



Final Report

Fiesta-Downtown Chandler Transit Corridor Study

May 2017



TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	OVERVIEW	1
1.2	PURPOSE	1
1.3	GOALS AND OBJECTIVES.....	3
2.0	PROJECT RESEARCH.....	5
2.1	POPULATION AND EMPLOYMENT	5
2.2	TRANSIT-DEPENDENT POPULATION	5
2.3	LAND USE AND ACTIVITY CENTERS	6
	2.3.1 Existing and Planned Land Use	6
	2.3.2 Existing Activity Centers.....	7
	2.3.3 Planned Activity Centers and Land Use Trends.....	9
2.4	EXISTING AND PLANNED TRANSIT	11
	2.4.1 Existing and Planned Fixed Route Service	11
	2.4.2 Passenger Facilities.....	12
	2.4.3 Demand Responsive Service.....	13
2.5	OPPORTUNITIES AND CONSTRAINTS	13
3.0	FUTURE SCENARIOS AND MODES	16
3.1	TRANSIT SERVICE IMPROVEMENT RECOMMENDATIONS	16
	3.1.1 Principles and Recommendations.....	16
	3.1.2 Summary of the Implementation Processes.....	19
3.2	ECONOMIC AND LAND USE SCENARIOS.....	20
3.3	TRANSIT-SUPPORTIVE ENHANCED LAND USE	20
	3.3.1 Assumptions	20
	3.3.2 Methodology	21
3.4	HCT SCENARIOS AND MODAL ALTERNATIVES	22
3.5	DESCRIPTION OF HCT SCENARIOS	25
	3.5.1 HCT Scenario 1 – Dobson Road/Southern Avenue/ Country Club Drive/ Arizona Avenue.....	25
	3.5.2 HCT Scenario 2 – Country Club Drive/Arizona Avenue	26
3.6	CONCEPTUAL CROSS SECTIONS	26
3.7	CONCLUSION.....	27
4.0	EVALUATION OF HCT SCENARIOS.....	28
4.1	TWO-TIERED EVALUATION PROCESS	28
4.2	TIER 1 EVALUATION	28
4.3	TIER 2 EVALUATION	29
	4.3.1 Light Rail Travel Forecasting	29
	4.3.2 2040 Light Rail Ridership by Scenario and by Station	29

4.4	CAPITAL COST	33
4.5	OPERATING COST	33
5.0	RECOMMENDATIONS	34
5.1	RECOMMENDED HCT SCENARIO	34
5.2	SUPPLEMENTARY FINDINGS	35
5.3	RECOMMENDATIONS FOR ACHIEVING 2040 LAND USE SCENARIO	35
6.0	IMPLEMENTATION.....	37
6.1	HCT FEASIBILITY WITH RESPECT TO TRAFFIC IMPACTS	37
6.2	PROPOSED HCT PHASING	39
	6.2.1 Definition of Phases	39
	6.2.2 Capital Cost by Phase.....	40
	6.2.3 Federal Funding Competitiveness.....	42
6.3	COMMUNITY PLANNING FOR ENHANCED LAND USE	44
6.4	POTENTIAL FUNDING FOR ENHANCED TRANSIT SERVICES AND HCT	45
6.5	NEXT STEPS	47
7.0	REFERENCES	48

FIGURES

FIGURE 1	STUDY AREA.....	2
FIGURE 2	ACTIVITY CENTERS	9
FIGURE 3	STUDY AREA HCT SCENARIOS (LONG-TERM 2040)	24
FIGURE 4	FORECAST WEEKDAY LIGHT RAIL BOARDINGS, MAG BASE 2040 LAND USE SCENARIO	31
FIGURE 5	FORECAST WEEKDAY LIGHT RAIL BOARDINGS, ENHANCED 2040 LAND USE SCENARIO	32

TABLES

TABLE 1	TRANSIT-DEPENDENT HOUSEHOLD AND POPULATION CHARACTERISTICS.....	6
TABLE 2	EXISTING AND FUTURE LAND USE.....	7
TABLE 3	WEEKDAY BUS ROUTE.....	12
TABLE 4	PARK-AND-RIDE LOTS IN STUDY AREA	13
TABLE 5	OPPORTUNITIES AND CONSTRAINTS	15
TABLE 6	ILLISTRATIVE BUS SERVICE SCENARIOS	17
TABLE 7	LONG-TERM HCT SCENARIOS: ASSUMED CHARACTERISTICS	22
TABLE 8	ASSUMED CROSS SECTION DIMENSIONS (FEET).....	27
TABLE 9	TIER 1 COMPARISON OF ALTERNATIVE HCT SCENARIOS	29
TABLE 10	2040 LIGHT RAIL WEEKDAY RIDERSHIP FORECASTS, BASE AND ENHANCED LAND USE SCENARIOS	29
TABLE 11	FORECAST 2040 RAIL BOARDINGS AND RANK BY STATION.....	29
TABLE 12	TIER 2 EVALUATION SUMMARY	34
TABLE 13	ROADWAY SEGMENT LOS: 2015, 2040 NO BUILD AND 2040 BUILD.....	38
TABLE 14	PHASE I CAPITAL COST ESTIMATES (2016).....	41
TABLE 15	PHASE II CAPITAL COST ESTIMATES (2016).....	42
TABLE 16	SUMMARY OF NEW STARTS ANALYSIS RESULTS.....	42
TABLE 17	PHASED PLANNING RECOMMENDATIONS: ENHANCED LAND USE SCENARIO	44

APPENDICES

- APPENDIX A. TECHNICAL MEMORANDUM 1
- APPENDIX B. TECHNICAL MEMORANDUM 2
- APPENDIX C. ECONOMIC DEVELOPMENT BROCHURE
- APPENDIX D. TECHNICAL MEMORANDUM 3
- APPENDIX E. TRAFFIC SEGMENT ANALYSIS MEMORANDUM
- APPENDIX F. PHASING EVALUATION MEMORANDUM

ABBREVIATIONS

ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
BDMC	Banner Desert Medical Center
BRT	Bus Rapid Transit
CFR	Code of Federal Regulations
CP/EV	Central Phoenix/East Valley
DMS	Dynamic Message Sign
EVIT	East Valley Institute of Technology
FAR	Floor Area Ratio
FDCTCS	Fiesta-Downtown Chandler Transit Corridor Study
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HCT	High-Capacity Transit
HOV	High Occupancy Vehicle
ITS	Intelligent Transportation Systems
LPA	Locally Preferred Alternative
LOS	Level of Service
MAG	Maricopa Association of Governments
MCC	Mesa Community College
PMT	Project Management Team <i>or</i> Person Miles Traveled
RTP	Regional Transportation Plan
SEVTSS	Southeast Valley Transit System Study
SR	State Route
SRTP	Short Range Transit Program
STOPS	Simplified Trips-on Project Software
TOD	Transit-Oriented Development
TSP	Transit Signal Priority
TSPM	Transit Standards and Performance Measures
UPRR	Union Pacific Railroad
US	United States
USC	United States Code

