Appendix D
Circulation and Travel Demand Model Update

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APPENDIX D
Circulation and Travel Demand Model Update

Introduction

Appendix D provides a copy of the General Plan Circulation Element Update and Travel Demand Model Update. This report identifies the background data and presents the existing City traffic circulation conditions. Future travel demand projections generated from the model are documented in this report and projected circulation issues are identified. The recommended circulation improvements are also presented.

City of Galt
General Plan Circulation Element Update and Travel Demand Model Update

Draft Report

Prepared for:

City of Galt

and

Mintier & Associates

Prepared by:

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CITY OF GALT
GENERAL PLAN CIRCULATION ELEMENT UPDATE AND TRAVEL DEMAND MODEL UPDATE

DRAFT REPORT

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INTRODUCTION

The City of Galt is located in south Sacramento County, approximately 25 miles south of the City of Sacramento and approximately 25 miles north of the City of Stockton. The estimated City population as of January 1, 2007 is 23,500. State Route 99 (SR-99) bisects the City, with the central business district on the west side of SR-99. The northeast area of the City was adopted as a specific plan in 1987 and has developed with residential uses. Figure 1 illustrates the City of Galt street system, the current City Limits, and the City's relation to other communities in the general vicinity.

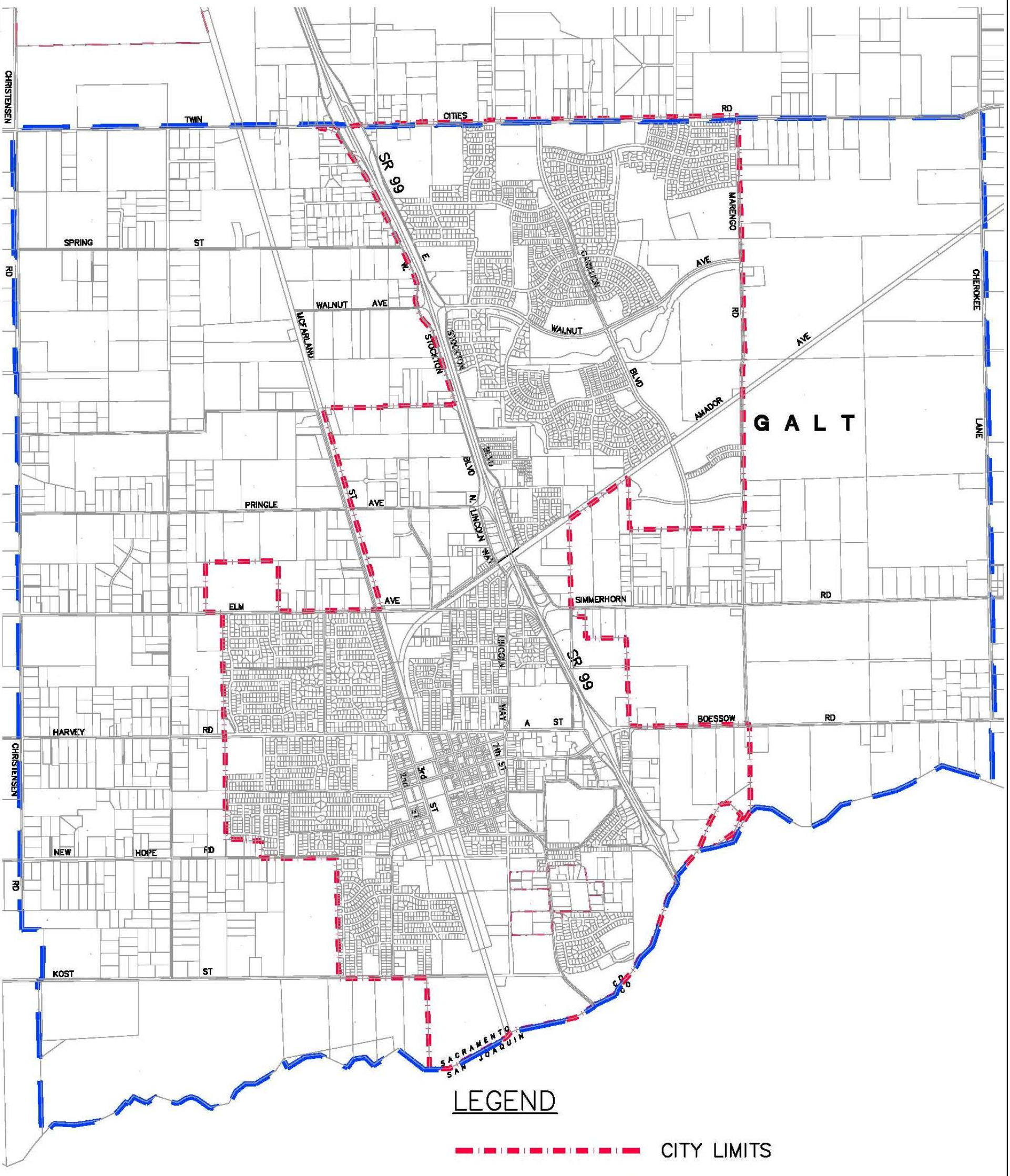
The City of Galt is undergoing a General Plan Update led by Mintier & Associates. The City's General Plan update process was initiated in 2003. Mintier & Associates commissioned OMNI-MEANS in 2003 to provide General Plan Update support for the Circulation Element and Public Facilities and Services Element. This Draft Report presents OMNI-MEANS's analyses associated with the Circulation Element Update, which involves an update to the City's travel demand model.

Sacramento County is currently modeled on a regional basis within the existing Sacramento Council of Governments (SACOG) regional travel demand model (SACMET). The City of Galt travel demand model simulates current traffic flow patterns and forecasts future travel demands and traffic flow patterns on a City-level basis. The refined city-level model utilizes the SACMET model to estimate interregional productions and attractions, through traffic, and future regional growth. Maintaining consistency from the city-level model to the regional model is important in providing a "regionally compliant" circulation plan for the City of Galt.

The procedure outlined below summarizes the City Circulation Element and City of Galt Travel Demand Model update process:

1. Collect data to establish a benchmark for existing circulation conditions.
    a. Traffic network configuration (e.g. roadway classification, lanes, speed, and right-of-way)
    b. Traffic conditions (e.g. traffic volumes, heavy vehicle percentage, Level-of-Service (LOS), existing deficiencies, and historical growth)
    c. Travel patterns (e.g. commuter travel patterns, bus routes, and truck routes)
    d. Public transit (e.g. bus and Dial-a-Ride service)
    e. Bicycle routes
2. Develop an existing conditions travel demand model of the City. Calibrate the existing conditions model to match traffic conditions observed in Step 1.
3. Forecast future travel demand on a 25-year horizon using the city-level model created in Step 2 and the future land use alternatives created by the General Plan land use consultant.
    a. Test up to five alternative land use / circulation concepts on a "preview" basis for preliminary General Plan team consideration.
    b. Test up to four alternative land use / circulation concepts for inclusion in the final EIR.
    c. Test and evaluate future traffic networks, including the current General Plan network, for their ability to handle projected future traffic.
4. Select a preferred circulation network alternative that correlates with the preferred land use alternative.

This Draft Report documents the background data and presents the existing City traffic circulation conditions. Future travel demand projections generated from the model are documented in this Draft Report and projected circulation issues are identified. The recommended circulation improvements are presented in this Draft Report. The procedure used to update the City travel demand model is included as an appendix to this Draft Report.



LEGEND

CITY LIMITS

SPHERE OF INFLUENCE BOUNDARY

City of Galt General Plan Update

Figure 1

CITY OF GALT PLANNING AREA

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EXISTING CIRCULATION SYSTEM

The following section provides a general description of the roadways that provide circulation to the City, pedestrian facilities (e.g. sidewalks and walking trails), commuter and recreational bicycle routes, and public transit service.

LAND DEVELOPMENT PATTERNS

The City of Galt is predominantly a "bedroom community," with the majority of workers commuting outside the City to work in the metropolitan areas of Sacramento to the north and Stockton to the south. , The City population has grown from 13,000 to over 22,000 in the past ten years. Much of this growth has occurred in both the northeast and southwest portions of the City. Residential development in the City has been particularly active with the adoption of the Northeast Area Specific Plan in the late 1980s. Future growth is likely to occur north to Twin Cities Road (SR 104), and along Simmerhorn Road and Boessow Road.

Retail commercial and highway commercial opportunities are located mainly in downtown Galt and along the SR 99 corridor. Light manufacturing uses are primarily located in the northwestern quadrant of the City, between SR 99 and the Union Pacific Railroad tracks. Little employment growth has occurred within the City due to the proximity of Sacramento and Stockton as metropolitan employment hubs. Many commercial, office, and industrial lands remain vacant or underutilized within the City. The Galt Market remains a major regional shopping attraction each week on Tuesday and Wednesday, making Tuesday/Wednesday traffic conditions in the City significantly worse than all other days.

VEHICULAR STREET NETWORK

The City street network serves to circulation trips generated by developed land uses. State Route 99 is the major State highway, which bisects the middle of the City, providing important regional access. State Route 104, traverses the current northern boundary and also provides regional accessibility. The balance of the City street system is largely a combination of roadways that connect the City with surrounding county lands and provide for intra-city travel. The following section contains a short description of roadways that provide primary and secondary circulation through the City.

State Route 99 (SR-99) is the primary interregional route serving the City of Galt. The freeway passes through the San Joaquin Valley and Central Valley, running approximately parallel to Interstate 5 (I-5) between the City of Red Bluff and the City of Bakersfield. Communities serviced by SR-99 near the City of Galt include the Cities of Stockton, Modesto, Merced, and Fresno. The freeway is a major commuter and truck travel route.

SR-99 is a four-lane freeway within the City and forms interchanges with Arno Road, State Route 65 (SR-165)/State Route 104/Twin Cities Road, Walnut Avenue, Pringle Avenue/Ayers Lane, Elm Avenue/Simmerhorn Road, C Street, and Crystal Way/Fairway Drive.

Twin Cities Road / State Route 104 (SR 104) provides east-west regional access to southern Sacramento County and northern Galt. The road begins as Twin Cities Road at the Sacramento River and becomes SR 104 at its connection to SR-99. Twin Cities Road/SR-104 connects I-5, SR-99, the City of Galt, and southern Amador County. The City General Plan Circulation Element designates Twin Cities Road/SR 104 as an arterial.

Major Arterials - According to the General Plan, Kost Road, New Hope Road, Harvey Road/A Street/Boessow Road, Orr Road/Elm Road/Simmerhorn Road, and Walnut Avenue constitute "arterial

streets" in the east-west direction. Marengo Road, Carillion Boulevard, Lincoln Way, and Christensen Road corridors represent north-south "arterial streets."

TRUCK ROUTES

The City Municipal Code, Title 10 Vehicles and Traffic, lists the following road segments designated as truck routes. The Municipal Code Section 10.40.020 states that use of the truck routes is required for vehicles heavier than five tons, except when necessary to traverse another street for the purposes of reaching a loading/unloading destination. Passenger buses under the jurisdiction of the public utilities commission are exempt.

