56	68	27	75	100	84	106	145	66	35
School Enrollment	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	0	0	0	0	0	0	0	0	0	0	0
Office	16	2	1	1	0	1	2	2	2	3	1	1
Service	3	0	0	1	0	0	0	1	0	1	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total Employment	19	2	1	2	0	1	2	3	2	4	1	1

TRAN 3.02: The approved TSC25-0016 indicates approximately 11,340 dwelling units for the proposed development (SF-D: 9,195; SF-A: 861; MF: 1,374). However, Table 4 shows that the model evaluated only 9,025 units (excluding the baseline 329 units and Estates at Craver Ranch 115 units). Please clarify this discrepancy.

Table 4. Updated Socio-Economic Data in Study Area TAZs – With Project

SOCIOECONOMIC DATA	#4145	#4146	#4147	#4148	#4149	#4150	#4151	#4152	#4153	#4154	#4155	
Total Households	49	726	1764	272	922	978	1634	715	1220	773	416	Total = 9,469
Total Population	132	2176	5290	815	2762	2932	4902	2138	3652	2316	1246	
School Enrollment	0	0	600	0	0	1800	0	0	600	0	0	
Retail	0	142	53	79	60	63	197	76	100	0	0	
Office	2	1	0	0	1	0	0	1	2	0	0	
Service	0	0	0	0	0	0	0	0	1	0	0	
Industrial	0	0	0	0	0	0	0	0	0	0	0	
Total Employment	2	143	53	79	61	63	197	77	103	0	0	

TRAN 3.03: Include the background calculations in the Appendix (tabular format) showing how the socioeconomic data for each category was generated for each TAZ.

TRAN 3.04: Please clarify whether the study considered the teacher-to-student ratio when estimating teacher employment data.

TRAN 3.04: Add a column having the total estimate for each socioeconomic category

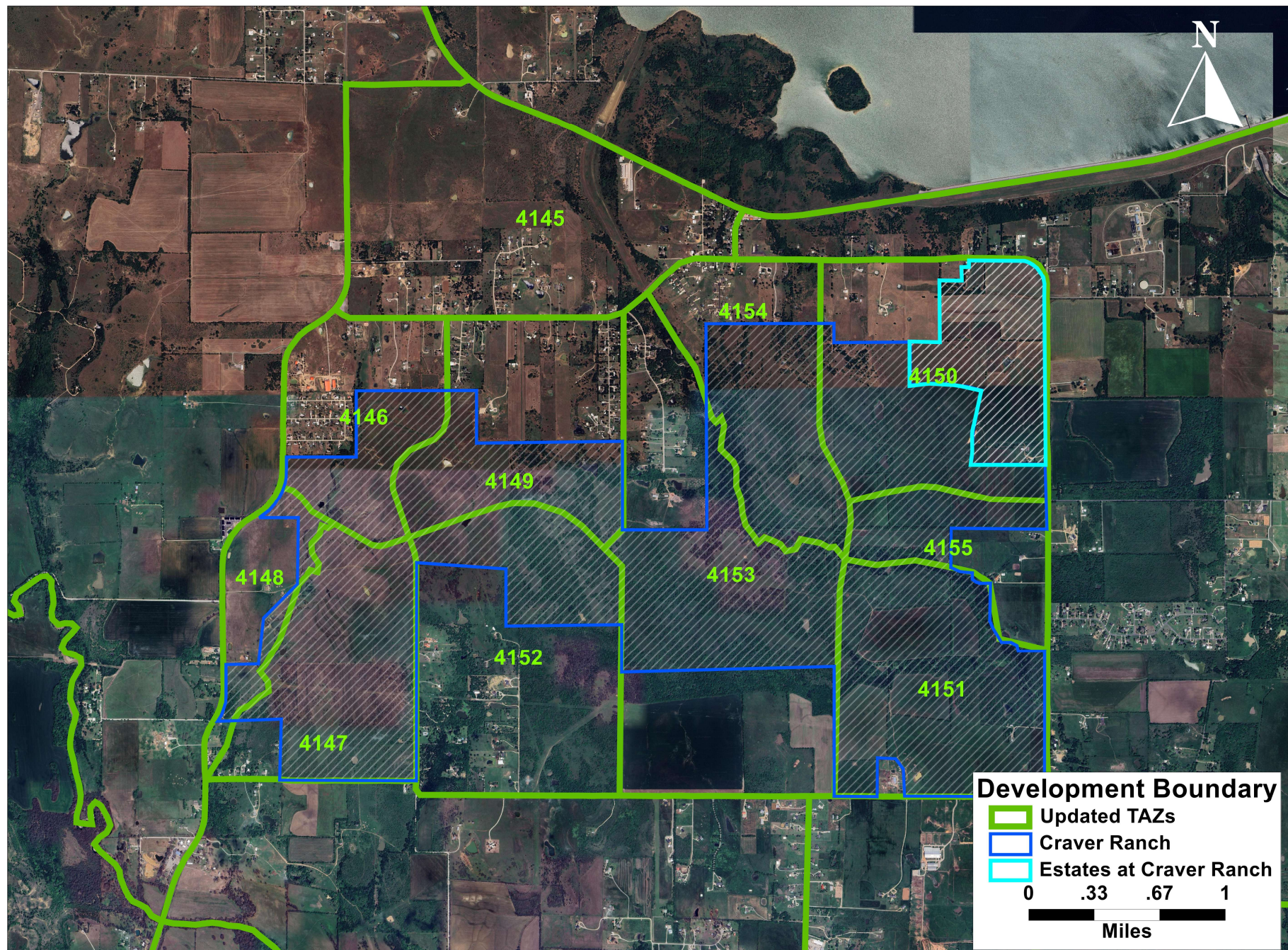


Exhibit 1 - Craver Ranch Development Study Limits and Updated Traffic Analysis Zones