1.0 INTRODUCTION

1.1 OVERVIEW

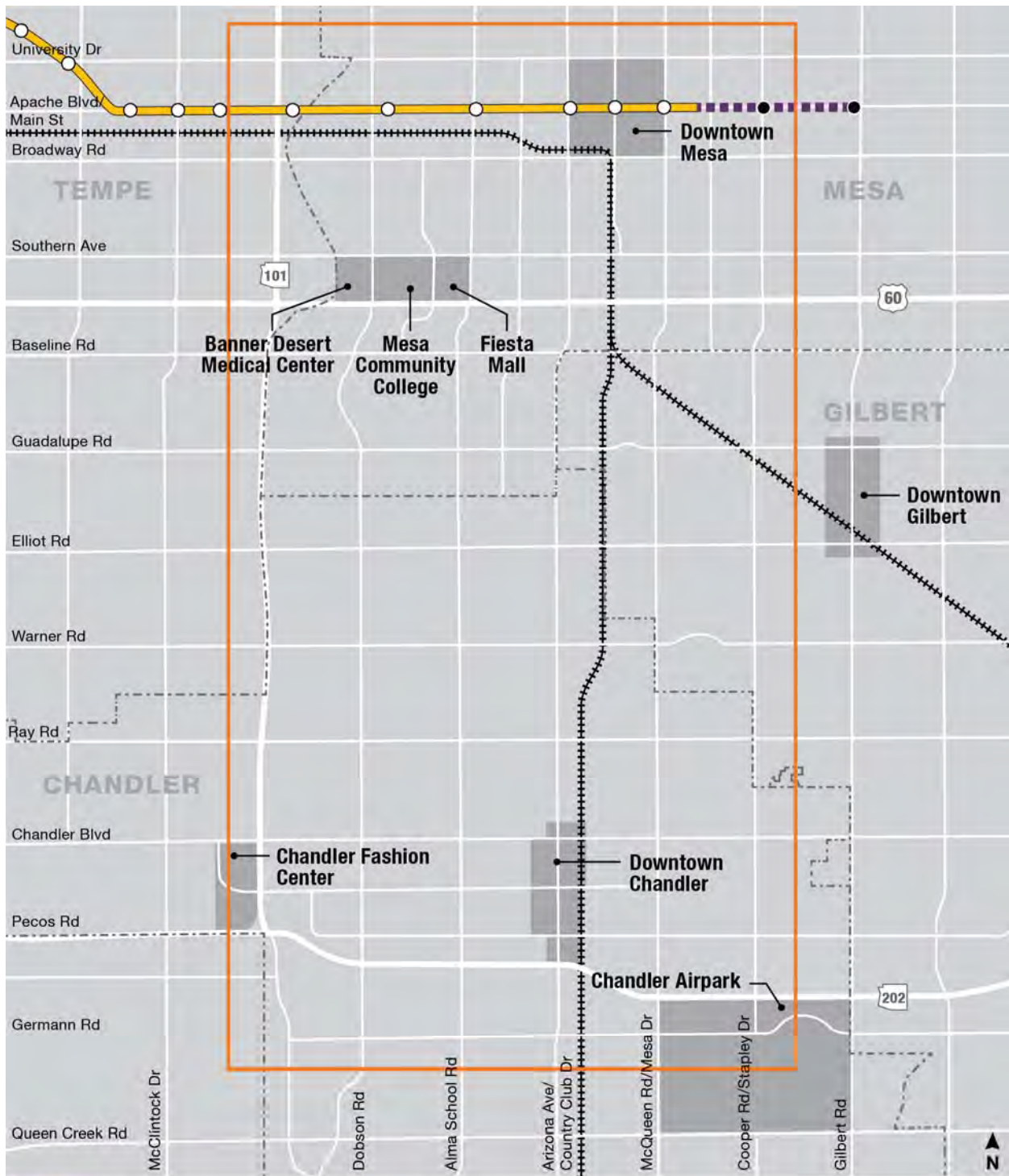
Valley Metro, in cooperation with the municipalities of Chandler, Gilbert and Mesa, has completed the Fiesta-Downtown Chandler Transit Corridor Study (FDCTCS). The study evaluated various transit modes and two distinct scenarios along existing arterial roadways to recommend a transit option that can improve mobility in the study area, which encompasses approximately 66 square miles, as depicted in Figure 1. Valley Metro's study partners – including the three municipalities and the Maricopa Association of Governments (MAG) – identified potential land use adjustments and transit investments, including local bus service and high-capacity transit (HCT) appropriate in the short-term (2020), mid-term (2030) and long-term (2040) to meet anticipated demand for public transportation. This final report consists of the following chapters:

- 1.0 Introduction
- 2.0 Project Research
- 3.0 Future Scenarios and Modes
- 4.0 Evaluation of HCT Scenarios
- 5.0 Recommendations
- 6.0 Implementation
- 7.0 References





1.2 PURPOSE

A transit investment in the FDCTC would serve existing and projected travel demand throughout the study area. As Figure 1 illustrates, this area extends two to four miles east and west of Country Club Drive/Arizona Avenue, one-half mile south of Germann Road and approximately one-half mile north of University Drive. It provides opportunities for connections between major activity centers in the study area and the existing regional transit system, including links between downtown Chandler, the Arizona Avenue employment core and Mesa destinations, such as downtown (served by existing light rail on Main Street), Mesa Community College (MCC) and the Fiesta Mall District.

FIGURE 1 STUDY AREA



LEGEND

 Valley Metro Rail Line/Station	 Study Area
 Gilbert Road Extension/Station	 UPRR

Source: Valley Metro, December 2016

The FDCTCS contains recommendations that support a potential HCT corridor in the future, with an implementation plan in Chapter 6.0. The plan recommends incremental steps necessary to provide such support, including land use adjustments, to build the necessary demand to support increasing levels of transit investment. The report addresses potential land use policy actions and the phasing of transit improvements. The FDCTCS will provide the communities a plan of action to advance an HCT investment in the study area.

1.3 GOALS AND OBJECTIVES

This transit corridor study identifies potential land use modifications and transit investments appropriate in the short-, mid- and long-term to meet increasing travel demand in the study area. One of the outcomes for the long-term includes the potential for a HCT option.

The original goals and objectives that guided the FDCTCS process include:

Goal: Refine and expand recommendations from the 2012 *Arizona Avenue High Capacity Transit Long Range Study* (summarized in Technical Memorandum No. 1 for this study).

Objectives:

- Engage staff representing various municipal departments from Chandler, Gilbert and Mesa throughout the study to lend guidance with respect to previous decisions and update earlier recommendations through the FDCTCS.
- Evaluate previous recommendations in comparison with updated land use, transportation, socioeconomic conditions and other relevant information to support the outcome of the FDCTCS.

Goal: Identify short- to long-term (1) transit demand, (2) land use adjustments and (3) recommendations for transit investments (e.g., enhanced bus service, bus rapid transit [BRT] and light rail transit) in the study area.

Objectives:

- Identify current and forecast travel patterns, including origins and destinations in and around the study area.
- Identify transit demand within the area and its high-demand corridors, focusing on existing ridership and trends relating to light rail, BRT and local/express bus service.
- Coordinate with municipal staff representing community development and planning departments to identify planned, transit-supportive short- and long-term land development.
- Evaluate the feasibility of long-range transit alternatives (enhanced bus service, BRT, light rail) through development and analysis of evaluation criteria, including opportunities and constraints, cost and other relevant factors.

Goal: Engage stakeholders throughout the process.

Objectives:

- Identify and coordinate with a select group of stakeholders representing agencies and other organizations, the general public and the business community to receive input throughout the study.
- Maintain communication with the general public through regular updates to online materials, including project fact sheets and updates, as requested by the Project Management Team (PMT).

As the study advanced, representatives from the participating communities collectively agreed to defer stakeholder outreach until the next steps in the planning process, following the conclusion of the FDCTCS. This will provide Valley Metro and the participating entities an opportunity to gather input from the affected communities to shape a transit vision and solution for the corridor, as opposed to the technical analysis limited to two HCT routing scenarios defined in this study.

2.0 PROJECT RESEARCH

Valley Metro evaluated the study area to understand its existing and future characteristics and the potential for future transit investments. The analysis of existing conditions, presented with maps and tables in Technical Memorandum No. 1, outlines the socioeconomic characteristics, land use patterns, transit needs and transportation network conditions of the study area.

2.1 POPULATION AND EMPLOYMENT

Valley Metro reviewed population and employment trends by Transportation Analysis Zone or Census Block Group. The population of the study area is expected to increase from 372,000 by 17 percent, to 448,000 people, from 2010 to 2040, accounting for 7 percent of the MAG region's growth. The regional population is projected to grow by 38 percent over the same period. The study area, however, is far more densely populated than Maricopa County as a whole, containing 10 percent of the county's population in less than 1 percent of its land area in 2010.

The most heavily populated portions of the study area are located near downtown Mesa and downtown Chandler. Generally, population is densest in the portion of the area north of Southern Avenue. The trend toward population density around downtown Chandler is projected to intensify between now and 2040.

According to MAG data, employment in the FDCTCS study area totaled 192,000 jobs in 2010. Based on MAG projections, total employment in the area is expected to increase by 33 percent, to 285,000 jobs, by 2040. In other words, study area employment is projected to grow proportionately more than twice as fast as population over 30 years. Meanwhile, employment throughout the MAG region is expected to increase by 47 percent, to over 3 million jobs, during this period.

Currently the corridors with the densest employment in the study area are located along Arizona Avenue, US 60 (Superstition Freeway) and the existing light rail line in Mesa. In addition, clusters of relatively high-density employment exist near downtown Chandler and the Loop 101/Price Road corridor. MAG has predicted future employment growth in downtown Mesa, the US 60 corridor between Dobson Road and Stapley Drive/Cooper Road and Arizona Avenue south of Elliot Road and west of downtown Chandler.