#	Roadway	From	To
1	Lincoln Way	South city limits	Live Oak Ave
2	F Street / New Hope Drive	West city limits	Lincoln Way
3	C Street / Boessow Road	East city limits	Lincoln Way
4	Simmerhorn Road	East city limits	Lincoln Way
5	Amador Avenue	Elm Avenue	Carol Drive
6	Elm Avenue	West city limits	Intersection with Amador Avenue
7	Carol Drive	Amador Avenue	Intersection with Ayers Lane
8	A Street	Fairway Drive west	West city limits
9	McFarland Avenue	A Street	North city limits
10	Fourth Street	A Street south	F Street
11	Industrial Drive	Elm Avenue north	Live Oak Avenue
12	Live Oak Avenue	Industrial Drive	Lincoln Way
13	W. Stockton Boulevard	Live Oak Avenue	Twin Cities Road
14	E. Stockton Boulevard	Ayers Lane	Twin Cities Road
15	Fairway Drive	A Street	Glendale Drive
16	Crystal Way	Boessow	South end

Source: City of Galt Municipal Code, Section 10.40.030

PEDESTRIAN FACILITIES

According to the current General Plan Circulation Element, sidewalks are required of all new development in Galt. Linked pedestrian walkways /bikeways are required in the Northeast Area along Dead Man Gulch, Carillion Boulevard, and Walnut Avenue.

BICYCLE FACILITIES

According to the Galt Bicycle Transportation Plan (May 2002), the City has approximately 9,200 linear feet of Class I bikeway and 4,800 linear feet of Class II bikeway. Class I bikeways provide a completely separated right-of-way for two-way bicycle and pedestrian traffic, and are generally ten feet wide with two foot shoulders. Existing Class I bikeways are located along Dry Creek, Deadman Gulch (South Fork) and Deadman Gulch (North Fork). Class II bikeways provide a striped lane for one-way bicyclist travel on a street or highway. Existing Class II bikeways are located along Lincoln Way and "F" Street. "A" Street serves as an unofficial Class III bikeway, which provides shared bicyclist-automobile use. "A" Street has not been widened to Class II standards to preserve native oak trees that line the street.

PUBLIC TRANSIT

South County Transit (SCT/Link) provides bus service in the City of Galt. There are four in-town bus routes that run Monday thru Friday, from 7:00 a.m .to 6:25 p.m. The fare is $1 for travel in the City or $2 for a single-day pass. Discounted fees are offered to students, seniors (65+), and disabled persons.

SCT/LINK offers service along the SR-99 corridor by providing direct intercity service connecting Galt with the Cities of Lodi, Elk Grove and Sacramento. The SR-99 Route runs Monday thru Friday, with

hourly service all day from 5:20 am to 7:20 pm. Service in the City of Lodi SCT/LINK now offers direct bus service from the Delta to Lodi, with stops at Lodi Wal-Mart, Lodi Memorial Hospital and Lodi Transit Center. This route also provides direct service to Galt with connecting service via Hwy 99 to Elk Grove and Sacramento. The Delta Route runs four times a day Monday thru Friday.

RAIL SERVICE

According to the City's current General Plan Circulation Element (1990), freight trains pass through the City 20 to 40 times per day on a random schedule. Trains range from 10 to 140 cars and travel at 30 to 60 mph. The nearest Amtrak commuter rail station is located in the City of Lodi, which is approximately 10 miles south on SR-99 and is serviced by SCT/Link. The City has no grade-separated railroad crossings.

MAJOR CIRCULATION ISSUES

Observations by City staff and residents indicate several circulation issues within the City beyond roadway Level-of-Service, including existing deficiencies at SR-99 freeway interchanges and the lack of an adequate intra-city circulation network. The observations were confirmed in traffic studies and are summarized below:

- The City lacks a "backbone" hierarchy of arterials, collectors, and local streets to provide a cohesive circulation system. In particular, the City lacks an arterial system that provides adequate connectivity across SR-99 and as a result, City residents tend to use the freeway for intra-city travel.
- The Central Galt/SR 99 interchange is a non-standard "tight-diamond" interchange design that congests regularly, particularly on Galt Market days. Improvements to this interchange are imperative for the future growth of the City.
- The Twin Cities Road/SR 99 interchange is nearing capacity and improvements are required for it to continuing facilitating City and regional traffic circulation.
- The Caltrans Transportation Concept Report (TCR) for SR-99 (Caltrans District 3, May 2004) shows that the facility is being considered for a concept facility configuration as a six-lane freeway with High-Occupancy Vehicle (HOV) lane (Segment 1, PM 0.0 to 12.761). The ultimate concept is an eight-lane freeway with HOV lanes. Initial review indicates that the six-lane widening can generally occur within the center median. Widening SR-99 to eight lanes within the City will require the existing "hook-ramps" at Twin Cities Road, Walnut Avenue, Pringle Road, Ayers Road, Elm Street, Simmerhorn Road, Fairway Drive, and Crystal Way to be removed or redesigned. The right-of-way required for the freeway widening to eight lanes is expected to require the removal of City frontage roads on at least one side of the SR-99.
- Rail traffic has increased in frequency and length of trains. The lack of separated grade crossings at railroad tracks creates circulation and safety issues and exacerbates poor cross-town circulation.

BACKGROUND DATA

The following section summarizes the research and data compiled in assessing the existing circulation conditions in the City of Galt.

LITERATURE REVIEW

Omni-Means assessed the City circulation system and conditions by compiling data and conclusions provided by studies addressing circulation in and around the City, including:

- City of Galt General Plan (Planning Concepts, amended March 1991)
- City of Galt Municipal Code, Title 10 Vehicles and Traffic
- City of Galt Bicycle Transportation Plan (May 2002)
- Sacramento County Geographical Information Systems (GIS) database
- US Census Bureau 2000 Data
- California Department of Transportation (Caltrans) traffic count and truck traffic data
- California Department of Finance population, housing, and employment data
- Recent traffic circulation studies and traffic impact studies.
    - Central Galt and SR 99 Interchange Modification, FEIR (May 2007)
    - Central Galt Interchange Final Traffic Forecasts and Traffic Operations Analysis (Omni-Means, 2005)
    - Carillion Rite Aid TIS (Omni-Means, May 2007)
    - Lonnie Estates/Four Seasons TIS (Omni-Means, February 2007)
    - Creekside Unit III (Omni-Means, October 2006)
    - Simmerhorn Road Realignment Study (October 2005)
- Sacramento Council of Governments (SACOG) regional travel demand model (SACMET)

EXISTING TRAFFIC COUNTS

Roadways

New daily traffic counts were collected by Omni-Means at 52 locations within the City during July and October 2005. Daily roadway segment counts were generally collected on Tuesdays and Wednesdays to account for increased traffic within the City associated with Galt Market Days. City traffic counts were supplemented by counts performed by Caltrans on SR-99 and SR-104 (2005 All Traffic Volumes of CSHS, Caltrans Traffic and Vehicle Data Systems Unit). The traffic count locations are listed below and the counts are shown in Figure 2.

2005 Caltrans Counts

SR 99, s/o Crystal Way/Fairway Drive
SR 99, s/o C Street/Boessow Road
SR 99, s/o Simmerhorn Road/Elm Avenue
SR 99, s/o Pringle Way/Ayers Lane
SR 99, SR 99, s/o Walnut Avenue
SR 99, SR 99, s/o Twin Cities Road
SR 99, SR 99, s/o Mingo Road
SR 99, SR 99, n/o Mingo Road
SR 104/Twin Cities Road, e/o SR 99
SR 104/Twin Cities Road, e/o Cherokee Lane

2005 City Counts

Amador Avenue, w/o Lincoln Way
Amador Avenue, e/o Lincoln Way
Boessow Road, e/o SR 99 NB Ramps
C Street, e/o 3rd Street
C Street, e/o Lincoln Way
Carillion Boulevard, n/o Walnut Avenue
Carillion Boulevard, s/o Walnut Avenue
Cherokee Lane, n/o Twin Cities Road
Elm Avenue, e/o McFarland Street
Elm Avenue, w/o Lincoln Way

2005 City Counts (continued)

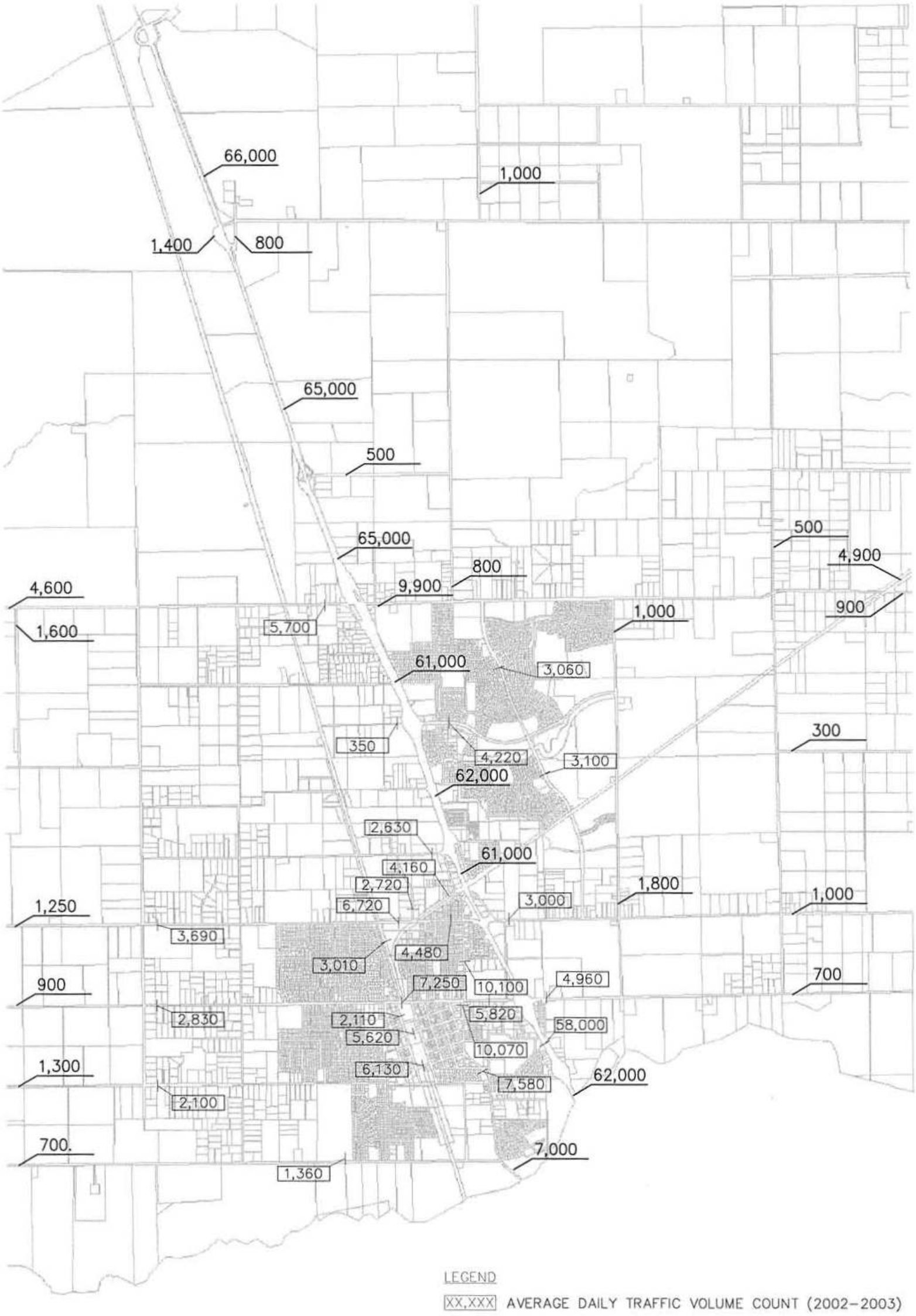
F Street e/o 3rd Street
Fairway Drive, s/o Caroline Avenue
Harvey Road, e/o western City Limits
Harvey Road, w/o western City Limits
Industrial Drive n/o Elm Avenue
Kost Road, e/o western City Limits
Kost Road, w/o western City Limits
Lincoln Way, n/o Simmerhorn Road
Lincoln Way, n/o Elm Avenue
Lincoln Way, between C Street and A Street
Marengo Road, n/o Simmerhorn Road
Marengo Road, s/o Twin Cities Road
McFarland Street, btw. Elm Avenue and A Street
McKenzie Road, n/o Twin Cities Road
Mingo Rd, e/o SR 99
New Hope Road, e/o western City Limits
New Hope Road, w/o western City Limits
Orr Road, e/o western City Limits
Orr Road, w/o western City Limits
Lincoln Way, between C Street and F Street
Lincoln Way, s/o F Street
Pringle Avenue, w/o SR 99 SB Ramp
Quiggle Road, e/o Cherokee Ln.
Simmerhorn Road, e/o Cherokee Ln.
Simmerhorn Road, e/o Lincoln Way
Twin Cities Road, w/o Pellandini Rd
W. Stockton Boulevard, s/o Walnut Avenue
E. Stockton Boulevard, s/o Walnut Avenue
Walnut Avenue, e/o East Stockton Blvd.
Walnut Avenue, w/o West Stockton Blvd.