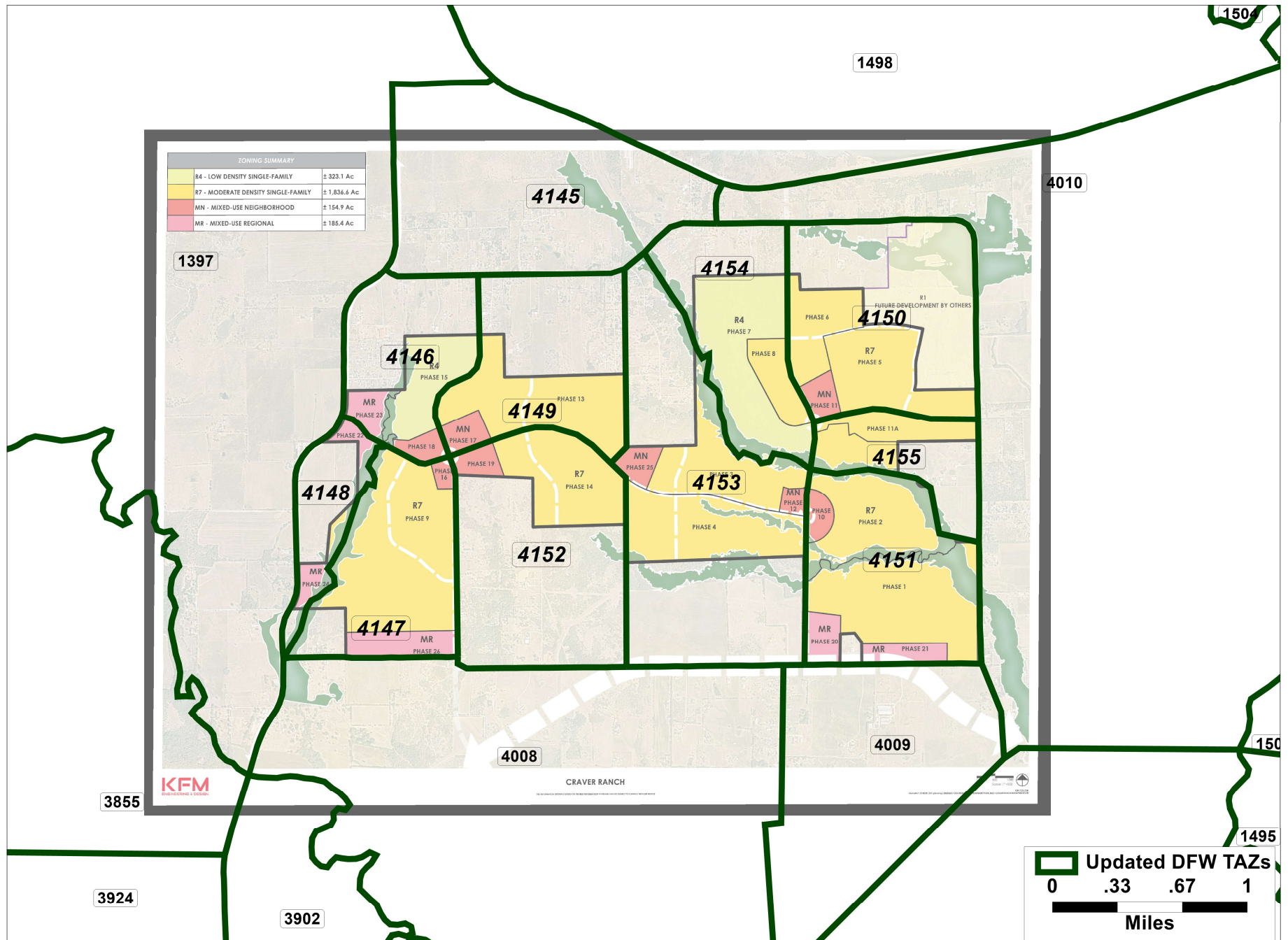


Exhibit 2 - Updated Traffic Analysis Zones and Craver Ranch Concept Plan

Study Area Roadways

The study site is located north of Shepherd Road/Gribble Springs Road, east of FM 2164, and south and west of FM 2153. In the Base model, FM 2164 and FM 2153 are both designated as Minor Arterials. Shepherd/Gribble Springs Roads are designated as Collector. The alignments of two future north-south Secondary Arterials and one future east-west Secondary Arterial are located within the site, which are coded as Minor Arterials, along with Collectors, as shown in Exhibit 3. Roadway network features, including functional classification, number of lanes, and posted speed limit, are shown in Table 5.