2.2 TRANSIT-DEPENDENT POPULATION

Transit dependency applies to people who rely on transit service to ensure basic mobility. The study area population is diverse and includes groups with a propensity to use transit. Such groups include households with one car or no car, low-income households and seniors (over age 65). Table 1 compares transit-dependent characteristics in the study area and the MAG region. A person may belong to one, two or all three categories

TABLE 1 TRANSIT-DEPENDENT HOUSEHOLD AND POPULATION CHARACTERISTICS

Characteristic of Households ¹ or Population ²	Potentially Transit-Dependent Households or Population			
	FDCTCS Study Area	Percent of Study Area Total	MAG Region	Percent of MAG Regional Total
Zero- and one-car households ¹	55,223	30%	464,783	27%
Household income <\$35,000 annually ¹	22,949	25%	359,345	21%
Over age 65 (senior) ²	27,909	8%	490,222	13%

¹Refers to households in study area or region.

²Refers to population of study area or region.

Source: US Census Bureau, 2013a, 2013b, 2013c (see list of references)

The percent of the population with a household income under \$35,000 and of households with no more than one car is higher in the study area than in the region overall. The percent in the study area over age 65 is less than in the MAG region, however. According to Valley Metro’s analysis of the three characteristics of households or population, the areas west of Arizona Avenue and north of Baseline Road appear to have the highest potential for transit dependence.

2.3 LAND USE AND ACTIVITY CENTERS

Supportive land use contributes to the productivity of transit systems and is an integral element of this study. Land uses are correlated with the potential for ridership as well as employment and activity center destinations. Land use policies that are compatible with transit and transit-oriented development (TOD) may bolster future transit investments in the study area.

2.3.1 Existing and Planned Land Use

Table 2 summarizes existing and planned land uses throughout the FDCTCS study area. Land uses are listed in order of existing acreage. The most prevalent land use is currently single-family residential, which covers 45 percent of the study area. According to the MAG future land use data, this will remain the predominant land use, encompassing 48 percent of the land at buildout.

TABLE 2 EXISTING AND FUTURE LAND USE

Land Use Category	Existing Land Use (2012)		Future Land Use (Buildout)	
	Acres	Percent of Total	Acres	Percent of Total
Single-family residential	22,600	45	24,371	48
Open space	4,349	9	1,353	3
Commercial	3,657	7	4,604	9
Multi-family residential	3,643	7	3,835	8
Industrial	3,462	7	1,193	2
Transportation	3,306	7	3,314	7
Vacant	2,174	4	36	<1
Educational	1,531	3	1,529	3
Agriculture	1,245	2	3,970	8
Institutional	1,139	2	1,273	3
Public	818	2	944	2
Office	719	1	886	2
Tourist	649	1	657	1
Airport	525	1	544	1
Water	466	1	480	1
Developing land	263	1	0	0
Mixed-use	0	0	1,557	3
Total	50,546	100	50,546	101*

*Percents add up to more than 100 due to rounding.
Source: MAG, 2012

2.3.2 Existing Activity Centers

Activity centers in the study area are generally composed of both local and regional destinations. Local areas of interest include retail, grocery, restaurants and employment centers. Several regional activity centers are associated with both downtown Chandler and Mesa, including entertainment venues such as Mesa Arts Center and Chandler Center for the Arts that provide special events throughout the year. MCC, the largest community college in the county, is located in the study area at Dobson Road and Southern Avenue. Of its approximately 23,000 students (in 2014), more than half attend classes regularly on campus, with others taking online classes. MCC is adjacent to the Mesa Fiesta District, which continues to develop. The downtown corridors of Mesa and Chandler provide mixed-use opportunities, including residential, shopping, restaurants and entertainment.

Existing activity centers in the FDCTCS study area include:

Chandler

- Chandler Fashion Center
- Downtown Chandler
 - Chandler Chamber of Commerce
 - Chandler Public Library
 - Chandler Community Center
 - Chandler Center for the Arts
 - Chandler City Hall
 - Chandler Senior Center
- Chandler Airpark
- Tumbleweed Park

Gilbert

- Gilbert Museum

Mesa

- Downtown Mesa
 - Mesa City Hall
 - Arizona Museum of Natural History (Mesa Southwest Museum)
 - i.d.e.a. Museum (formerly Arizona Museum for Youth)
 - Mesa Arts Center
 - Mesa Amphitheatre
 - Mesa Historical Museum
 - Nile Theater
- Price Road Corridor
- Mesa Community College (MCC)
- East Valley Institute of Technology (EVIT)
- Fiesta Mall
- Banner Desert Medical Center (BDMC)

2.3.3 Planned Activity Centers and Land Use Trends

The most significant areas of planned redevelopment in the FDCTCS study area are located in downtown Chandler along Arizona Avenue, the Price Road Employment Corridor near Chandler Boulevard/Price Road and the Fiesta District along Southern Avenue in Mesa. Large parcels of vacant land east of Arizona Avenue between Guadalupe and Ray roads are currently designated for Industrial land uses.

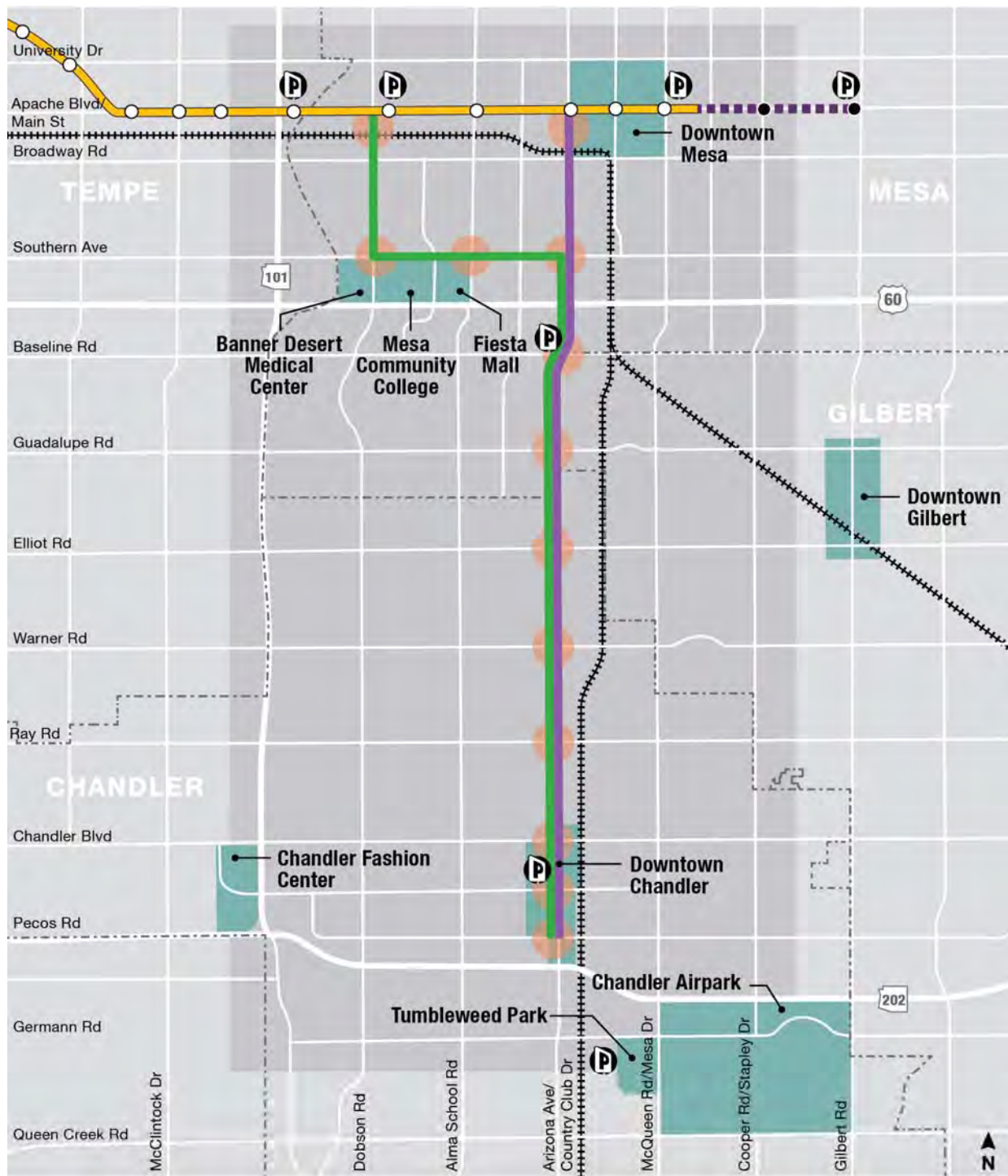
The area bound by Chandler Boulevard to the north and Pecos Road to the south along Arizona Avenue is considered the downtown Chandler Redevelopment Area. Planned projects in this area include mixed-use/high-density residential, mixed-use entertainment, office space and medium-density residential development. Under the *South Arizona Avenue Corridor Area Plan (2010)*, this area will include pedestrian corridors and connections to transit corridors.