Intersections

New intersection traffic counts were collected by Omni-Means at 17 locations beginning in 2005 and continuing through January 2008 during the AM Peak-Hour and PM Peak-Hour periods. The AM Peak-Hour is defined as the one-hour of peak traffic flow (which is the highest total volume count over four consecutive 15-minute count periods) counted between 7:00 AM and 9:00 AM on a typical weekday. The PM Peak-Hour is defined as the one-hour of peak traffic flow counted between 4:00 PM and 6:00 PM on a typical weekday.

The traffic count locations are listed below and the counts are shown in Figure 3.

1. Twin Cities Road/West Stockton Boulevard
2. Twin Cities Road/East Stockton Boulevard
3. Twin Cities Road/Carillion Boulevard
4. Twin Cities Road/Marengo Road
5. Walnut Avenue/Carillion Boulevard
6. Walnut Avenue/SR 99 NB Ramps/E. Stockton Blvd.
7. SR-99 SBRamps-Pringle Avenue / N. Lincoln Way
8. SR-99 NB Ramps-Ayers Lane / E. Stockton Boulevard-Carol Lane
9. Amador Avenue / Lincoln Way
10. Amador Avenue / Carol Drive
11. Simmerhorn Way / Lincoln Way
12. SR-99 SB Ramps-Elm Avenue / Lincoln Way
13. SR 99 NB Ramps / Simmerhorn Road
14. Simmerhorn Road / Carillion Boulevard
15. SR 99 SB Ramps / A Street
16. Lincoln Way/C Street
17. 'C' Street/Fairway Drive
18. Boessow Road/SR 99 NB Ramps



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XX,XXX AVERAGE DAILY TRAFFIC VOLUME COUNT (2002–2003)

14,900 AVERAGE DAILY TRAFFIC VOLUME COUNT (2005)

City of Galt - General Plan Update

Figure 2

EXISTING DAILY TRAFFIC VOLUMES

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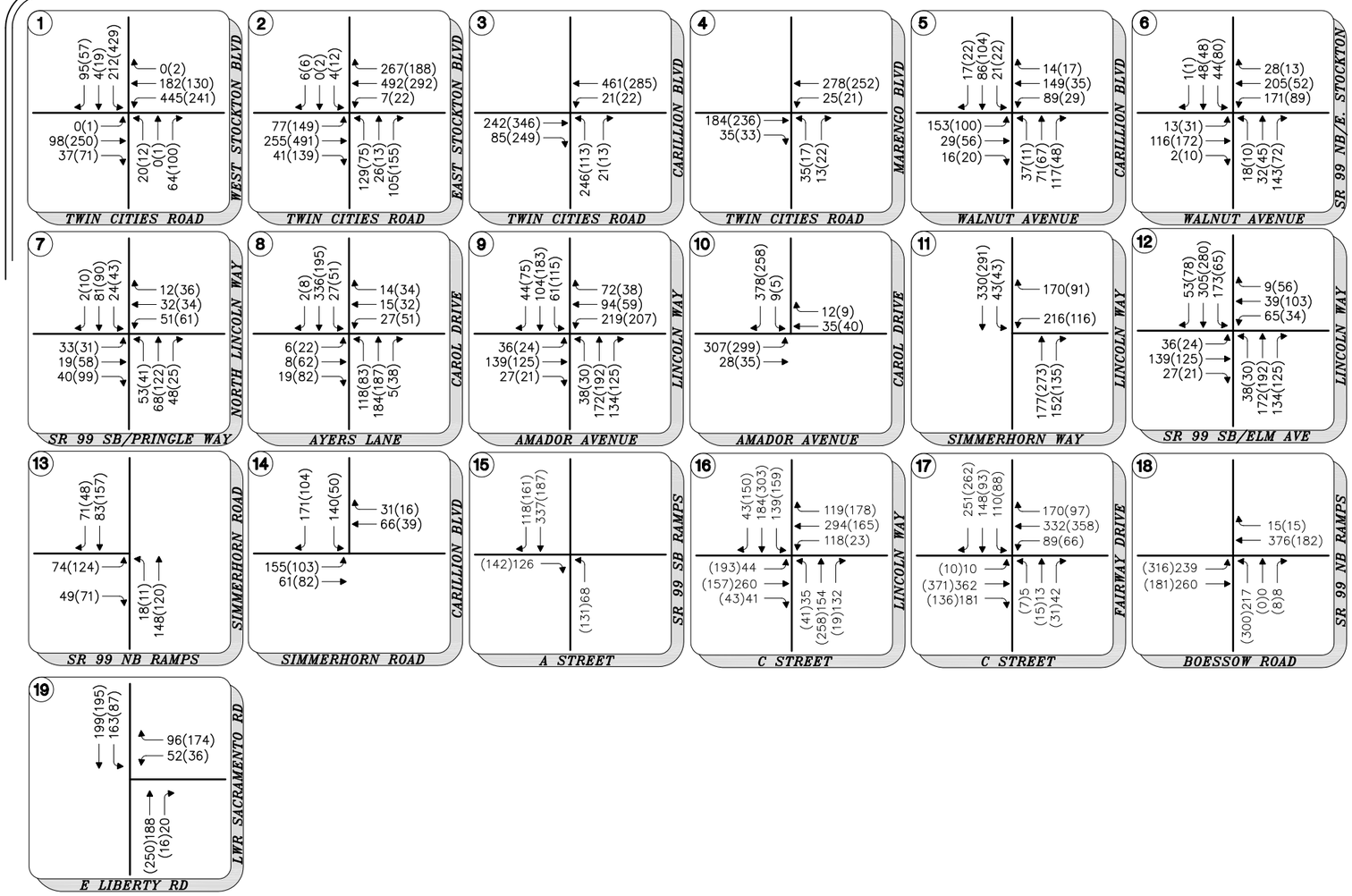

LEGEND:
XX – AM PEAK HOUR TRAFFIC VOLUMES
(XX) – PM PEAK HOUR TRAFFIC VOLUMES

City of Galt General Plan Update

Figure 3

Existing Peak Hour Traffic Volumes

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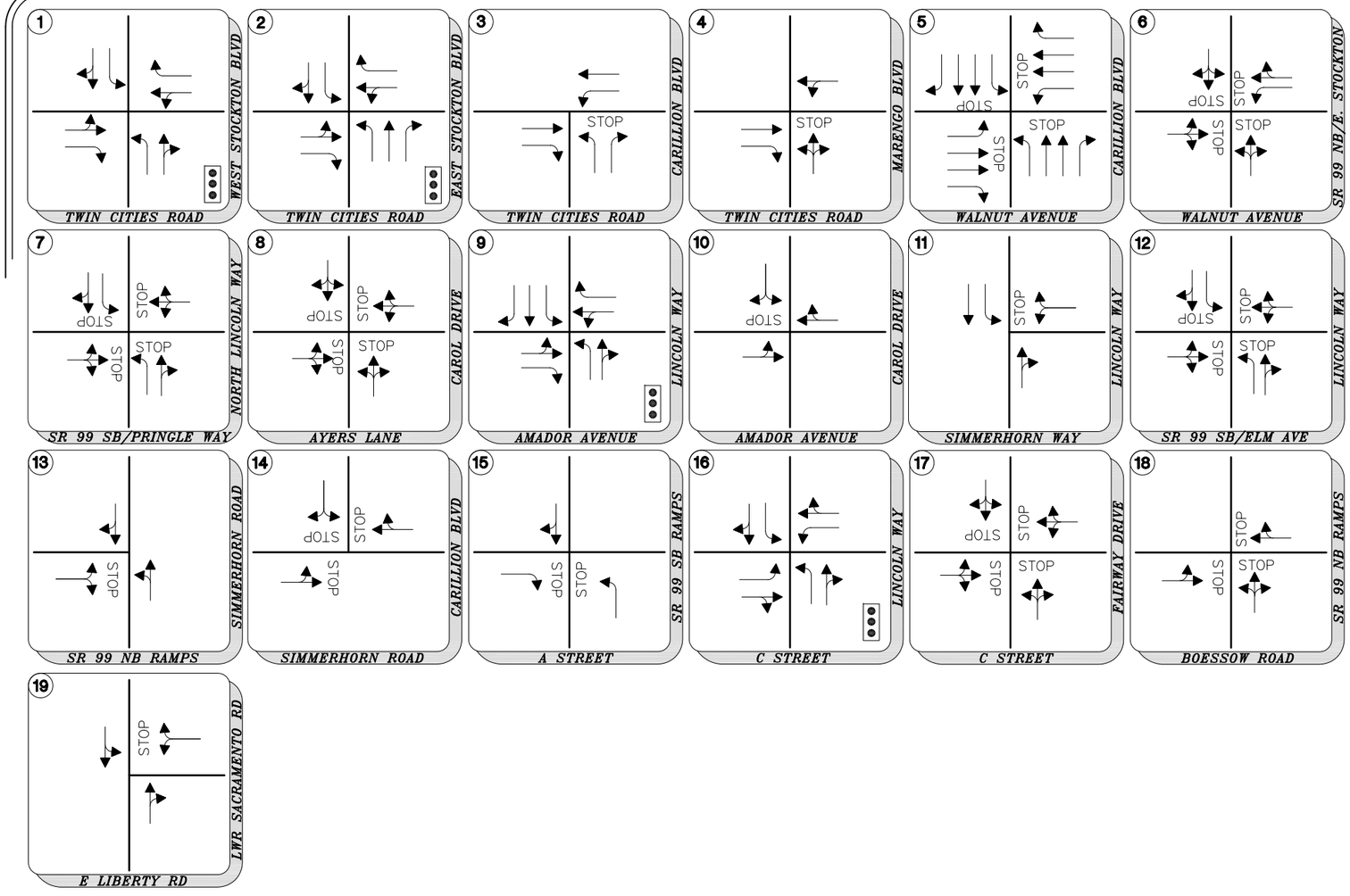