Analysis Results

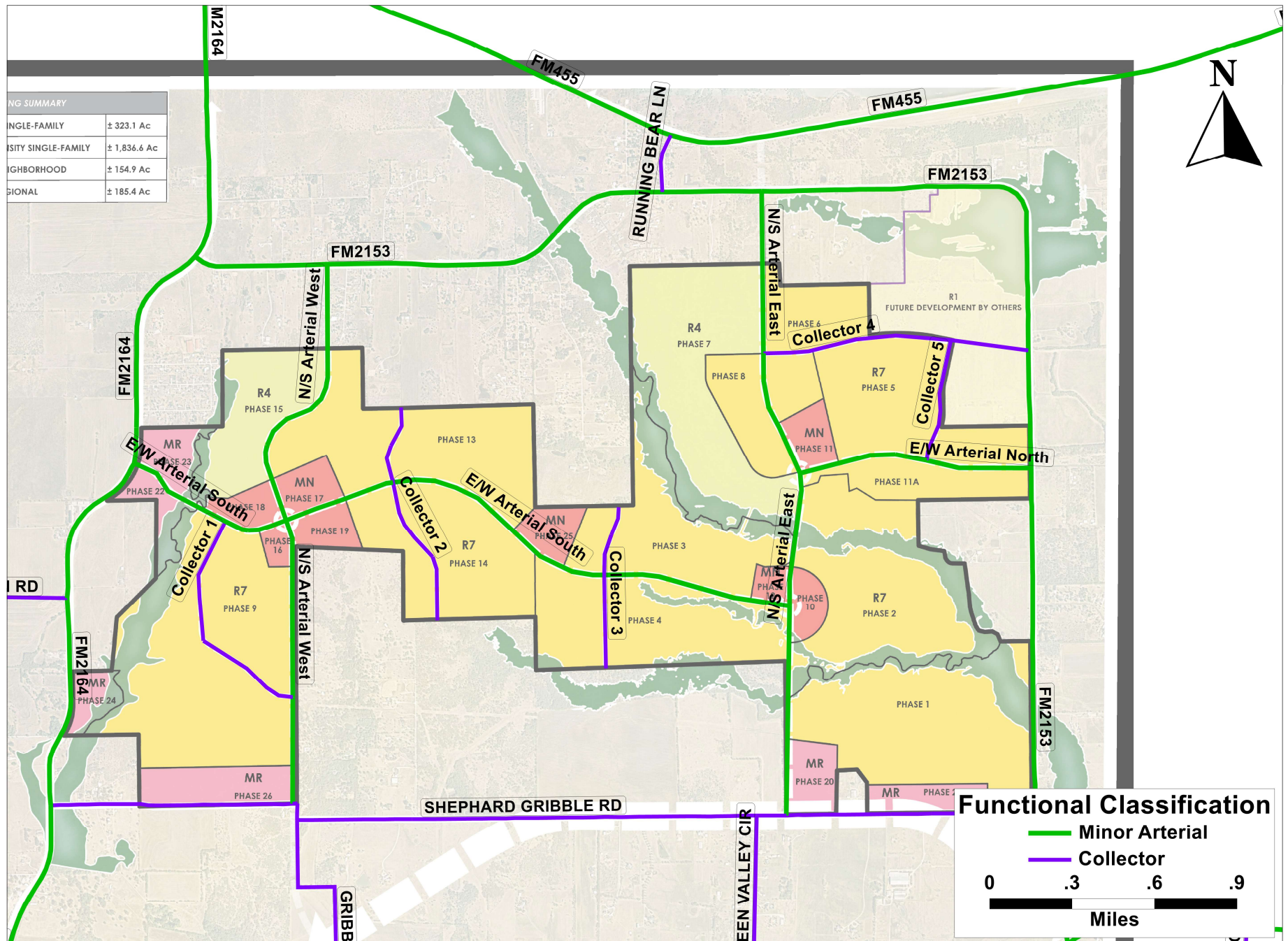
For this analysis, the City of Denton's 2016 TDM was used as the base model. The locations of the centroid and centroid connectors for each TAZ have been carefully determined, considering the center of gravity of a zone's major trip-generating locations based on the Craver Ranch site plan and existing residential areas to provide fair trip distribution.