The Price Road Employment Corridor in Chandler is bounded by Ray Road to the north, Chandler Heights Boulevard to the south, Price Road to the west and Alma School Road to the east. Development in this corridor is mostly centered along Price Road between Chandler Boulevard and Ocotillo Road, with a focus on mixed and industrial uses.

The Fiesta District in Mesa is centered on Southern Avenue between Dobson and Extension roads. Within this district, streetscape improvement, multi-family housing, improvements to Fiesta Mall, retail and office space are under development.

As development comes to fruition, increased population and employment will drive the need to increase transit investment. Figure 2 illustrates study area activity centers.

FIGURE 2 ACTIVITY CENTERS



LEGEND

- Valley Metro Rail Line/Station
- Gilbert Road Extension/Station
- Park-and-Ride
- Study Area
- Activity Centers
- UPRR
- HCT Scenario 1
- HCT Scenario 2
- HCT Station Target Areas

Source: Valley Metro, 2016

2.4 EXISTING AND PLANNED TRANSIT

This section describes the existing transit system and planned improvements in the study area. These form the base network for Fiesta-Downtown Chandler Corridor alternatives considered later in the report.

2.4.1 Existing and Planned Fixed Route Service

Fixed route bus service, demand responsive service and transit passenger facilities are provided in the study area. Table 3 identifies the routes and summarizes weekday ridership and productivity for November 2016. The data represent the portions of each route in Chandler, Gilbert and Mesa. Routes 30, 45, 61, 77, 108, 156 and the express routes also serve Tempe, Phoenix or both.

Local Bus

Local bus routes provide mainline transit service, primarily along the MAG region's one-mile arterial street network. Bus service operations vary, with all routes offering service Monday through Friday and some offering service seven days a week as late as 11:30 p.m. to 12:00 a.m. on select routes. Twelve routes currently serve the study area.

Circulator

Mesa's BUZZ circulator serves residents and visitors in the downtown area. It offers free two-way service every 30 minutes weekdays and hourly Saturday.

Express Bus

Express bus routes (the 500 series) provide weekday peak period commuter service between the East Valley, downtown Phoenix and the State Capitol. Express service crosses through the study area on US 60 and Loop 202. Four express commuter bus routes pass through or serve the FDCTCS study area.

TABLE 3 WEEKDAY BUS ROUTE PERFORMANCE IN CHANDLER, GILBERT AND MESA

Route	Boardings	Passengers per Revenue Mile
30 – University Dr	26,337	1.3
40 – Main St ¹	40,870	1.4
45 – Broadway Rd	26,537	1.3
61 – Southern Ave	46,986	2.0
77 – Baseline Rd	1,795	1.1
96 – Dobson Rd	36,778	1.8
104 – Alma School Rd	19,026	1.4
108 – Elliot Rd	12,515	0.7
112 – Country Club Dr/Arizona Ave ¹	53,644	2.2
120 – Mesa Dr	7,682	1.9
128 – Stapley Dr	6,717	1.2
156 – Chandler Blvd	19,060	0.7
Circulator		
Buzz – Mesa Downtown	10,432	1.8
Express Routes²		
531 – Mesa/Gilbert Express	2,589	1.0
541 – Chandler Express	1,417	0.8
542 – Chandler Express	4,468	1.4

¹Recently improved to replace former LINK route.

²Route 533 passes through the study area on US 60, but does not serve it.

Source: Valley Metro Monthly Ridership Report, November 2016

Table 3 shows total weekday ridership (boardings) in November 2016 in Chandler, Gilbert and Mesa. The routes with the highest ridership in the three study area municipalities serve Country Club Drive/Arizona Avenue (Route 112), Southern Avenue (Route 61) and Main Street (Route 40). Routes 112 and 61 are the most productive local routes, with each showing two or more passengers per revenue mile. Plans exist to extend Routes 77 and 104 and to add a new route, Route 140 on Ray Road in Chandler.

2.4.2 Passenger Facilities

Table 4 lists the park-and-ride lots in the study area and the local and express routes that serve each. One of these facilities, at Gilbert Road and Main Street, will open concurrently with the two-mile Central Phoenix/East Valley (CP/EV) light rail extension currently under construction. The other seven operate today. The Gilbert Road Park-and-Ride, located just east of the study area boundary and not shown in the table, serves routes 136 and 531.

TABLE 4 PARK-AND-RIDE LOTS IN STUDY AREA

City	Name	Location (if different)	Routes Served
Mesa	Sycamore/Main St Transit Center	Not applicable	30, 40, 45, 96, light rail
Mesa	Mesa Dr/Main St	Not applicable	40, 120, light rail
Mesa	Gilbert Rd/Main St ¹	Not applicable	40, 136, light rail
Mesa	West Mesa	Juanita Ave/Vineyard	112, 531, 541
Chandler	Carl's Jr. ²	Warner Rd/Alma School Rd	104, 541
Chandler	Food City Plaza ²	Ray Rd/Arizona Ave	112, 541
Chandler	City Lot	Chicago St/Arizona Ave	104, 112
Chandler	Chandler Park-and-Ride	Germann Rd/Hamilton St	112, 542

¹To open with the light rail extension from Mesa Dr to Gilbert Rd, currently under construction.

²Transit parking on private property is subject to discontinuance at any time.

Source: Valley Metro, 2016

2.4.3 Demand Responsive Service

Demand responsive service, sometimes called paratransit and known locally as dial-a-ride, offers door-to-door service to those who are unable to use the fixed route transit system, as the Americans with Disabilities Act (ADA) mandates. Federal law requires ADA service within three-fourths mile of every fixed transit route, but Chandler, Gilbert and Mesa offer it throughout their corporate limits. Trips can now be scheduled across municipal boundaries region-wide.

2.5 OPPORTUNITIES AND CONSTRAINTS

To understand the potential of the study area to support additional transit investment in the future, Valley Metro conducted an opportunities and constraints analysis. The team conducted a field tour to document physical connections; land use issues and opportunities; transportation and right of way conditions; and activity centers along arterials.

The north-south major arterial roadways west of Arizona Avenue cross the existing Union Pacific Railroad (UPRR) freight tracks at grade. Arizona Avenue provides connections to activity centers in all three jurisdictions, has a grade-separated crossing of the existing tracks and serves vacant land that could be developed to support increased transit service.

The east-west corridors throughout the study area provide access to many activity centers. Some, such as Baseline Road and Southern Avenue, have existing bus routes with high productivity. Access to the Fiesta District in Mesa along Southern Avenue could offer an opportunity to support an increased transit investment along that corridor. The US 60 corridor offers a unique opportunity in that available right of way may reduce the need for expensive land acquisition and allow greater travel speeds.

TABLE 5 summarizes an opportunities and constraints analysis conducted early in the study effort to review the potential for HCT along arterials and a freeway segment within the study area. Based on this analysis, the highest potential for higher-capacity transit modes in the long-term appears to exist on segments of Country Club Drive/Arizona Avenue, Dobson Road and Southern Avenue. As the Fiesta/Downtown Chandler corridor advances through subsequent study and review, each of these segments should be further evaluated to include technical analysis and public input.

This study focuses on the two specific HCT corridors: 1) Dobson Road from Main Street to Southern Avenue, Southern Avenue from Dobson Road to Country Club Drive, along Country Club Drive/Arizona Avenue to Pecos Road, and 2) Country Club Drive/Arizona Avenue from Main Street to Pecos Road, approximately one mile south of downtown Chandler.