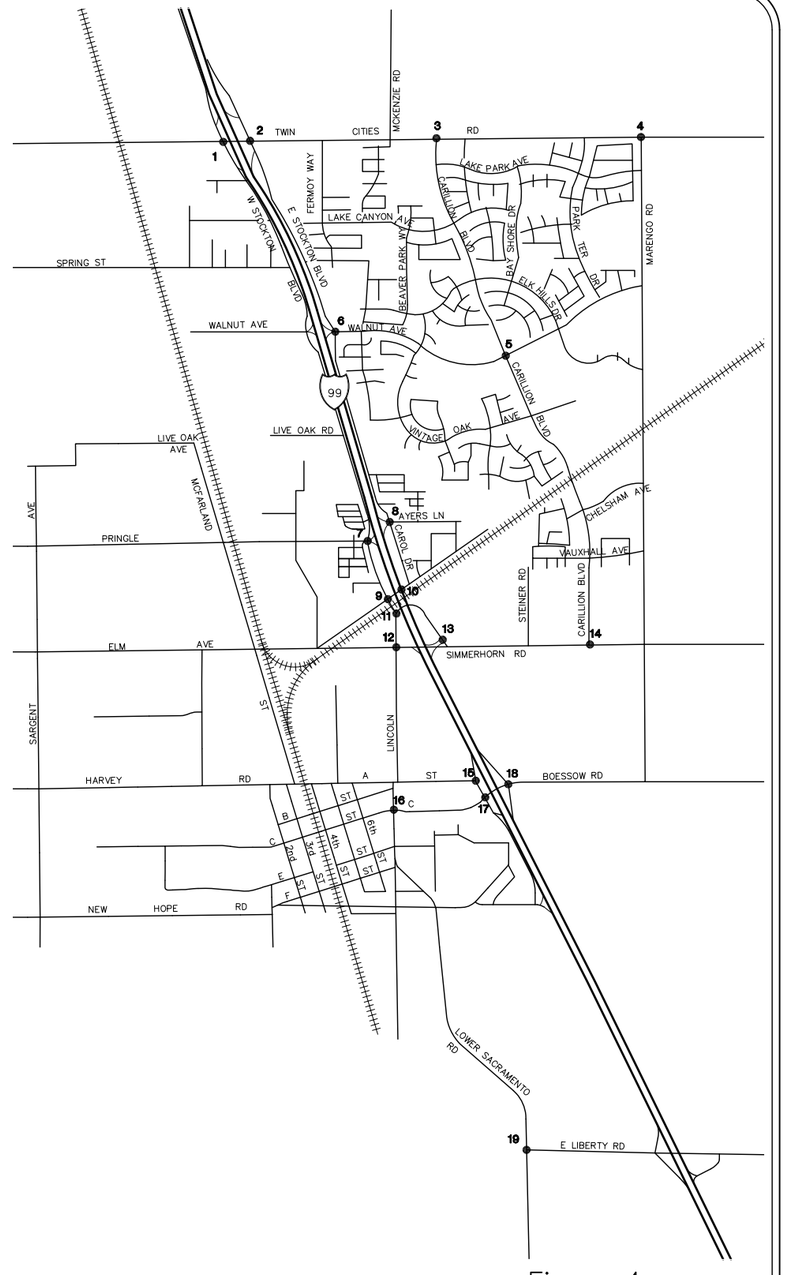

City of Galt General Plan Update

Figure 4

Existing Lane Geometrics and Control

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EXISTING LAND USES

Table 1 lists the land use types and quantity within the City's General Plan area.

TABLE 1
EXISTING LAND USES

Land Use Category	Existing Land Use			
	Existing City Limits	Preferred Alternative City Limits	Remaining Model Area	Total Model Study Area
Residential				
Single Family	5,595 DU	555 DU	280 DU	6,430 DU
Multi-Family	1,110 DU	0 DU	0 DU	1,110 DU
Total	6,705 DU	555 DU	280 DU	7,540 DU
Non-Residential				
Commercial / Retail	86 acres	1 acres	-	87 acres
Office	8 acres	-	-	8 acres
Industrial	99 acres	-	-	99 acres
Agriculture	10 acres	2,970 acres	40 acres	3,020 acres
Schools	5,000 students	-	300 students	5300 students
Employment Category	**Existing Employment (employees)**			
	Existing City Limits	Preferred Alternative City Limits	Remaining Model Area	Total Model Study Area
Retail	1,310	10	0	1,320
Service	1,515	10	30	1,555
Other	1,440	1,485	340	3,265

The land uses summarized in Table 1 were used as direct inputs into the base year travel demand model. The travel demand modeling process is explained in the appendix.

EXISTING TRAFFIC CONDITIONS

This section first presents a qualitative estimate of roadway operations based on a Level-of-Service (LOS) derived from the relationship between observed daily traffic volume and theoretical capacity of the roadway. The LOS is a proxy for driver delay and congestion, and also indicates the amount of remaining capacity. The section concludes by summarizing circulation issues identified by City staff and residents, and confirmed in previous traffic impact studies.

Existing roadway segment operations were theoretically qualified based on the ratio between observed daily traffic volume (Figure 2) and the roadway's theoretical daily traffic capacity. The LOS-capacity thresholds are outlined in the appendix. The daily traffic counts are considered representative of average conditions; the counts are henceforth referred to as Average Daily Traffic (ADT). The resulting ADT-based LOS estimates for major study segments within the City planning area are presented in Table 2A.

Existing AM Peak-Hour and PM Peak-Hour intersection traffic operations were quantified utilizing methodology contained in the Transportation Research Board-published *Highway Capacity Manual 2000,* the existing traffic volumes (Figure 3), and the existing intersection lane geometrics and control (Figure 4). The methodology is further summarized in Appendix A.

TABLE 2A
EXISTING ROADWAY SEGMENT LEVEL OF SERVICE

As shown in Table 2, SR-99 is estimated to operate at the cusp of Caltrans acceptable LOS "C-D". Segments of SR 104/Twin Cities Road, C Street, and Lincoln Way are estimated to operate near or at capacity (LOS E) under existing conditions.

Table 2B
Existing Intersection Level of Service

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Twin Cities Road/West Stockton Boulevard	Signal	D	31.4	C	-	41.4	D	-
2	Twin Cities Road/East Stockton Boulevard	Signal	D	29.2	C	-	33.3	C	-
3	Twin Cities Road/Carillion Boulevard	TWSC	D	28.7	D	-	16.2	C	-
4	Twin Cities Road/Marengo Road	TWSC	D	11.8	B	No	11.0	B	No
5	Walnut Avenue/Carillion Boulevard	AWSC	D	9.6	A	No	8.6	A	No
6	Walnut Avenue/E Stockton Blvd./SR 99 NB Ramps	AWSC	D	10.1	B	No	9.2	A	No
7	SR-99 SBRamps-Pringle Avenue / N. Lincoln Way	AWSC	D	8.3	A	No	14.7	B	No
8	SR-99 NB Ramps-Ayers Lane / E. Stockton Boulevard-Carol Lane	AWSC	D	10.6	B	No	10.7	B	No
9	Amador Avenue / Lincoln Way	Signal	D	35.5	D	-	31.7	C	-
10	Amador Avenue / Carol Drive	TWSC	D	11.3	B	No	11.2	B	No
11	Lincoln Way / Simmerhorn Road	TWSC	D	28.6	D	No	17.9	c	No
12	SR-99 SB Ramps-Elm Avenue / Lincoln Way	AWSC	D	24.3	C	Yes	16.7	C	Yes
13	Simmerhorn Road/SR 99 NB Ramps	TWSC	D	10.6	B	No	11.7	B	No
14	Simmerhorn Road/Carillion Blvd.	AWSC	D	9.7	A	No	8.2	A	No
15	'A' Street/SR 99 SB Ramps	TWSC	D	10.7	B	No	9.4	A	No
16	Lincoln Way/C Street	Signal	D	31.9	C	-	35.2	D	-
17	**'C' Street/Fairway Drive**	**AWSC**	**D**	**84.3**	**F**	**Yes**	**44.5**	**E**	**Yes**
18	Boessow Road/SR 99 NB Ramps	AWSC	D	17.0	C	No	16.6	C	No

Notes:
1. TWSC = Two Way Stop Control; AWSC = All Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections
3. Warrant = Based on California MUTCD Warrant 3

As shown above, all study intersections are projected to operate at acceptable during Existing Conditions., with the exception of the "C" Street/Fairway Drive Intersection. The deficient intersection is part of the Central Galt Interchange, which is in the process of reconstruction.

TRAFFIC MODEL UPDATE

The procedure used to create and validate the base year City Travel Demand Model is briefly summarized in this section. Included in this section are an explanation of the Four-Step Model process and a description of the data used to generate travel demand forecasts. Full model documentation is provided in the appendix.

Two datasets are needed to generate travel demand forecasts: the land use and the traffic network within a study area. Differing land uses generate differing trip quantities on a similar per unit basis (e.g. trips per square-foot for a shopping center versus an office). The trips are matched between complimentary land uses as origin-destination pairs (e.g. home-to-work, home-to-shop) based on congested travel time through the roadway network.

The trip is assigned a travel mode if non-vehicular trips are accounted for in the model. The trips are assigned through the traffic network on a shortest-path basis, if multiple paths exist, based on the travel time between the zones containing the complimentary land uses. Short distances and high capacity, high-speed roadways result in short travel times. The model procedure is summarized below:

1. Collect parcel data and aggregate areas into Traffic Analysis Zones (TAZ)
2. Model the traffic network
3. Create the four-step modeling process
    - Trip Generation – Estimate the trips generated and attracted by individual Traffic Analysis Zones (TAZs)
    - Trip Distribution – Match trips that are generated and attracted between zones for varying trip purposes.
    - Mode Choice – Select a travel mode for a particular trip.
    - Assignment – Select a path for the chosen travel mode and trip.
4. Calibrate the base year model
5. Forecast build-out year travel demand

BUILD-OUT CIRCULATION SYSTEM

Build-out of the City of Galt is based on two components: the build-out land use and roadway network. The City's build-out land uses were updated within the City General Plan Update process and disseminated by the Mintier & Associates, the General Plan Update consultant.

Interregional growth is a third model component that affects City build-out forecasts. Land use and interregional traffic patters originating or terminating outside the City model area were derived by performing a "sub-area extraction" of the SACMET travel demand model.

FUTURE LAND USES

The City General Plan process involved analyzing multiple land use alternatives prior to selecting a preferred alternative. Table 3A summarizes the dwelling unit count and non-residential acreage of the three study alternatives and the Preferred Plan alternative. Table 3B summarizes the forecasted employment resulting from the three study alternatives and the Preferred Plan alternative.

TABLE 3A
FUTURE LAND USE

	Build-Out Land Use					
	Existing Development		Current General Plan		Preferred Alternative	
Land Use Category	Current City Limits	Pref. Alt. City Limits	Current City Limits	Pref. Alt. City Limits	Current City Limits	Pref. Alt. City Limits
Residential						
Single Family	5,595 DU	555 DU	8,335 DU	1,105 DU	7,580 DU	6,460 DU
Multi-Family	1,110 DU	0 DU	1,110 DU	0 DU	2,605 DU	1,465 DU
Total	6,705 DU	555 DU	9,445 DU	1,105 DU	10,185 DU	7,925 DU
Non-Residential						
Commercial / Retail	86 acres	1 acres	270 acres	57 acres	265 acres	355 acres
Office	8 acres	-	16 acres	0 acres	20 acres	110 acres
Industrial	99 acres	-	322 acres	75 acres	290 acres	320 acres
Agriculture	10 acres	2,970 acres	10 acres	2,970 acres	0 acres	0 acres
Schools	5,000 students	-	10,500 students	-	5,000 students	8,500 students

TABLE 3B
FUTURE EMPLOYMENT

	Existing Employment (employees)					
	Existing Development		Preferred Alternative		Preferred Alternative	
Land Use Category	Current City Limits	Pref. Alt. City Limits	Current City Limits	Pref. Alt. City Limits	Current City Limits	Pref. Alt. City Limits
Retail	1,310	10	3,313	625	4,910	5,294
Service	1,515	10	3,134	420	1,904	5,923
Other	1,440	1,485	4,679	2,575	11,438	12,710

The land uses summarized in Table 3 are used as direct inputs into the Build-Out Year (2030) travel demand model. The travel demand modeling process is explained in the appendix.