For this supplemental study, the following scenarios were analyzed:

- I. Year 2016 Baseline Conditions with proposed Craver Ranch roadway network
- II. Year 2016 Craver Ranch Development (i.e., includes socio-economic data in accordance with proposed Craver Ranch land uses) with proposed Craver Ranch roadway network

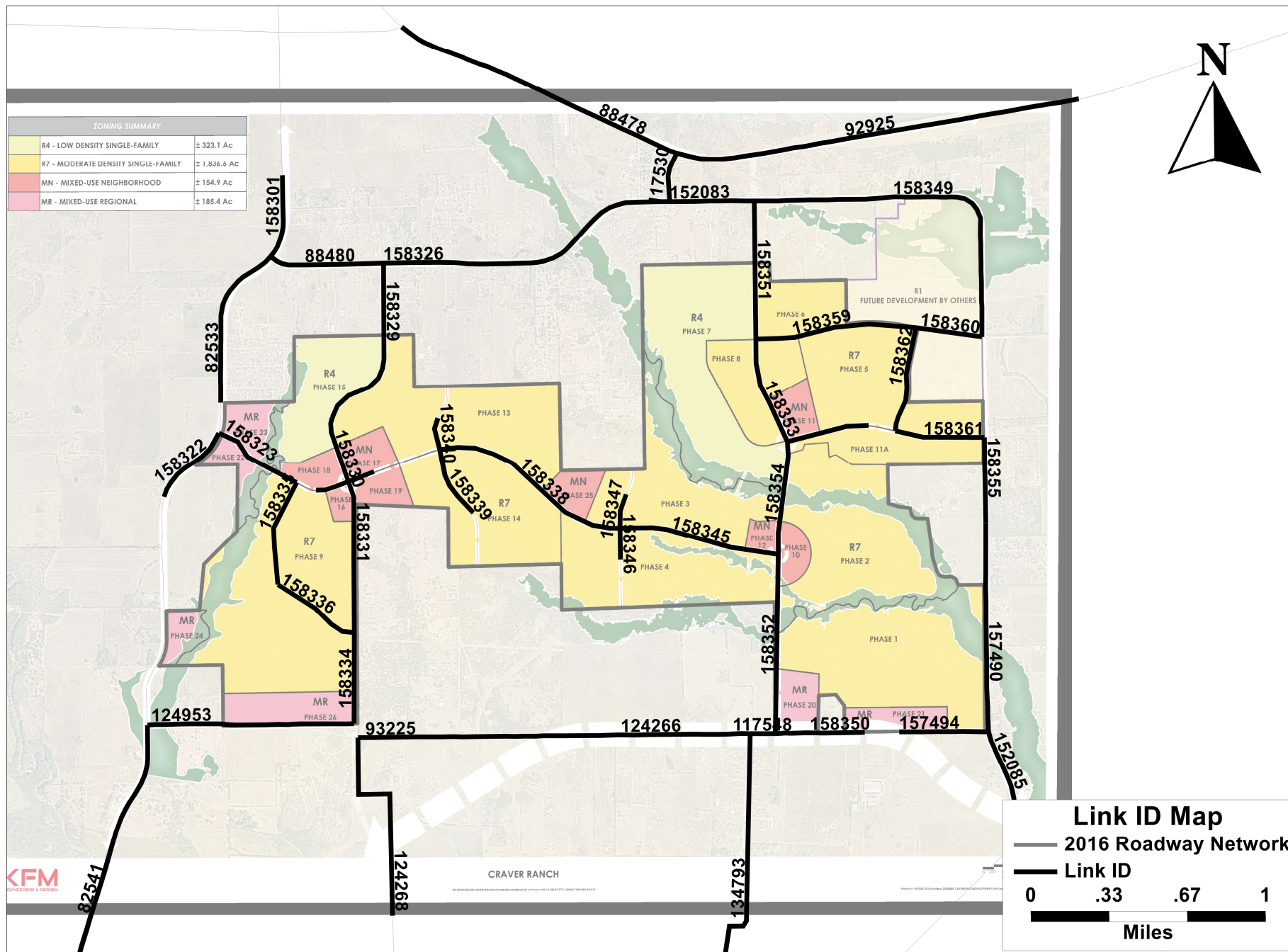
Locations of each link ID can be found in Exhibit 4. The results of the analysis are presented in Table 5 and graphically summarized in Exhibits 5 to 8. As shown in the results summary, all roadways are projected to operate at Level of Service C or better, for all analysis scenarios under the conditions described herein when constructed to the City's Thoroughfare-Plan-designated cross-sections.

END OF MEMO



LAND USE SUMMARY	
SINGLE-FAMILY	± 323.1 Ac
MULTI-FAMILY SINGLE-FAMILY	± 1,836.6 Ac
NEIGHBORHOOD	± 154.9 Ac
REGIONAL	± 185.4 Ac