TABLE 5 OPPORTUNITIES AND CONSTRAINTS

Major Arterial	Physical Connections	Land Use	Transportation/ROW	Activity Centers	November 2016 Weekday Bus Ridership in Study Area Cities
Dobson Rd	<ul style="list-style-type: none"> Does not serve Gilbert Easier connection with current light rail line Currently no grade-separated crossing of railroad tracks Minimizes duplication of HCT on Main St Connects to Southern Ave with its high transit ridership and numerous activity centers 	<ul style="list-style-type: none"> Relatively low-density housing prevalent 	<ul style="list-style-type: none"> Narrow ROW on Dobson Rd, especially south of Baseline Rd Primarily 2+1+2 lane configuration with flared intersections 	<ul style="list-style-type: none"> Fiesta Mall MCC Banner Desert Medical Center Dignity Health Chandler Regional Medical Center Dobson High School Anderson Elementary, Junior High and High schools Seton Catholic Prep High School Chandler Fashion Center (CFC) 	<ul style="list-style-type: none"> Local Route 96 36,778 boardings Second highest ridership among north-south routes in study area communities
Alma School Rd	<ul style="list-style-type: none"> Easier connection with current light rail line than east-west alternatives Currently no grade-separated crossing of railroad Does not serve Gilbert Serves downtown Chandler park-and-ride 	<ul style="list-style-type: none"> Single-family housing prevalent along southern part of road, industrial uses along northern part 	<ul style="list-style-type: none"> ROW restrictions in southern portion Primarily 2+1+2 lane configuration with flared intersections 3+1+3 lane configuration in northern portion 	<ul style="list-style-type: none"> Fiesta Mall Bank of America building Freescall corporate campus Arizona College Prep - Erie Campus Retail nodes at Elliot Rd, Warner Rd, Ray Rd and Chandler Blvd Freescall plant at Knox Road 	<ul style="list-style-type: none"> Local Route 104 19,026 boardings 1.4 boardings per mile
Country Club Dr/ Arizona Ave	<ul style="list-style-type: none"> Easier connection with current light rail line than east-west alternatives Serves all three communities participating in the FDCTCS Country Club Dr provides narrow below-grade crossing of railroad tracks Serves Germann Rd park-and-ride 	<ul style="list-style-type: none"> Downtown Mesa and downtown Chandler have major high-density land uses Country Club Dr is predominantly fronted by commercial or high-density residential Some vacant or agricultural land 	<ul style="list-style-type: none"> Wide ROW accommodates 6 travel lanes Downtown Chandler has ROW constraints that might require removal of travel lane or on-street parking Higher congestion, especially in the evening 	<ul style="list-style-type: none"> Downtown Mesa Downtown Chandler Chandler High School Country Club/Baseline Road retail node CFC Chandler Airpark area Businesses at Elliot and Warner roads Retail node at Pecos Road Chandler Center for the Arts 	<ul style="list-style-type: none"> Local Route 112 53,644 boardings Highest boardings (total and per mile) of routes in study area communities
Southern Ave	<ul style="list-style-type: none"> Provides a connection to the Fiesta District including MCC and Fiesta Mall Route 61, one of the most productive in southeast valley No direct connection to existing light rail 	<ul style="list-style-type: none"> Directly serves commercial, education and medical centers in Fiesta District New office development through adaptive reuse project Higher-density housing to the north Large amounts of vacant land, large parking lots and underutilized parcels 	<ul style="list-style-type: none"> Recent lane removal and streetscape improvements make it more difficult to fit HCT in the road Walkable, pedestrian-friendly streetscape Primarily 2+1+2 lane configuration 	<ul style="list-style-type: none"> Fiesta Mall MCC Banner Desert Medical Center Bank of America building Many development opportunities plus existing activity centers 	<ul style="list-style-type: none"> Local Route 61 46,986 boardings Second highest boardings (total and per mile) of study area bus routes
US 60	<ul style="list-style-type: none"> Increased distance from activity centers Faster travel time than arterial alignments More difficult access than arterial HCT 	<ul style="list-style-type: none"> Adjacent to commercial, education, and medical centers No residential impacts Limited TOD opportunities in freeway corridor Not pedestrian-friendly 	<ul style="list-style-type: none"> Large amounts of ROW available via parking lots, canal and side streets Less likely to encounter major utility issues than on arterials No at-grade crossings 	<ul style="list-style-type: none"> Fiesta Mall MCC Banner Desert Medical Center Requires transfer or substantial walk to activity centers 	<ul style="list-style-type: none"> No local bus service
Baseline Rd	<ul style="list-style-type: none"> Existing West Mesa Park-and-Ride 	<ul style="list-style-type: none"> Single-family housing and low-density shopping centers prevalent throughout 	<ul style="list-style-type: none"> Primarily 3+3 with center median and left turn pockets lane configuration 	<ul style="list-style-type: none"> Rhodes Junior High School Country Club Dr/Baseline Road retail node 	<ul style="list-style-type: none"> Local Route 77 1,795 boardings; ends at Dobson Rd Under consideration for extension

ROW = Right of way
Source: Valley Metro, 2016

3.0 FUTURE SCENARIOS AND MODES

This chapter identifies two HCT routing scenarios and three transit modal alternatives – two (BRT and light rail) for HCT and one (illustrative bus service scenarios) that Valley Metro and its member agencies may implement with or without HCT. It defines the scenarios and modes in the context of HCT corridors and possible station locations.

3.1 TRANSIT SERVICE IMPROVEMENT RECOMMENDATIONS

3.1.1 Principles and Recommendations

Valley Metro analyzed local transit improvements in the short-, mid- and long-term (2020, 2030 and 2040) to evaluate the level of transit investments necessary to support an HCT corridor. The baseline for the enhancements derived from a review of planned transportation improvements in Valley Metro's *Short Range Transit Program (SRTP)*, the MAG and Valley Metro *Southeast Valley Transit System Study (SEVTSS)*, the *Arizona Avenue High Capacity Transit Long Range Study (2012)* and other basic improvements to meet Valley Metro's Transit Standards and Performance Measures (TSPM). Development of transit improvements involved coordination between Valley Metro, the PMT and staff from Chandler, Gilbert and Mesa.

To help prioritize service enhancements, Valley Metro developed a set of principles using the SRTP, SEVTSS, TSPM, transit service improvements documented in the MAG 2035 RTP, and input from the PMT as follows:

Short-Term (2020)

- Enhance local routes to meet weekday TSPM standards.
- Increase to 15-minute frequency on the highest ridership routes.

Mid-Term (2030)

- Enhance local routes to meet weekend TSPM standards.
- Implement new routes to fill in the arterial grid system and expand the network.
- Increase to 15-minute peak frequency on the majority of routes in the study area.

Long-Term (2040)

- Implement HCT along one of the alternatives identified in this study.

Technical Memorandum No. 2, “Transit Service Scenarios,” describes Valley Metro’s development of transit improvement alternatives and the prior studies, policies and performance standards that contributed thereto. In addition, two transit service networks – both without HCT added in the study area – were tested for modeling purposes. The RTP or No Build network consists of the highway and transit improvements in the adopted MAG 2035 RTP. The enhanced bus network adds numerous additional enhancements designed to meet regional performance standards and support a future Country Club Drive/Arizona Avenue HCT investment. Under this scenario Valley Metro would extend both weekday and weekend hours of service on several routes in the study area while increasing many operating frequencies. Service on Mesa Drive, Baseline Road and Guadalupe Road would be extended with new routes on Ray, Warner, Queen Creek and Pecos roads by 2040. All of these improvements would help Valley Metro partner with Chandler, Gilbert, and Mesa to meet the guiding principles. Table 6 is a list of illustrative bus service scenarios for consideration in the short-, mid- and long-term.