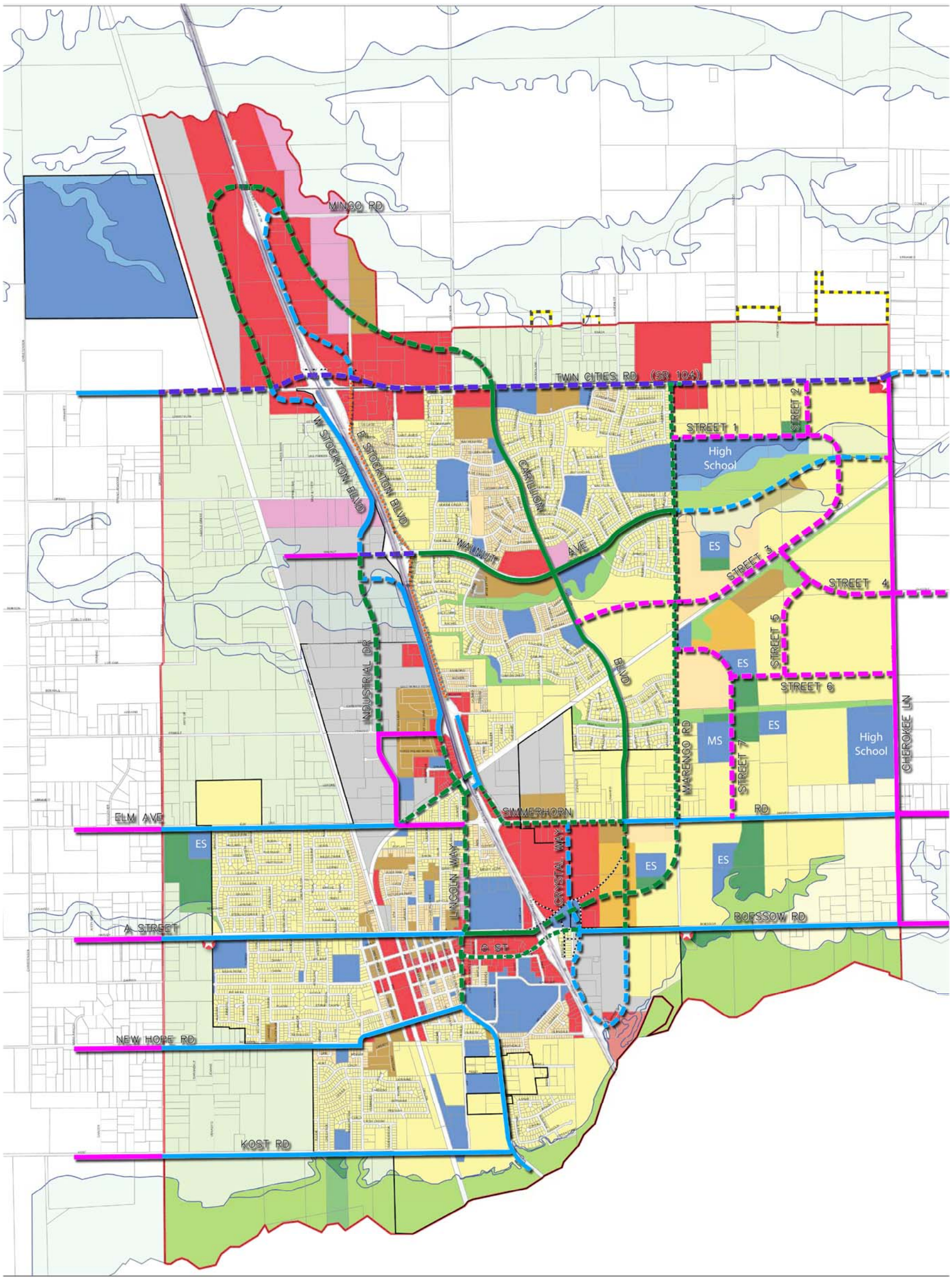
BUILD-OUT TRAFFIC NETWORK

The City's 2006 update to the Citywide Traffic Capital Improvements Program (TCIP) anticipates the following roadway network improvements:

- **Central Galt Interchange** is planned for modification by the year 2010. The facility is extremely congested during the morning and afternoon hours, with most of the congestion occurring at the C Street/Fairway Drive/SR 99 southbound off-ramp intersection and the Boessow Road/SR 99 northbound on- and off-ramp. The improvements involve extending and expanding the interchange on- and off-ramps to improve circulation and driver safety. Three alignments are under study. The City's preferred interchange alignment, Alternative 13A (OMNI-MEANS, 2004), was utilized for future travel forecasting within the travel demand model and includes a **Carillion Boulevard extension** from its existing terminal at Simmerhorn Road to the interchange**.**
- **Amador-Simmerhorn Interchange** near Amador Avenue and Simmerhorn Road consists of hook ramps at Simmerhorn Road, Elm Avenue, Pringle Avenue, and Ayers Lane; and overpasses at Amador Avenue and Simmerhorn Road. Study of improvements at this location is ongoing, with concepts emphasizing the widening and realigning of the overpasses, and removing some ramps. The preliminary concept analyzed in this study is a "tight diamond" interchange configuration, which keeps the northbound off-ramp at Simmerhorn Road, the southbound on-ramp at Elm Avenue, the northbound on-ramp at Ayers Lane, and the southbound off-ramp at Pringle Avenue. The **Simmerhorn Road extension** to Carol Drive would be constructed as a part of this concept.
- **Walnut Avenue Interchange** currently has northbound and southbound hook ramps, but lacks an overpass. The need for additional cross-freeway access is anticipated with further development in the northern portion of the City. Improvements at Walnut Avenue include constructing only an overpass or a full-access interchange.
- **Twin Cities Road Interchange** is anticipated for reconstruction in the TCIP. The City General Plan has the surrounding area designated for Highway Commercial and the interchange is nearing capacity. Further capacity is required to accommodate the build-out of the area consistent with the General Plan.
- **Marengo Road Extension** is noted in the General Plan Circulation Element plans from its existing alignment to the present location of the Crystal Way/SR99 ramps. Marengo Road would then connect across SR 99, via an overcrossing to Glendale Avenue or Fairway Drive.
- **Various road widening projects** noted in the TCIP include improvements at **Kost Road, F Street, A Street, Elm Avenue/Amador Drive, Twin Cities Road, Marengo Road,** and sections of **Walnut Avenue** and **C Street** adjacent to their respective interchanges.

One additional improvement to the City circulation system not included in the TCIP, but anticipated based on other regional planning, is the **widening of SR-99 to six and eventually eight lanes**. The improvement to six and eight lanes is listed in the SR-99 Caltrans Transportation Concept Report (TCR, Caltrans District 3, May 2004) as a concept facility configuration and ultimate facility configuration, respectively. The right-of-way required for the ultimate expansion would result in the closure of some frontage road segments and ramps. However, the future concept for intra-city circulation is to move away from frontage roads and to emphasize travel on a parallel arterial system using "backbone" facilities such as Carillion Boulevard to the east and Industrial Drive to the west.

Figure 5 shows an initial concept of the build-out Circulation Plan based on the improvements listed above.



City of Galt General Plan Update

Figure 5

Preferred Land Use Alternative w/Circulation

T684TG023.DWG(19SEP07)25-4725-03

BUILD-OUT BICYCLE FACILITIES

The Galt Bicycle Transportation Plan (May 2002) proposes a number of new Class II bikeways to create a citywide trail system. The citywide network aims to connects major activity centers and thereby promote non-motorized travel modes for short trips within the City. The Class II bikeway system includes the following facilities.

#	Roadway	From	To
1	Twin Cities Road	Midway	Cherokee
2	Marengo Road	Twin Cities	Boessow
3	Carillion Road	Twin Cities	SR-99
4	West Stockton Boulevard / Frontage Road	Twin Cities	Pringle
5	North Lincoln / Lincoln Way	Orr Road	Kost Road
6	McFarland/4th/Railroad	Live Oak Road	Kost Road
7	Walnut Avenue	E. Stockton	Cherokee
8	Vintage Oak Drive	Walnut	Carillion
9	Amador Avenue	Elm	Village Oak Avenue
10	Live Oak Avenue	N. Lincoln	End of pavement
11	Pringle Avenue / Industrial Drive	N. Lincoln	Elm
12	Orr Avenue / Elm Avenue	Sargent	N. Lincoln
13	Sparrow Avenue	W. Elm Avenue	West A St.
14	Emerald Oak Drive	W. Elm Avenue	West C St.
15	Oak Avenue	W. Elm Avenue	West A St.
16	Simmerhorn Road	Marengo	Lincoln Way
17	A Street	Sargent (Harvey)	Marengo Road
18	C Street / Boessow Road	West City Limit	Marengo
19	New Hope Road / F Street	Sargent	Lincoln
20	Kost Road	Sargent	Lincoln
21	E. Stockton Boulevard / Carol Drive	Amador	Twin Cities

Source: Table 6, Galt Bicycle Transportation Plan (May 2002)

FORECASTED TRAFFIC CONDITIONS

This section first presents a qualitative estimate of future roadway operations based on a Level-of-Service (LOS) derived from the relationship between forecasted daily traffic volume and theoretical capacity of the roadway. The future forecasts were generated by the City Travel Demand Model for three scenarios:

- Current City General Plan, loaded on the existing traffic network
- Preferred Alternative, loaded on the existing traffic network
- Preferred Alternative, loaded on the build-out Circulation Plan traffic network

The section concludes by identifying whether any additional negative impacts are projected to occur with the improvements included in the build-out Circulation Plan.