Exhibit 3 - Existing Roadway Functional Classification



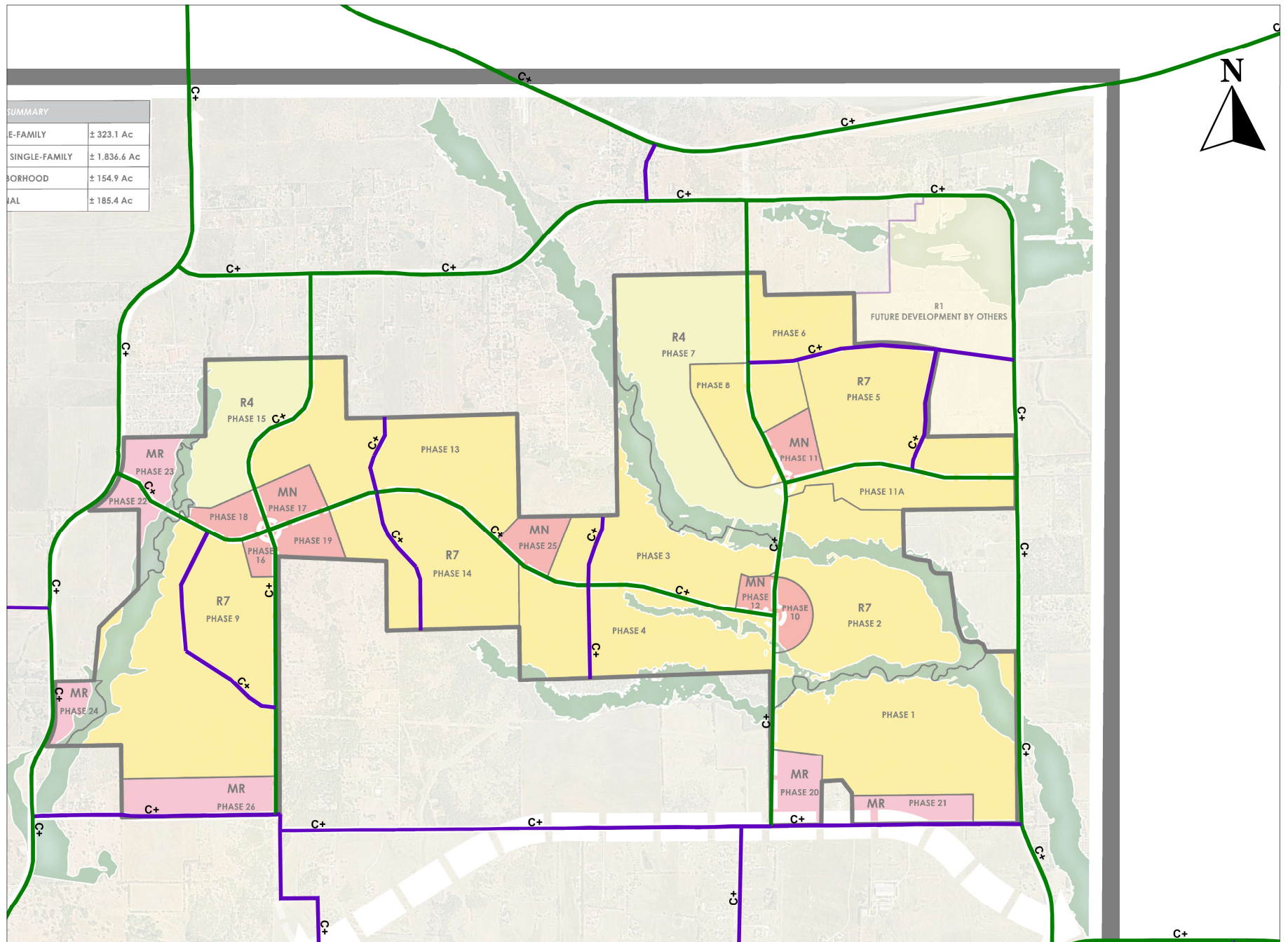


Exhibit 6 - Daily Level of Service (Baseline Conditions)