TABLE 6 ILLUSTRATIVE BUS SERVICE SCENARIOS

Route	Street Name	Existing (2015)		Short-term (2020)		Mid-term (2030)		Long-term (2040)	
		Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)
30	University Drive	30	30	30	30	30	30	30	30
30 ^A		-	-	15	15	15	15	15	15
40	Main Street/Apache Boulevard	30	30	15 [✓]	15 [✓]	15	15	15	15
45	Broadway Road	30	30	15	30	15	15	15	15
61	Southern Avenue	15	30	15	15	15	15	15	15
77	Baseline Road	30	30	30	30	30	30	30	30
77 ^A		-	-	-	-	15	15	15	15
81	McClintock Drive	15	30	15	30	15	30	15	30
96	Dobson Road/Alma School Road	30	30	30	30	30	30	30	30
96 ^A		-	-	15	30	15	15	15	15
104	Alma School Road	30	30	30	30	30	30	30	30
104 ^A		-	-	15	30	15	15	15	15
108	Elliot Road	30	30	30	30	15	30	15	30
112	Country Club/AZ Avenue	30	30	15	30	15	15 [*]	20	20
120	Mesa Drive	30	30	30	30	15	30	15	30
128	Cooper Road/Stapley Drive	30	30	30	30	15	30	15	30
136	Gilbert Road	30	30	15	30	15	30	15	30
156	Chandler Boulevard	30	30	15	30	15	15	15	15
HCT	1. Dobson Road 2. Country Club Drive	-	-	-	-	-	-	10	20
NEW ^A	Guadalupe Road	-	-	-	-	-	-	30	30
		-	-	-	-	-	-	15	30
NEW ^A	Ray Road	-	-	30 [*]	30 [*]	30	30	30	30
		-	-	-	-	15	30	15	30
NEW ^A	Warner Road	-	-	-	-	-	-	30	30
		-	-	-	-	-	-	15	30
NEW	Queen Creek Road	-	-	-	-	-	-	30	30
NEW	Chandler Circulator	-	-	-	-	30	30	15	30
NEW	Pecos Road	-	-	-	-	-	-	30	30
Mesa Main Street Link	Mesa Main Street	15	30	0 [✓]	0 [✓]	0	0	0	0
Arizona Avenue/Country Club Link	Arizona Avenue	30	30	0 [✓]	0 [✓]	0	0	0	0

Bold text indicates enhanced frequency compared to existing service

^AImproved frequency for route segment

[✓]Recently Implemented (April 2017)

^{*}Proposed for the October 2017 Service Changes

Source: Valley Metro, 2016

When analyzed through the MAG regional travel demand model, the local bus service scenarios resulted in less trips in the Country Club Drive/Arizona Avenue HCT corridor than the MAG 2035 base transit network. A circulator proof of concept (i.e. five bidirectional circulators extending approximately one mile on each side of the Country Club Drive/Arizona Avenue HCT corridor) was also analyzed as a next step in the study process. The modeling results showed that the circulator routes added more riders directly to the Country Club Drive/Arizona Avenue HCT corridor scenarios. A mix of transit modes, for example, the circulator proof of concept and local routes from the 2015 Southeast Valley Transit System Study could potentially both maximize ridership in the HCT corridor and provide additional mobility in the Southeast Valley.

3.1.2 Summary of the Implementation Processes

While implementing as many transit service improvement recommendations as possible would be ideal, some recommendations may be delayed and/or modified through the Short Range Transit Program (SRTP) and bi-annual service change process, in part, to ensure a performance-based transit system based on the most current financial and travel demand realities.

Service change scenarios or concepts developed through a number of planning efforts including coordination with member agencies, adherence to the Regional Transportation Plan (RTP) and local or sub-regional studies are possible inputs into the SRTP. The SRTP is a five-year program with the purpose of identifying an implementation order for regionally and locally funded fixed-route service change concepts. The SRTP is separated into two planning phases. The first two years are referred to as the Production Years and the concepts programmed in this phase have committed funding. The last three years are referred to as the Development Years and concepts programmed in this phase need funding and/or further analysis and discussion. The SRTP is a living program that is updated annually and based on ongoing discussion and analysis. Through the annual update process to the SRTP, service change concepts are evaluated using the framework of the Board-adopted Transit Standards and Performance Measures (TSPM).

Service Change concepts in the Productions Years of the SRTP serve as an input into not only the annual TLCP updates, but also the bi-annual service change process. During the bi-annual service change process Valley Metro performs any task necessary for public outreach, considers Title VI impacts and accessibility issues, gathers feedback from the Valley Metro Accessibility Advisory Group (VMAAG), conducts further analysis, and determines adjustments of affected transit service operating contracts and Intergovernmental Agreements with member agencies. Following ongoing review by the Service Planning Working Group (SPWG), proposed service changes are brought before the Board for action through the bi-annual service changes process.

3.2 ECONOMIC AND LAND USE SCENARIOS

Valley Metro also developed two socioeconomic and land development scenarios for transportation modeling purposes. The MAG Base 2040 land use scenario uses pre-existing population and employment projections. The alternative Enhanced 2040 land use scenario uses input from the three municipalities to add TOD in the study area that could support HCT in one or both routing scenarios.

Travel patterns in the study area indicate a heavy dependency on the private automobile, which contradicts the development of a transit-friendly culture in the built environment. Such a culture needs to develop in the study area to help increase ridership on local bus routes and create more TOD opportunities, which in turn would result in a built environment that provides better access for pedestrians and multimodal transit. At the same time, continued preparation for future HCT will consider segment- and intersection-specific traffic conditions, as well as interlining with and transfer to existing HCT service.

3.3 TRANSIT-SUPPORTIVE ENHANCED LAND USE

In order to better evaluate the feasibility of HCT service and capital investments in the short-, mid- and long-term in the study area, Valley Metro recommends certain enhancements to local land use plans and policies. Land use vision planning involved Valley Metro, the PMT and Chandler, Gilbert and Mesa planning and economic development staff. The vision developed through the *Valley Metro Arizona Avenue High Capacity Transit Long Range Study* served as the baseline for the Enhanced 2040 scenario, which considered the existing major land uses, such as Fiesta Mall, MCC, downtown Chandler and major employers, and examined project features that would support HCT. Specific densities, floor area ratios (FAR) and land use changes were recommended in the entire study area.

3.3.1 Assumptions

Several assumptions were made in order to complete the analysis and develop a new, Enhanced 2040 land use scenario:

- The MAG 2012 existing land use data are the existing land use baseline.
- Station areas are defined by a one-fourth mile buffer around planned stations (located at every arterial intersection, with a mid-block station at Frye Road in downtown Chandler).
- Land use enhancements are applied only to parcels located in a station area.
- Both Dobson Road/Southern Avenue/Country Club Drive/Arizona Avenue (Scenario 1) and Country Club Drive/Arizona Avenue (Scenario 2) are considered in the Enhanced 2040 land use scenario.

3.3.2 Methodology

Development of the Enhanced 2040 land use scenario required updating the existing uses in the corridor. MAG's 2012 existing land use data were the most recent available regional level data available, yet are three years old and do not include recent developments in the corridor. Valley Metro supplemented MAG data by developing an existing land use map, coordinating with staff from the three municipalities to include new developments and confirm existing land use.

On December 9, 2015, Valley Metro staff met with planning, economic development and public transit staff from Chandler, Gilbert and Mesa to begin developing the Enhanced 2040 scenario. Valley Metro presented proposed station areas and discussed development opportunities with staff from each city or town. Opportunities included possible sites for new development and redevelopment, as well as expected land uses, residential densities (dwelling units per acre) and FARs for any parcels of land within one-fourth mile of a planned station. These sites were recorded on roll plots of the Fiesta-Downtown Chandler corridor, to be digitized later.

During various workshops, Valley Metro further refined the development opportunities presented by local staff. The team proposed additional sites, identified land uses and applied expected densities to each parcel. A second meeting with planning, economic development and public transit staff from the three municipalities occurred on March 3, 2016 to verify the Enhanced 2040 scenario. This included confirming Valley Metro's additional sites and proposed land uses and densities. Based on recommended edits from municipal staff, the team prepared the final Enhanced 2040 land use scenario.

The municipalities and Valley Metro used each site's proposed land use, residential densities and FAR to calculate population for parcels that the Enhanced 2040 scenario affected, by multiplying dwelling units per acre by acreage to determine total population of areas with residential and mixed uses. (MAG provided data on average residents per dwelling unit.) The team calculated employment by multiplying the FAR by the square feet of each parcel to determine useable square feet by land use. The team then used standard conversion rates to determine the number of employees per useable square foot, and input these values to the Simplified Trips-on Project Software (STOPS) model to determine the projected number of riders for each alternative.

Valley Metro also developed an Example Development brochure that provides examples of TOD and high-density development in the Phoenix region, see Appendix C. The developments shown were either complete or under construction at the time this document was compiled. These developments provide examples of various projects that have the types of density and land use mixes recommended in the Enhanced 2040 scenario. Valley Metro provided this brochure to Chandler, Gilbert, and Mesa staff to assist in visualizing the scale and type of development attracted by investments in HCT, specifically light rail.

3.4 HCT SCENARIOS AND MODAL ALTERNATIVES

The two HCT scenarios are (1) the Fiesta route from the existing CP/EV light rail corridor south along Dobson Road, east along Southern Avenue and south on Country Club Drive/Arizona Avenue to Pecos Road, 1/2 mile south of downtown Chandler; and (2) the Country Club Drive/Arizona Avenue route south from CP/EV to Pecos Road. Figure 3 illustrates these two scenarios.

This study considers two modes for each HCT scenario: BRT and light rail. An enhanced bus service network could support and lead up to either HCT mode. Valley Metro and the municipalities could also implement it independently.