TABLE 4
BUILD-OUT ROADWAY TRAFFIC FORECASTS

				Year 2030 Forecast, Existing Network				Year 2030 Forecast, Improved Network		
				Current General Plan		Preferred Alternative			Preferred Alternative	
Roadway	Location	Facility Type	2005 Count (Daily)	Average Daily Traffic	Roadway LOS	Average Daily Traffic	Roadway LOS	Facility Type	Average Daily Traffic	Roadway LOS
SR 99	s/o Crystal Way/Fairway Drive	Four-lane Freeway	63,000	87,800	E-F	87,800	E-F	Six-lane Freeway	87,800	C-D
SR 99	s/o C Street/Boessow Road	Four-lane Freeway	62,000	89,200	E-F	94,600	F	Six-lane Freeway	91,900	C-D
SR 99	s/o Simmerhorn Road/Elm Avenue	Four-lane Freeway	64,000	94,700	F	106,100	F	Six-lane Freeway	120,000	E-F
SR 99	s/o Pringle Way/Ayers Lane	Four-lane Freeway	63,000	94,200	F	116,600	F	Six-lane Freeway	137,400	F
SR 99	s/o Walnut Avenue	Four-lane Freeway	64,000	101,100	F	126,900	F	Six-lane Freeway	145,100	F
SR 99	s/o Twin Cities Road	Four-lane Freeway	63,000	97,900	F	125,000	F	Six-lane Freeway	150,100	F
SR 99	s/o Mingo Road	Four-lane Freeway	66,000	93,900	F	117,000	F	Six-lane Freeway	122,100	E-F
SR 99	n/o Mingo Road	Four-lane Freeway	66,000	92,200	F	92,200	F	Six-lane Freeway	92,200	C-D
SR 104/Twin Cities Road	w/o SR 99	Two-lane Arterial	-	17,300	F	25,900	F	Six-lane Arterial	47,300	C-D
SR 104/Twin Cities Road	SR 99 Overcrossing	Two-lane Arterial	-	27,800	F	52,200	F	Six-lane Arterial	50,100	D-E
SR 104/Twin Cities Road	e/o SR 99	Two-lane Arterial	17,600	24,300	F	34,700	F	Six-lane Arterial	59,700	E
SR 104/Twin Cities Road	w/o Carillion Road	Two-lane Arterial	-	15,200	E-F	27,300	F	Six-lane Arterial	34,600	A-B
SR 104/Twin Cities Road	e/o Carillion Road	Two-lane Arterial	-	8,500	A-B	15,000	E-F	Four-lane Arterial	19,900	A-B
SR 104/Twin Cities Road	e/o Cherokee Lane	Two-lane Arterial	5,100	12,600	D-E	12,600	F	Four-lane Arterial	12,600	A-B
A Street	w/o SR 99	Two-lane Arterial	-	9,400	B-C	13,100	D-E	Four-lane Arterial	25,500	B-C
A Street	SR 99 Overcrossing	-	-	-	-	-	-	Four-lane Arterial	32,700	D-E
A Street	e/o SR 99	-	-	-	-	-	-	Four-lane Arterial	30,600	C-D
Amador Avenue	w/o Lincoln Way	Two-lane Collector	1,900	10,500	C-D	16,900	F	Two-to-Four lane Arterial	7,000	A
Amador Avenue	SR 99 Overcrossing	Two-lane Collector	6,900	19,800	F	33,100	F	Two-to-Four lane Arterial	10,700	A
Boessow Road	e/o SR 99 NB Ramps	Two-lane Collector	4,700	17,000	F	24,700	F	Four-lane Arterial	15,900	A-B
C Street	e/o 3rd Street	Two-lane Arterial	7,000	7,000	B-C	10,600	B-C	Two-lane Arterial	11,000	C
C Street	e/o Lincoln Way	Two-lane Arterial	12,100	16,500	F	19,100	F	Four-lane Arterial	26,600	C-D
C Street	SR 99 Overcrossing	Two-lane Arterial	-	32,200	F	48,900	F	Four-lane Arterial	32,300	C-D
Carillion Boulevard	n/o Walnut Avenue	Four-lane Arterial	3,600	11,600	A-B	25,000	B-C	Four-lane Arterial	22,600	B-C
Carillion Boulevard	s/o Walnut Avenue	Four-lane Arterial	4,100	15,000	A-B	31,200	C-D	Four-lane Arterial	22,600	B-C
Carillion Boulevard	n/o Twin Cities Road	-	-	-	-	-	-	Four-lane Arterial	8,200	A
Carillion Boulevard	s/o Twin Cities Road	-	-	-	-	-	-	Four-lane Arterial	23,300	B-C
Cherokee Lane	n/o Twin Cities Road	Two-lane Collector	500	500	A	500	A	Two-lane Collector	500	A
Cherokee Lane	s/o Twin Cities Road	Two-lane Collector	-	1,500	A	10,300	D-E	Two-lane Arterial	5,200	A
Cherokee Lane	n/o Simmerhorn Road	Two-lane Collector	-	1,800	A	15,400	F	Two-lane Arterial	2,000	A
Elm Avenue	e/o McFarland Street	Two-lane Collector	5,800	9,300	C-D	14,300	F	Two-lane Collector	7,500	B-C
Elm Avenue	w/o Lincoln Way	Two-lane Collector	5,000	9,300	C-D	18,000	F	Two-lane Collector	6,800	B-C
F Street	e/o 3rd Street	Two-lane Arterial	6,900	9,600	B-C	11,000	B-C	Two-lane Arterial	10,100	B-C
Fairway Drive	s/o Caroline Avenue	Two-lane Collector	1,800	2,800	A-B	5,300	A	Two-lane Collector	2,800	A
Harvey Road	e/o western City Limits	Two-lane Collector	1,500	3,200	A-B	7,700	B-C	Two-lane Collector	2,700	A
Harvey Road	w/o western City Limits	Two-lane Collector	900	900	A	900	A	Two-lane Collector	900	A
Industrial Drive	n/o Elm Avenue	Two-lane Collector	1,800	4,900	A-B	17,900	F	Two-lane Arterial	8,600	A
Industrial Drive	s/o Walnut Avenue	-	-	-	-	-	-	Two-to-Four lane Arterial	20,700	C-D
Kost Road	e/o western City Limits	Two-lane Collector	1,400	2,100	A	2,100	A	Two-lane Collector	1,400	A
Kost Road	w/o western City Limits	Two-lane Collector	700	2,300	A	2,300	A	Two-lane Collector	2,300	A
Lincoln Way	n/o Simmerhorn Road	Two-lane Arterial	11,400	16,200	F	23,800	F	Two-lane Arterial	15,600	C-D
Lincoln Way	n/o Elm Avenue	Two-lane Arterial	12,200	20,600	F	29,300	F	Four-lane Arterial	17,300	D-E
Lincoln Way	between C Street and A Street	Two-lane Arterial	9,800	13,600	D-E	14,200	E-F	Two-lane Arterial	15,900	C-D
Lincoln Way	between C Street and F Street	Two-lane Arterial	8,400	12,300	C-D	12,800	C-D	Two-lane Arterial	13,600	C-D
Lincoln Way	s/o F Street	Two-lane Arterial	6,900	8,600	A-B	10,300	B-C	Two-lane Arterial	9,000	A-B

Roadway	Location	Facility Type	2005 Count (Daily)	Year 2030 Forecast, Existing Network				Year 2030 Forecast, Improved Network		
				Current General Plan		Preferred Alternative			Preferred Alternative	
				Average Daily Traffic	Roadway LOS	Average Daily Traffic	Roadway LOS	Facility Type	Average Daily Traffic	Roadway LOS
Marengo Road	n/o Simmerhorn Road	Two-lane Collector	2,000	2,000	A	5,100	A	Four-lane Arterial	9,000	A
Marengo Road	s/o Twin Cities Road	Two-lane Collector	1,000	4,700	A-B	12,300	E-F	Four-lane Arterial	9,900	A
McFarland Street	between Elm Avenue and A Street	Two-lane Collector	2,000	2,000	A	7,600	B-C	Two-lane Collector	2,000	A
McKenzie Road	n/o Twin Cities Road	Two-lane Collector	800	1,500	A	16,600	F	-	-	-
Mingo Rd	e/o SR 99	Two-lane Collector	500	900	A	16,200	F	Four-to-Six lane Arterial	39,900	C
Mingo Rd	SR 99 Overcrossing	-	-	-	-	-	-	Six-lane Arterial	39,400	C
Mingo Rd	w/o SR 99	-	-	-	-	-	-	Four-to-Six lane Arterial	39,900	C
New Hope Road	e/o western City Limits	Two-lane Collector	1,300	2,500	A	3,900	A	Two-lane Collector	2,500	A
New Hope Road	w/o western City Limits	Two-lane Collector	2,400	3,800	A-B	3,800	A-B	Two-lane Collector	3,800	A
Orr Road	e/o western City Limits	Two-lane Collector	2,100	2,100	A	6,600	B-C	Two-lane Collector	2,100	A
Orr Road	w/o western City Limits	Two-lane Collector	1,200	1,500	A	1,500	A	Two-lane Collector	1,500	A
Pringle Avenue	w/o SR 99 SB Ramp	Two-lane Collector	2,000	4,800	A-B	8,600	B-C	Two-lane Collector	11,900	D-E
Quiggle Road	e/o Cherokee Ln.	Two-lane Collector	300	300	A	300	A	Two-lane Collector	300	A
Simmerhorn Road	e/o Cherokee Ln.	Two-lane Arterial	1,000	4,900	A-B	4,900	A-B	Two-lane Arterial	4,900	A-B
Simmerhorn Road	SR 99 Overcrossing	Two-lane Arterial	4,800	22,100	F	36,600	F	Four-lane Arterial	23,700	C-D
Twin Cities Road	w/o Christensen Road	Two-lane Arterial	4,600	8,800	B-C	8,800	B-C	Two-lane Arterial	8,800	A
W. Stockton Boulevard	s/o Walnut Avenue	Two-lane Collector	3,200	3,200	A-B	15,000	F	Two-lane Collector	7,800	B-C
W. Stockton Boulevard	n/o Walnut Avenue	Two-lane Collector	-	7,300	B-C	19,700	F	Two-lane Arterial	6,400	B
W. Stockton Boulevard	s/o Twin Cities Road	Two-lane Collector	-	6,200	B	16,700	F	Two-lane Arterial	6,000	B
E. Stockton Boulevard	s/o Walnut Avenue	Two-lane Collector	3,900	10,400	D-E	20,900	F	-	-	-
E. Stockton Boulevard	n/o Twin Cities Road	Two-lane Collector	-	1,100	A	10,600	D-E	Four-lane Arterial	24,200	C-D
Walnut Avenue	e/o East Stockton Blvd.	Two-lane Arterial	4,700	20,200	F	28,400	F	Four-to-Six lane Arterial	32,800	C
Walnut Avenue	w/o West Stockton Blvd.	Two-lane Collector	400	500	A	8,400	B-C	Four-to-Six lane Arterial	36,500	C
Walnut Avenue	SR 99 Overcrossing	-	-	-	-	-	-	Six-lane Arterial	40,500	B-C

As shown in Table 4, development of the current General Plan or the Preferred Alternative without any improvements to the roadway network will result in adverse impacts on the SR 99 freeway, which is within State right-of-way, and on a several City roadways.

The majority of City intersections in the improved roadway circulation system are projected to operate at acceptable LOS. Future intersections will be configured based on the capacity of the adjacent roadway segments. Table 5 presents intersections forecasted to operate at or beyond capacity. Some intersections are planned for improvement consistent with roadway improvements (e.g. widening, interchange reconstruction, etc). Several existing intersections have limited right-of-way for further expansion; the constraints on the mitigation are identified in the table below.