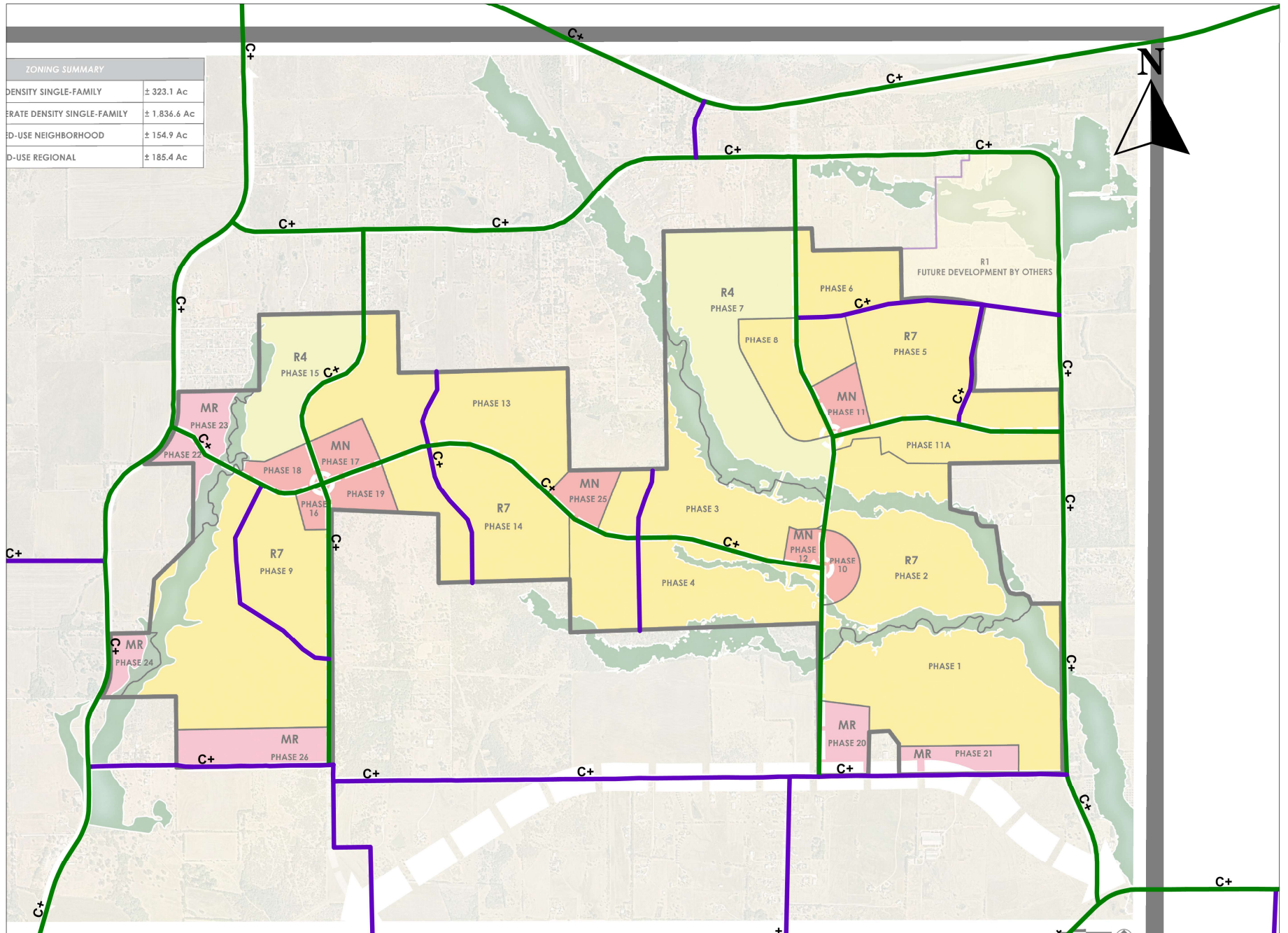


Exhibit 8 - Daily Level of Service (With Project)

TRAN 3.08: Provide additional details indicating whether the roadways are coded as divided or undivided.

Table 5. Summary of Planning Level I

TRAN 3.07: Update the Level of Service (LOS) and volume-to-capacity (V/C) ratios based on the revised roadway capacities as recommended in TRAN 3.06.