- Enhanced local bus service is defined as increased bus service to meet at least the standards identified in the TSPM. Concepts include more robust and high-frequency services, exploring means to improve lower-productivity route segments, offering a minimum 30-minute service frequency and increasing frequency on high-ridership routes. All routes must support ADA service requirements.
- BRT uses rubber-tired vehicles in designated lanes or a fixed guideway to combine the flexibility of buses with the high capacity of rail, at a lower capital cost than the latter. BRT operates faster, with less frequent stops than traditional buses. It may use platform-level boarding and transit signal priority (TSP) for high-frequency, two-way service.
- Light rail operates on tracks, typically in an exclusive or semi-exclusive guideway and powered by an overhead electric contact system. Valley Metro's system has stations located generally every one-half mile in downtown areas, to one-mile apart at major arterials and utilizes TSP for speed and reliability. The 26-mile system connects activity centers in Mesa, Phoenix and Tempe.

Valley Metro used each jurisdiction's Transportation Master Plan in addition to the MAG Base 2040 and Enhanced 2040 land use and socioeconomic projections to assess the ridership potential of HCT in the study area. Table 7 shows characteristics assumed for the two BRT and light rail scenarios under both 2040 study area development scenarios.

TABLE 7 LONG-TERM HCT SCENARIOS: ASSUMED CHARACTERISTICS

Characteristic	BRT Scenarios		Light Rail Scenarios	
	(1) Dobson/Southern	(2) Country Club/Arizona	(1) Dobson/Southern	(2) Country Club/Arizona
Route length (miles)	10.5	8.5	10.5	8.5
Fleet size (vehicles) ¹	19	14	19	14
Stations	12	10	12	10
No. of park-and-rides	3 ²	4 ³	2	2
Park-and-ride spaces	1,000	1,000	1,000	1,000
Frequency ⁴ (minutes)	10/20	10/20	10/20	10/20
Operating span (hours)	22	22	22	22

¹Includes 20% (1/5) spare ratio. BRT buses are articulated.

²Includes West Mesa (near Baseline Rd/Arizona Ave), Ray Rd/Arizona Ave and downtown Chandler lots.

³Includes West Mesa, Sycamore/Main St, Ray Rd/Arizona Ave and downtown Chandler lots.

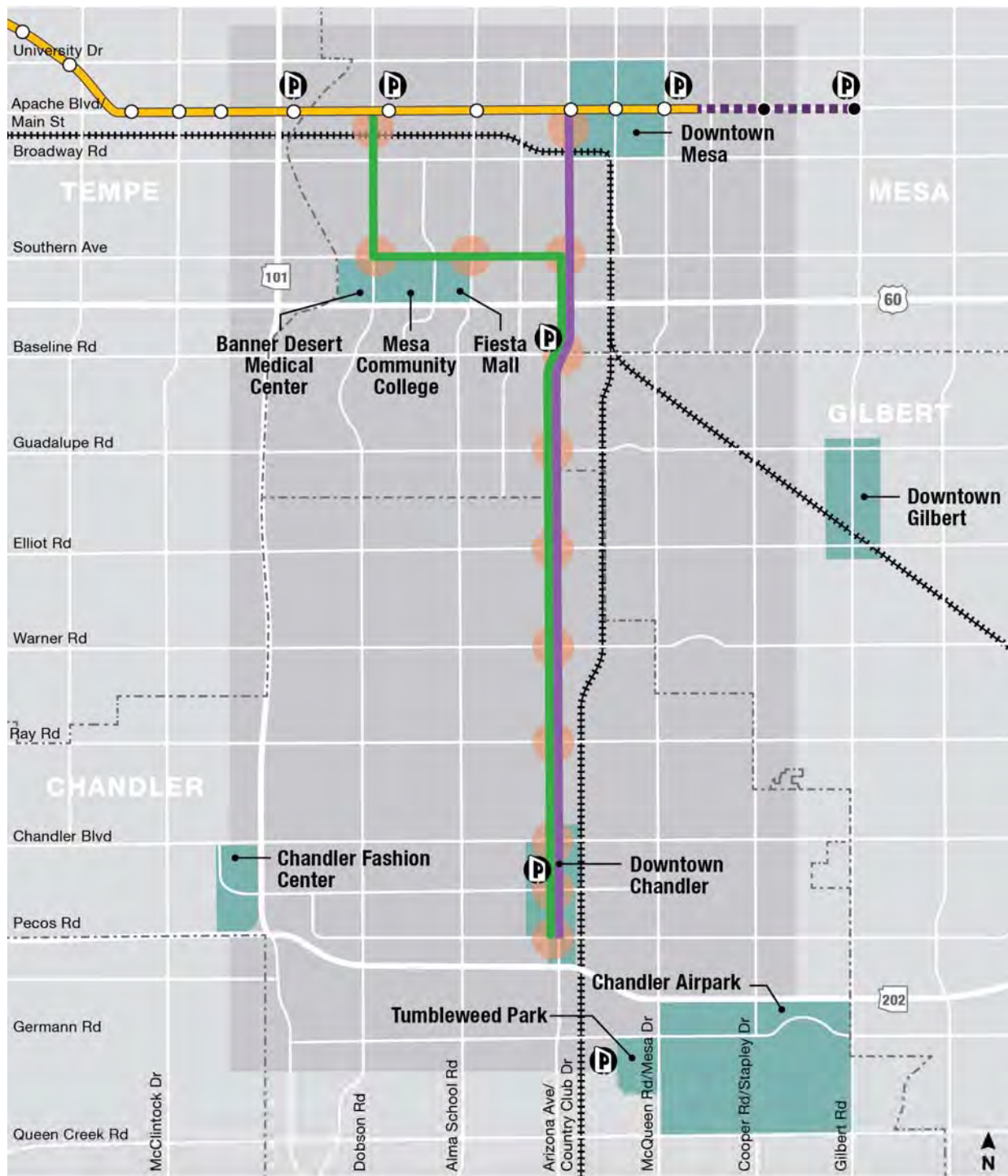
⁴Peak/off-peak

Fleet quantity includes 20 percent spare ratio.

Source: Valley Metro, 2016

Without interlining (in the case of rail), HCT Scenario 1 assumes that riders would have to walk about a quarter mile between the existing Sycamore/Main Street and the new 1st Avenue/Dobson Road stations to change trains. Similarly, Scenario 2 would require passengers to walk a short distance between the two stations at and near Main Street/Country Club Drive. Chapter 6 briefly addresses the option of light rail interlining.

FIGURE 3 STUDY AREA HCT SCENARIOS (LONG-TERM 2040)



LEGEND

- Valley Metro Rail Line/Station
- Study Area
- HCT Scenario 1
- HCT Scenario 2
- Gilbert Road Extension/Station
- Activity Centers
- UPRR
- P Park-and-Ride
- HCT Station Target Areas

Source: Valley Metro, 2016

3.5 DESCRIPTION OF HCT SCENARIOS

This subsection describes the two HCT scenarios illustrated in Figure 3. Scenarios 1 and 2 share the same station locations along Country Club Drive/Arizona Avenue from Southern Avenue in Mesa to Pecos Road in Chandler.

3.5.1 HCT Scenario 1 – Dobson Road/Southern Avenue/Country Club Drive/Arizona Avenue

The proposed HCT route for Scenario 1 is 10.5 miles long, beginning at Main Street/Dobson Road (between the existing Price Road/Loop 101 and Sycamore rail stations), proceeding one and one-half miles south on Dobson Road to Southern Avenue, and then two miles east on Southern Avenue to Country Club Drive, where it would turn south and remain on Country Club/Arizona Avenue to an end-of-line station at Pecos Road, south of downtown Chandler. Dobson Road between Main Street and Southern Avenue would be converted from three to two through lanes in each direction, retaining the existing bike lanes. The guideway would be median running along Dobson, with a new, elevated guideway crossing of the UPRR along Dobson Road between Main Street and Broadway Road. Southern Avenue would retain two through lanes in each direction as well as the existing bike lanes. Along Southern Avenue the guideway would be median running with center stations, which would follow the original CP/EV design standards should light rail be selected as the recommended mode. Turning south from Southern Avenue, Country Club Drive and Arizona Avenue would retain three through lanes and bike lanes, with the guideway median running from Southern Avenue to Baseline Road and then continuing south along the same corridor as in Scenario 2, described below. The bridge over US 60 at Country Club Drive would retain all existing through lanes and turn lanes. Three park-and-rides exist along or near the route at Juanita Avenue/Vineyard in Mesa (near Baseline Road/Country Club Drive), at Ray Road/Arizona Avenue in Chandler and at Chicago Street/Arizona Avenue in Chandler.