TABLE 5
FORECASTED AT-CAPACITY OR OVERCAPACITY INTERSECTIONS

Deficient Intersection	Existing Control	Feasible Mitigation
Twin Cities Road / SR 99 Interchange	Signal Control, Two-Lane Overcrossing	Reconstruct Interchange, Six to Eight Lane Overcrossing
Walnut Avenue/SR 99 NB Ramps	Stop Sign Control, No Overcrossing	Reconstruct Interchange, Four to Six Lane Overcrossing
Walnut Avenue/Carillion Blvd.	Signal Control	Further turning movement lane channelization, limited right-of-way available
Lincoln Way/Pringle Avenue	Stop Sign Control	Signal control and/or ramp/interchange reconstruction with Ayers Lane, Elm Avenue, and Simmerhorn Road. Lincoln Way has limited right-of-way for further widening.
Lincoln Way/Amador Avenue		
Lincoln Way/Simmerhorn Road		
Lincoln Way/Elm Avenue		
Ayers Lane/Carol Drive/SR 99 NB Ramps		
Simmerhorn Road/SR 99 NB Ramps		
Lincoln Way/A Street	Signal Control	Lincoln Way has limited right-of-way for further widening. City has adopted LOS "E" exception for the downtown area.
Lincoln Way/C Street		
A Street / Boessow Road /. SR 99 (Central Galt) Interchange	Signal Control, Two-Lane Overcrossing	Interchange currently in reconstruction process
Glendale Avenue/Fairway Drive/SR 99 SB Ramps	Stop Sign Control	Traffic diversion resulting from adjacent Central Galt interchange reconstruction

Improvements presented in the Circulation Plan (Figure 5) are forecasted to provide daily operating conditions at LOS D or better at nearly all roads in the City's jurisdiction. The SR 99 freeway, which was analyzed with six lanes, is forecasted to operate at deficient LOS E or worse within the City. The further widening of the freeway to eight lanes will likely provide LOS "D" or better. Freeway overcrossing facilities at SR 104/Twin Cities Road, A Street, C Street, Simmerhorn Road, and Walnut Avenue are forecasted to operate near capacity (LOS D/E). All other roadway segments are forecasted operate at acceptable LOS "D" or better, which is consistent with City standard.

In constructing the Circulation Plan, the following existing circulation issues are resolved:

- The Circulation Plan establishes a hierarchy of arterials, collectors, and local streets to provide a cohesive circulation system that provides improved connectivity across SR 99 and reduces the need for City residents to use the freeway for intra-city travel.

- Interchange issues at Twin Cities Road and the Central Galt Interchange are resolved with the new interchanges at those two locations and additional improvements at Walnut Avenue and Simmerhorn Road/Amador Avenue.

Further study is required for the following issues:

- Widening the SR-99 freeway to six lanes is not forecasted to provide acceptable operations at year 2030 conditions. The ultimate concept for the freeway is an eight-lane freeway with HOV lanes, which is forecasted to provide the needed capacity. Further study is required to address the feasibility of the project and necessary funding and schedule.

- Rail traffic will continue to negatively affect roadway circulation. Plans for a separated grade crossing are being studied.

TECHNICAL APPENDIX

APPENDIX A
LEVEL OF SERVICE METHODOLOGY

LEVEL OF SERVICE METHODOLOGY

Traffic operations along road segments and intersections are estimated using a "Level of Service" (LOS), where a letter grade "A" through "F" is represents progressively worsening traffic conditions. LOS is calculated using the methods documented in the Transportation Research Board Publication *Highway Capacity Manual, Fourth Edition, 2000*.

Intersection delays are calculated based on intersection delay. The LOS is based on the average delay for all intersection movements at signalized and All-Way-Stop-Controlled (AWSC) intersections. The LOS is based on the minor-street approach at Two-Way Stop-Controlled (TWSC) intersections. Table A-1 presents the intersection delay thresholds.

Road segments have estimated maximum capacities that are based on the roadway type (e.g. freeway, arterial and collector) and number of lanes. LOS is calculated based on the ratio of volume to capacity (V/C). Table A-2 presents the roadway segment LOS V/C thresholds and estimated daily volumes based on those thresholds for a set of roadway types.

The City of Galt adopts LOS D as the minimum acceptable LOS for all intersections within the City limits.

The Caltrans published Guide for the Preparation of Traffic Impact Studies (dated June 2001) states the following:

> *"Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities, however, Caltrans acknowledges that this may not be always feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS."*

Consistent with City policy, this study considers LOS "D" as the maximum acceptable threshold for all intersections and roadway segments not on the State highway system. Consistent with the Caltrans' guidelines, LOS "C" is considered the maximum acceptable threshold for operations at freeway and highway segments and intersections.

TABLE A-1
INTERSECTIONS LEVEL-OF-SERVICE (LOS) CRITERIA

LEVEL OF SERVICE	TYPE OF FLOW	DELAY	MANEUVERABILITY	STOPPED DELAY/VEHICLE (SEC)		
				SIGNALIZED	UNSIGNALIZED	ALL-WAY STOP
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	$\leq$ 10.0	$\leq$ 10.0	$\leq$ 10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10 and $\leq$ 20.0	>10 and $\leq$ 15.0	>10 and $\leq$ 15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	>20 and $\leq$ 35.0	>15 and $\leq$ 25.0	>15 and $\leq$ 25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35 and $\leq$ 55.0	>25 and $\leq$ 35.0	>25 and $\leq$ 35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55 and $\leq$ 80.0	>35 and $\leq$ 50.0	>35 and $\leq$ 50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	> 80.0	> 50.0	> 50.0

Source: 2000 Highway Capacity Manual

TABLE A-2
ROADWAY SEGMENTS LEVEL-OF-SERVICE (LOS) CRITERIA

	LOS "A"	LOS "B"	LOS "C"	LOS "D"	LOS "E"
All Facilities (Volume-to-Capacity Ratio (V/C))	<0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1.0
Roadway Segment Type	**Two-way Average Daily Traffic (ADT) Threshold**				
	LOS "A"	**LOS "B"**	**LOS "C"**	**LOS "D"**	**LOS "E"**
6-Lane Freeway	64,500	75,500	86,500	97,000	108,000
4-Lane Freeway	43,000	50,500	57,500	64,500	72,000
4-lane Rural Highway	21,500	25,000	28,500	32,500	36,000
2-Lane Rural Highway	10,500	12,500	14,500	16,000	18,000
6-Lane Major Arterial	26,000	30,000	34,500	39,000	43,000
4-Lane Major Arterial	17,500	20,000	23,000	26,000	28,500
4-Lane Minor Arterial	15,000	17,500	20,000	22,500	25,000
2-Lane Minor Arterial	7,500	8,500	10,000	11,500	12,500
4-Lane Collector	13,000	15,000	17,500	19,500	21,500
2-Lane Collector	6,500	7,500	8,500	9,500	10,500

Note: 1. Based on "Highway Capacity Manual", Transportation Research Board, 2000 peak hour capacities. Daily capacities in the study area are assumed as nine times the peak hour capacity.

2. All volumes are approximate and assume ideal roadway characteristics. Actual threshold volumes for each Level of Service listed above may vary depending on a variety of factors including (but not limited to) roadway curvature and grade, intersection or interchange spacing, driveway spacing, percentage of trucks and other heavy vehicles, travel lane widths, signal timing characteristics, on-street parking, volume of cross traffic and pedestrians, etc.

TRAFFIC SIGNAL WARRANT ANALYSIS CRITERIA

"A supplemental traffic signal "warrant" analysis has also been completed to determine whether "significance" should be associated with unsignalized intersection operations,. The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the need for installation of a traffic signal at an otherwise unsignalized intersection. This study has employed the signal warrant criteria presented in the latest edition of the California Manual on Uniform Traffic Control Devices (MUTCD) for all study intersections. The signal warrant criteria are based upon several factors, including the volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas.

The California MUTCD indicates that the installation of a traffic signal should be considered if one or more of the signal warrants are met. Specifically, this study will utilize the peak hour volume-based Warrant 3 as one representative type of traffic signal warrant analysis. Since Warrant 3 provides specialized warrant criteria for intersections with rural characteristics (e.g. located in communities with populations of less than 10,000 persons or with adjacent major streets operating at above 40 mph), study intersections which use this specialized criteria will be clearly identified.

APPENDIX B
TRAVEL DEMAND MODEL DEVELOPMENT

TRAVEL DEMAND MODEL DEVELOPMENT

This section presents the supporting technical documentation for the City Travel Demand Model development process. The procedure is outlined below:

1. Collect parcel data and aggregate areas into Traffic Analysis Zones (TAZ)
2. Model the traffic network
3. Create the four-step modeling process
4. Calibrate the base year model
5. Forecast build-out year travel demand

Land Use Data

Travel demand models simulate travel demand by first estimating trips generated in zones within the study area. The number and type of trips generated and attracted between areas depend on land use. The County Assessor's parcel database provides land use data in terms of zoning and development type (e.g. housing, commercial development, public uses). The land uses were further simplified into housing unit and employment estimates, which are consistent with the US Census. The existing land uses within the City are summarized in Table A-3.

TABLE A-3
EXISTING LAND USES

	Existing Land Use			
Land Use Category	**Existing City Limits**	**Preferred Alternative City Limits**	**Remaining Model Area**	**Total Model Study Area**
Residential				
Single Family	5,595 DU	555 DU	280 DU	6,430 DU
Multi-Family	1,110 DU	0 DU	0 DU	1,110 DU
Total	6,705 DU	555 DU	280 DU	7,540 DU
Non-Residential				
Commercial / Retail	86 acres	1 acres	-	87 acres
Office	8 acres	-	-	8 acres
Industrial	99 acres	-	-	99 acres
Agriculture	10 acres	2,970 acres	40 acres	3,020 acres
Schools	5,000 students	-	300 students	5300 students
	Existing Employment (employees)			
Employment Category	**Existing City Limits**	**Preferred Alternative City Limits**	**Remaining Model Area**	**Total Model Study Area**
Retail	1,310	10	0	1,320
Service	1,515	10	30	1,555
Other	1,440	1,485	340	3,265

City land uses are simplified into areas referred to as "Traffic Analysis Zones" (TAZs) for travel demand modeling purposes. Aggregating minute areas like parcels into larger zones decreases the computation intensity of the model and simplifies data processing. The TAZs are defined using real-world traffic boundaries, such as natural geographic barriers (e.g. rivers and creeks) and "man-made" barriers (e.g. major street right-of-ways and railroads).

Figure A-1 presents the City TAZ map. The TAZ boundaries are consistent with TAZ boundaries defined for the regional model. A total of 151 TAZs were defined for the City planning area.