Development	TDM Link ID	System Roadways	Location	TDM Configuration			Baseline Conditions				Future with Development				Development Utilization (%)	City Utilization (%)	
				Facility Type	# of Lanes	Speed (mph)	Volumes (vpd)	Capacity (Model Calculation)	LOS (Model Calculation)	V/C	Volumes (vpd)	Capacity (Model Calculation)	LOS (Model Calculation)	V/C			
On-Site	158329	Western N/S Arterial	South of FM 2153	Minor Arterial	2	55	85	21,433	C+	0.00	1,994	21,433	C+	0.09	95.7%	4.3%	
	158330	Western N/S Arterial	North of E/W Arterial South	Minor Arterial	2	55	83	21,433	C+	0.00	2,365	21,433	C+	0.11	96.5%	3.5%	
	TRAN 3.09: Add additional columns to this table identifying the responsible parties for constructing roadways that do not currently exist but were coded in the model, for improving any roadways where LOS deteriorates, or for implementing any recommendations. Format this information similar to Tables 6 and 8 in the Hunter-Cole 2040 TDM report.			W Arterial South	Minor Arterial	2	55	222	21,433	C+	0.01	286	21,433	C+	0.01	22.4%	77.6%
				Shepard Gribble Rd	Minor Arterial	2	55	235	21,433	C+	0.01	1,926	21,433	C+	0.09	87.8%	12.2%
				South of FM 2153	Minor Arterial	2	55	3,779	21,433	C+	0.18	5,147	21,433	C+	0.24	26.6%	73.4%
				W Arterial North	Minor Arterial	2	55	3,771	21,433	C+	0.18	4,527	21,433	C+	0.21	16.7%	83.3%
	158354	Eastern N/S Arterial	South of E/W Arterial North	Minor Arterial	2	55	285	21,433	C+	0.01	2,880	21,433	C+	0.13	90.1%	9.9%	
	158352	Eastern N/S Arterial	North of Shepard Gribble Rd	Minor Arterial	2	55	843	21,433	C+	0.04	4,462	21,433	C+	0.21	81.1%	18.9%	
	158323	E/W Arterial South	East of FM 2164	Minor Arterial	2	55	1,070	21,433	C+	0.05	7,243	21,433	C+	0.34	85.2%	14.8%	
	TRAN 3.10: Include the following link in the model network and add the results for this link to the corresponding table - 1. FM 428 (E Sherman Dr.) south-west of FM2153 2. FM 428 east of FM2153			Western N/S Arterial	Minor Arterial	2	55	1,044	21,433	C+	0.05	6,609	21,433	C+	0.31	84.2%	15.8%
Off-Site			Western N/S Arterial	Minor Arterial	2	55	896	21,433	C+	0.04	8,201	21,433	C+	0.38	89.1%	10.9%	
			Corridor 2 and Collector 3	Minor Arterial	2	55	807	21,433	C+	0.04	6,187	21,433	C+	0.29	87.0%	13.0%	
			Western N/S Arterial	Minor Arterial	2	55	812	21,433	C+	0.04	6,377	21,433	C+	0.30	87.3%	12.7%	
	158356	E/W Arterial North	East of Eastern N/S Arterial	Minor Arterial	2	55	3,700	21,433	C+	0.17	4,007	21,433	C+	0.19	7.7%	92.3%	
	158361	E/W Arterial North	West of FM 2153	Minor Arterial	2	55	3,699	21,433	C+	0.17	3,436	21,433	C+	0.16	-	-	
	158335	Collector 1	South of E/W Arterial South	Collector	2	35	53	17,388	C+	0.00	3,094	17,388	C+	0.00	-	-	
	158336	Collector 1	West of Western N/S Arterial	Collector	2	35	13	17,388	C+	0.00	1,639	17,388	C+	0.00	-	-	
	158339	Collector 2	South of E/W Arterial South	Collector	2	35	21	17,388	C+	0.00	620	17,388	C+	0.00	-	-	
	158340	Collector 2	North of E/W Arterial South	Collector	2	35	65	17,388	C+	0.00	2,521	17,388	C+	0.00	-	-	
	158346	Collector 3	South of E/W Arterial South	Collector	2	35	140	17,388	C+	0.01	3,164	17,388	C+	0.01	-	-	
	158347	Collector 3	North of E/W Arterial South	Collector	2	35	-	17,388	C+	0.00	923	17,388	C+	0.00	-	-	
	158359	Collector 4	East of Eastern N/S Arterial	Collector	2	35	23	17,388	C+	0.00	1,019	17,388	C+	0.00	-	-	
	158360	Collector 4	West of FM 2153	Collector	2	35	60	17,388	C+	0.00	2,620	17,388	C+	0.00	-	-	
	158362	Collector 5	North of E/W Arterial North	Collector	2	35	10	17,388	C+	0.00	732	17,388	C+	0.00	-	-	
	158322	FM 2164	South of E/W Arterial South	Minor Arterial	2	60	10,086	21,433	C+	0.47	14,274	21,433	C+	0.47	-	-	
158349	FM 2153	North of Collector 4	Minor Arterial	2	55	1,829	21,433	C+	0.09	1,580	21,433	C+	0.07	-	-		
158355	FM 2153	South of E/W Arterial North	Minor Arterial	2	55	5,589	21,433	C+	0.26	7,636	21,433	C+	0.36	26.8%	73.2%		
157490	FM 2153	North of Shepard Gribble Rd	Minor Arterial	2	55	6,364	21,433	C+	0.30	7,887	21,433	C+	0.37	19.3%	80.7%		
Off-Site	124953	Shepard Gribble Rd	East of FM 2164	Collector	2	35	125	17,388	C+	0.01	1,762	17,388	C+	0.10	92.9%	7.1%	
	158350	Shepard Gribble Rd	East of Eastern N/S Arterial	Collector	2	35	647	17,388	C+	0.04	2,622	17,388	C+	0.15	75.3%	24.7%	
	157494	Shepard Gribble Rd	West of FM 2153	Collector	2	35	660	17,388	C+	0.04	5,559	17,388	C+	0.32	88.1%	11.9%	
	82533	FM 2164	South of FM 2153	Minor Arterial	2	60	7,636	21,433	C+	0.36	8,105	21,433	C+	0.38	5.8%	94.2%	
	158301	FM 2164	North of FM 2153	Minor Arterial	2	60	6,030	21,433	C+	0.28	7,472	21,433	C+	0.35	19.3%	80.7%	
	82541	FM 2164	South of Shepard Gribble Rd	Minor Arterial	2	60	9,589	21,433	C+	0.45	13,956	21,433	C+	0.65	-	-	
	88480	FM 2153	East of FM 2164	Minor Arterial	2	55	2,483	21,433	C+	0.12	3,323	21,433	C+	0.16	-	-	
	158326	FM 2153	East of Western N/S Arterial	Minor Arterial	2	55	2,545	21,433	C+	0.12	3,149	21,433	C+	0.15	-	-	
	152083	FM 2153	West of Eastern N/S Arterial	Minor Arterial	2	55	5,608	21,433	C+	0.26	6,727	21,433	C+	0.31	-	-	
	152085	Shepard Rd	South of FM 2153	Minor Arterial	2	55	7,024	21,433	C+	0.33	13,431	21,433	C+	0.63	-	-	
	88478	FM 455	West of Running Bear Ln	Minor Arterial	2	60	10,475	21,433	C+	0.49	10,863	21,433	C+	0.51	-	-	
	92925	FM 455	East of Running Bear Ln	Minor Arterial	2	60	8,627	21,433	C+	0.40	10,244	21,433	C+	0.48	-	-	
	117530	Running Bear Ln	North of FM 2153	Collector	2	20	7,299	17,388	C+	0.42	8,946	17,388	C+	0.51	-	-	
	93225	Shepard Gribble Rd	East of Western N/S Arterial	Collector	2	35	1	17,388	C+	0.00	63	17,388	C+	0.00	-	-	
	124266	Shepard Gribble Rd	West of Green Valley Cir	Collector	2	35	11	17,388	C+	0.00	138	17,388	C+	0.01	-	-	
	117548	Shepard Gribble Rd	East of Green Valley Cir	Collector	2	35	199	17,388	C+	0.01	1,973	17,388	C+	0.11	-	-	
	134793	Green Valley Circle	South of Shepard Rd	Collector	2	35	188	17,388	C+	0.01	1,835	17,388	C+	0.11	-	-	
	124268	Gribble Springs Rd	South of Shepard Rd	Collector	2	35	325	17,388	C+	0.02	421	17,388	C+	0.02	-	-	