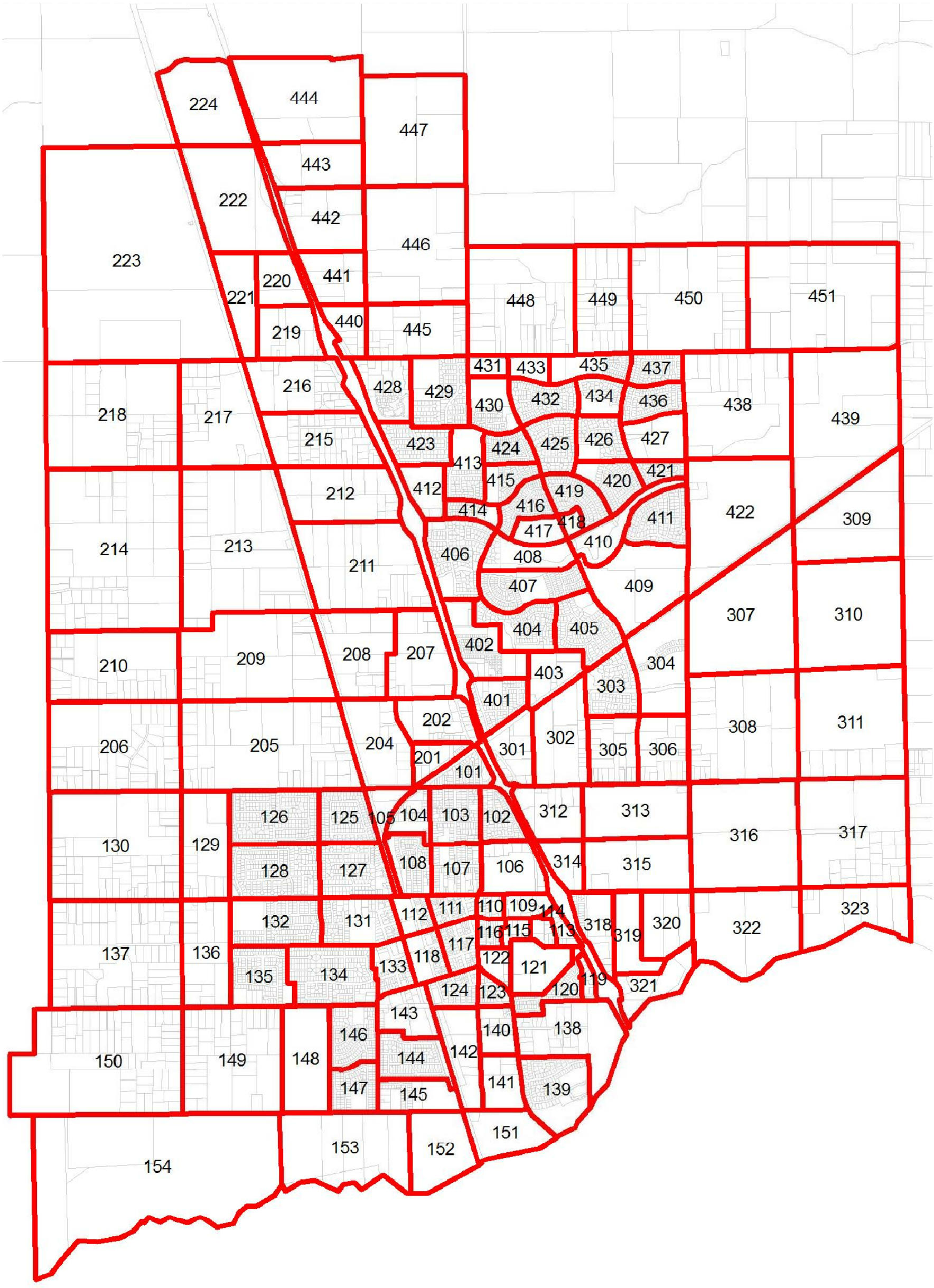


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Figure A–1

City Travel Demand Model TAZ Map

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Network Creation
Street networks handle the trips generated by land use. The travel demand model simulates a road's ability to handle travel demand based on facility type (e.g. freeway, highway, arterial, and collector), number of lanes, speed, and alignment. Figure A-2 shows the Base Year model street network, which reflects the existing City roadway system.

Table A-4 presents the road classification categories, the associated operating characteristics of each category, and examples of roads in each category.

TABLE A-4
ROADWAY CLASSIFICATION

Classification	Capacity (Vehicles per Lane per Hour)	Free-Flow Speed (mph)	Example Roadway
Freeway	2000	65-70	State Route 99
Arterial	700	35-45	Carillion Boulevard, Lincoln Way
Collector	600	25-35	Simmerhorn Road, Elm Avenue
Local	300	25-35	Glendale Avenue, Lake Canyon Avenue

Four-Step Modeling Process
The CUBE/Voyager (Citilabs) software suite was used to create the City Travel Demand Model. The regional model was created on an earlier version of the CUBE/Voyager software called TP+/Viper (Citilabs).

The travel demand model follows an industry-standard four-step procedure for modeling travel demand. The steps are as follows:

1. Trip Generation – Estimate the trips generated and attracted by individual Traffic Analysis Zones (TAZs)
2. Trip Distribution – Match trips that are generated and attracted between zones for varying trip purposes.
3. Mode Choice – Select a travel mode for a particular trip.
4. Assignment – Select a path for the chosen travel mode and trip.

Trip Generation
Land uses generate a varying number of trips based on development type and development quantity. Trip producing land use groups include single-family and multi-family residential dwelling units. Trip attracting land use groups include retail, office, industrial and educational land uses. The land use quantities derived from the parcel database was converted into dwelling unit and employment estimates. These TAZ-level estimates were checked for consistency with the US Census and the regional model.

Each trip purpose has a different trip generation rate for each land use. Trip generation rates for individual land uses were checked against traffic studies contained in the Institute of Transportation Engineers *Trip Generation, 7th Edition* manual.

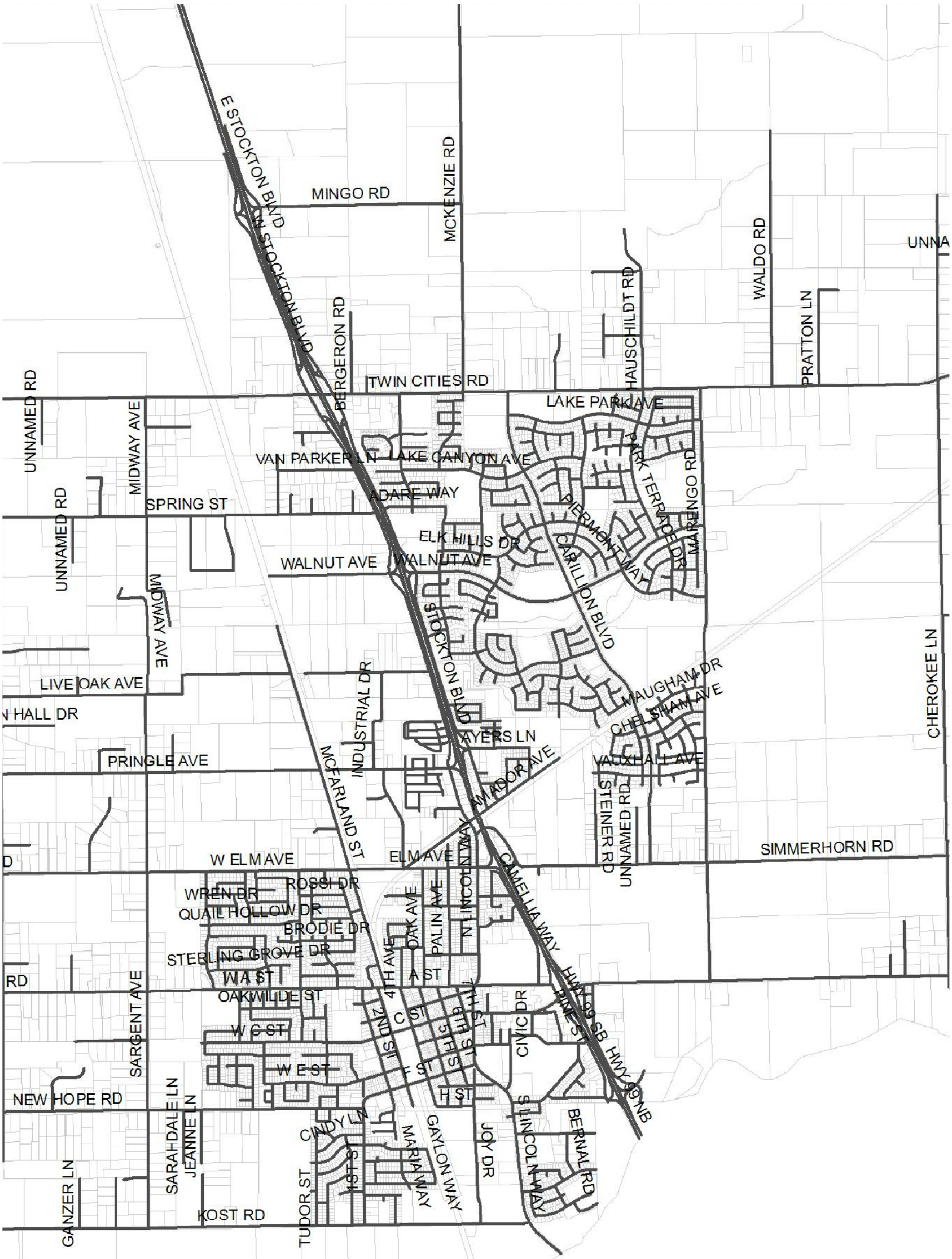

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Figure A–2

Base City Traffic Network

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Trip Distribution
The trips generated and attracted between land uses depend on trip purpose and network impedance. Modeled trips were sorted into five trip purpose categories.

1. Home-Based Work (HBW)
2. Home-Based Education (HBE)
3. Home-Based Shop (HBS)
4. Home-Based Other (HBO)
5. Other-Based Other (OBO)

The ability for one land use to satisfy the trip purpose of another land use leads to the creation of an origin-destination pairing (e.g. a trip from a residential area to an area containing retail development). The likelihood of such a pairing also depends on the travel time for such a trip to occur. Long travel times between zones, which are affected by congested roadways, decrease the likelihood of an origin-destination pairing and results in the model seeking another closer trip pairing opportunity.

Mode Choice
The City travel demand model solely simulates automobile travel patterns. Transit service is not a major component of the vehicular traffic within the City and was not considered in the travel demand model process.

Trip Assignment
Trips between origin-destination pairs are assigned by the model using an equilibrium process. The multiple possible paths between zones are iteratively loaded until no one path provides an advantage over another. The volumes on each network link are then compared against real-world traffic counts to determine model correctness. The following section outlines the model calibration procedure.

Model Calibration
The previous section described the creation of a complete but "un-validated" base year model, i.e. the model may not accurately reflect real-world travel demand. Calibrating the model so that it reasonably reflects real world travel demand requires matching the model estimate on a set of links against traffic counts.

Road Type and Percent Error
The model validation is based on criteria created by the Federal Highway Administration (*Federal Highway Administration, Calibration and Adjustment of System Planning Models, 1990.)* and Caltrans (*California Department of Transportation, Travel Forecasting Guidelines, 1992.).* Table A-5 presents the Federal Highway Administration (FHWA)-recommended absolute error targets for each facility type. The Root-Mean-Squared Error (RMSE) more heavily weights large errors.

TABLE A-5
CITY TRAVEL DEMAND MODEL – CALIBRATION SUMMARY

Roadway Classification	Traffic Count	Model Volume	% Error Model	% Error Target	RMSE Model	RMSE Target
Freeway	511,000	509,700	-0.3%	7.0%	3.6%	15.0%
Arterial	115,500	119,000	3.0%	15.0%	21.8%	40.0%
Collector	60,700	55,200	-9.1%	25.0%	47.6%	50.0%
Total	687,200	683,900	-0.5%	5.0%	36.2%	35.0%

Table A-5 shows that the model satisfies each facility-specific absolute percent-error target. The model satisfies the facility-specific RMSE targets, but exceeds the overall system RMSE target by 1.2%. Caltrans travel forecasting guidelines suggest that at least 75 percent of freeways, highways, and arterials fall within the maximum percent error target recommended by FHWA. Of the 49 counts used for model calibration, 55% of the model estimates fall within the maximum percent error target.

The primary reason for the large percent error and RMSE is the low traffic volume on many roads in the model study area. Having a small traffic count requires a smaller magnitude error when compared to roads with more traffic. This rationale is reflected in the FHWA Percent Error Targets, which increase in allowable percent error from the largest capacity roadways (e.g. freeways and highways) to smaller capacity roadways (e.g. arterials and collectors).

As such, the model calibration at any given count location was also considered acceptable when the magnitude error was equal to or less than 1,000 daily trips. Using both the 1,000 daily trip error threshold and the FHWA percent error thresholds, 76% of the calibration roadway segments were acceptably modeled; this satisfies the Caltrans travel forecasting guidelines of having at least 75 percent of roadways being calibrated within acceptable thresholds.

Regionwide Correlation Coefficient

The region-wide model correlation was calculated by plotting the model forecasts against the roadway counts. An acceptable correlation coefficient is 0.88; the model correlation coefficient is 0.99, meaning the model explains 99% of the variability in the traffic counts.