TRAN 3.06: TRAN 3.06: The model appears to overestimate roadway capacities compared with NCTCOG data. The 2019 NCTCOG "Transportation Analytical Forecasting Tool (TAFT) Validation Report" provides capacity estimates for roadway classification (see Exhibits 2.3–2.5). The City recommends "Urban Residential" as the area type when estimating roadway capacity. It must be noted that all off-site roadways in this 2-lane, undivided roads; the model should reflect this condition and capacities should be adjusted accordingly.

[Here is the link to NCTCOG TAFT report: https://www.nctcog.org/getmedia/b146d629-4942-4680-bab180e/2023_Appendix_12-7.pdf](https://www.nctcog.org/getmedia/b146d629-4942-4680-bab180e/2023_Appendix_12-7.pdf)

Exhibit 2.3. Arterial Hourly Capacities per Lane (Divided)

Area Type	Functional Class					
	Freeway	Principal Arterial	Minor Arterial	Collector	Frontage Road	HOV
CBD	N/A	725	725	475	1250	725
Outer Business District	N/A	775	775	500	1375	775
Urban Residential	N/A	850	825	525	1425	850
Suburban Residential	N/A	925	900	575	1600	900
Rural	N/A	1025	975	600	1725	975

Exhibit 2.4. Arterial Hourly Capacities per Lane (Undivided) (Traffic per hour per hour)

Area Type	Functional Class					
	Freeway	Principal Arterial	Minor Arterial	Collector	Frontage Road	HOV
CBD	N/A	650	650	425	1250	650
Outer Business District	N/A	725	725	450	1375	725
Urban Residential	N/A	775	750	475	1425	750
Suburban Residential	N/A	875	825	525	1600	825
Rural	N/A	925	875	550	1725	875

Exhibit 2.5. Capacity Conversion of Factors from Hourly to Time Periods

Time Period	Conversion Factor
Hourly	1.00
15-Minute	0.25
30-Minute	0.50
45-Minute	0.75
1-Hour	1.00
2-Hour	2.00
4-Hour	4.00
8-Hour	8.00
12-Hour	12.00
16-Hour	16.00
20-Hour	20.00
24-Hour	24.00

TRAN 3.06: TRAN 3.06: The model appears to overestimate roadway capacities compared with NCTCOG data. The 2023 NCTCOG "Transportation Analytical Forecasting Tool (TAFT) Model Validation Report" provides capacity estimates for roadways by classification (see Exhibits 2.3–2.5). The City recommends using "Urban Residential" as the area type when estimating roadway capacity. It must be noted that all off-site roadways in this study are 2-lane, undivided roads; the model should reflect this configuration, and capacities should be adjusted accordingly.

Here is the link to NCTCOG TAFT report:
https://www.nctcog.org/getmedia/b146d629-4942-4680-b584-74158bab180e/2023_Appendix_12-7.pdf

Exhibit 2-3. Arterial Hourly Capacities per Lane (2040e)									
Area Type	Functional Class								HOV
	Freeway	Principal Arterial	Minor Arterial	Collector	Frontage Road	Frontage Road	Frontage Road	Frontage Road	
CBD	N/A	725	725	475	1250	725	1000	N/A	
Outer Business District	N/A	775	775	500	1375	775	1000		
Urban Residential	N/A	850	825	525	1425	850	1000		
Suburban Residential	N/A	925	900	575	1500	900	1000		
Rural	N/A	1025	975	600	1725	975	1000		

Exhibit 2-4. Arterial Hourly Capacities per Lane (Undivided) (vehicle per hour)									
Area Type	Functional Class								HOV
	Freeway	Principal Arterial	Minor Arterial	Collector	Frontage Road	Frontage Road	Frontage Road	Frontage Road	
CBD	N/A	650	650	425	1250	650	N/A		
Outer Business District	N/A	725	725	450	1375	725	N/A		
Urban Residential	N/A	775	750	475	1425	750	N/A		
Suburban Residential	N/A	875	825	525	1500	825	N/A		
Rural	N/A	925	875	550	1725	875	N/A		

Exhibit 2-5. Capacity Conversion of Factors from Hourly to Peak Period

Exhibit 2-5. Capacity Conversion of Factors from Hourly to Peak Period									
Area Type	Functional Class								HOV
	Freeway	Principal Arterial	Minor Arterial	Collector	Frontage Road	Frontage Road	Frontage Road	Frontage Road	
HOV	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
HOV	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
HOV	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	