Stations

Twelve potential station locations are identified along HCT Scenario 1, including nine shared with Scenario 2. The northernmost station would be on Dobson Road near 1st Avenue, between Main Street and the UPRR, and approximately one block south of the former. The second would be located at Southern Avenue/Dobson Road, just northwest of MCC. A third would be located at Southern Avenue/Alma School Road, providing access to Fiesta Mall and MCC. Proposed station locations for the remainder of the corridor along Country Club Drive and Arizona Avenue, from Southern Avenue to Pecos Road, are listed under Scenario 2.

Late in this study, a potential additional station was identified at Broadway Road/Dobson Road. It would be located less than one-half mile south of the new station at 1st Avenue. This addition to the system may be investigated further in the Alternatives Analysis.

3.5.2 HCT Scenario 2 – Country Club Drive/Arizona Avenue

The Country Club Drive/Arizona Avenue route is 8.5 miles long, beginning at Main Street and traveling south to an end-of-line station at Pecos Road. The roadway would retain three through lanes in each direction and the existing bike lanes between Main Street and Baseline Road. The guideway would be median running, with a grade separation at the existing Country Club Drive underpass beneath the UPRR and Broadway Road. As in Scenario 1, all through and turn lanes would be retained at the US 60 bridge. From Baseline Road to Chandler Boulevard, the roadway would be reduced from three through lanes to two in each direction to accommodate a median-running HCT line and preserve the existing bike lanes. Two through lanes in each direction would be maintained on Arizona Avenue from Chandler Boulevard to Pecos Road in Downtown Chandler, including parallel bike lanes. This route would serve the same park-and-rides as Scenario 1.

Stations

Ten potential station locations exist along the Country Club Drive/Arizona Avenue corridor. Eight would be in the median, following the CP/EV design standards if light rail is the selected mode. The first proposed station is immediately south of Main Street near 1st Avenue/Country Club Drive, followed by a second approximately 1.5 miles south at Southern Avenue. Eight stations spaced one mile apart are proposed at major arterial streets: Baseline, Guadalupe, Elliot, Warner and Ray roads and Chandler Boulevard, in addition to the terminus at Pecos Road and a station at Frye Road.

Downtown Chandler Alternatives

Valley Metro evaluated several alternatives for the Arizona Avenue between Chandler Boulevard and Pecos Road. Alternatives included retaining two through lanes each way and exploration of a single traffic lane operating northbound and southbound. These alternatives will continue to be explored in the subsequent planning phases.

3.6 CONCEPTUAL CROSS SECTIONS

Valley Metro developed conceptual cross sections to demonstrate the existing right of way and conceptual roadway designs for HCT in a semi-exclusive guideway at representative locations along Dobson Road, Southern Avenue and Country Club Drive/Arizona Avenue; as well as dimensions for bike lanes, motor vehicle lanes and sidewalk width. Table 8 consists of assumed dimensions and should not be considered final.

TABLE 8 ASSUMED CROSS SECTION DIMENSIONS (FEET)

Estimated Widths	Dobson Rd	Southern Ave	Arizona Ave	Downtown Chandler
BRT/light rail station	17	17	17	None
Guideway	40	40	40	26
Travel lanes	11	11-12	11-16	11-12
Left turn lanes	10	10	10	None
Bus bays	None	None	11	None
Bike lanes	6	None	6	6
Streetscape	14	9-14	12	8
Existing right of way	110	110	138	100
Proposed right of way	142	129-134	None	None

*Guideway includes two-way tracks (or dedicated bus lanes) and station.
Source: Valley Metro, 2016

3.7 CONCLUSION

Without HCT, year 2040 transit improvements in the study area revolve around enhancements to well-performing local and key local bus routes to meet the standards identified in the TSPM. As noted in the SEVTSS, routes exhibiting high ridership and demand would have increased service frequency in the short-term (2020). Increased frequency, expanded service and the implementation of new local bus routes are proposed for the mid-term (2030) and long-term (2040).

Two potential HCT alignment scenarios were identified for the long term: (1) from the existing CP/EV light rail south along Dobson Road, east along Southern Avenue and south on Country Club Drive/Arizona Avenue to Pecos Road and (2) from the CP/EV along Country Club Drive/Arizona Avenue alignment to Pecos Road in downtown Chandler. Valley Metro conducted a comparison of the estimated capital and operating costs for the proposed BRT and light rail concepts as part of this phase of the study and documented in Chapter 4.0.

The next steps in the study process involved a detailed evaluation of the long-term HCT scenarios. Chapter 4.0 describes this evaluation.

4.0 EVALUATION OF HCT SCENARIOS

The purpose of this chapter is to select one of the two HCT scenarios (if forecast demand warrants either one) to move forward as the preferred alternative for further evaluation. A formal alternatives analysis and environmental analysis will be required later to determine the transit mode (BRT or light rail), alignment, stations and park-and-ride locations for a future project. Valley Metro will evaluate federal funding competitiveness as part of the final screening process that will include steps by which member agencies can make the corridor more competitive. Valley Metro will identify opportunities for phasing the project to meet passenger demand and funding availability.

4.1 TWO-TIERED EVALUATION PROCESS

A two-tiered screening process was used to evaluate the two conceptual alternatives for the FDCTCS area. The purpose of the initial Tier 1 screening was to evaluate the long-term HCT scenarios based on socio-economic and environmental constraints. The Tier 2 screening used ridership forecasts from the FTA's STOPS model to further evaluate the two HCT scenarios.

4.2 TIER 1 EVALUATION

The Tier 1 evaluation compares the two HCT scenarios regarding consistency with existing plans; population and employment served; zero- and one-vehicle households served; and proximity to Section 4(f) properties. Technical Memorandum No. 3, "Scenario Evaluation," presents details of both the Tier 1 and Tier 2 evaluations.

The two potential HCT scenarios rate equally well with respect to the following criteria:

- *Consistency with Existing Plans for Chandler and Gilbert* – Each scenario is equally consistent with existing plans.
- *Consistency with Long-term Plans for Mesa* – Each scenario is equally consistent with existing plans. The short-term (2020) BRT alternatives include BRT serving the Fiesta District as well as Country Club Drive. However, this difference does not constitute a preference for one of the long-term (2040) HCT routing scenarios.

Table 9 compares the estimated performance of the two scenarios with respect to the other Tier 1 criteria. Scenario 1 performs as well as or better than 2, except on number of 4(f) properties, where Scenario 1 approaches within one-fourth mile of one more property than 2.

TABLE 9 TIER 1 COMPARISON OF ALTERNATIVE HCT SCENARIOS

HCT Scenario	2040 Socioeconomic Base ¹			4(f) Properties within ¼ Mile
	Population within ½ Mile	Employment within ½ Mile	Population with <2 Vehicles ² within ½ Mile	
Dobson/ Southern/ Country Club	87,000	43,000	28,000	11
	68,000	35,000	20,000	10

¹Based on Enhanced 2040 land use scenario.

²Refers to number of persons residing in households with fewer than two vehicles available.

Sources: MAG and Valley Metro, 2016

4.3 TIER 2 EVALUATION

This section summarizes the Tier 2 quantitative evaluation, including travel forecast results and capital costs for the two HCT scenarios.

4.3.1 Light Rail Travel Forecasting

Methodology

The ridership forecasts for the two FDCTCS HCT scenarios were estimated using STOPS, a stand-alone ridership forecasting software package. The software, which the Federal Transit Administration (FTA) developed to support New Starts and Small Starts projects, applies a set of travel models to predict detailed travel patterns on fixed guideway systems. This study used a pre-release version of STOPS 2.0 to estimate ridership. *For traffic modeling, Valley Metro assumed light rail, because this mode represents the best case for ridership and stimulation of high-value economic development near stations. This does not imply that light rail is necessary preferable to BRT in the FDCTCS area.*

4.3.2 2040 Light Rail Ridership by Scenario and by Station

Under the MAG Base 2040 scenario, light rail Scenario 1 would attract 16 percent more ridership in the corridor than Scenario 2. Mesa’s proportion of boardings is higher under Scenario 1 than Scenario 2; the reverse is true of Chandler. Scenario 2, however, has somewhat higher boardings per route mile and per station than Scenario 1, because of the shorter extent of the alignment and fewer stations of this corridor. All HCT boardings at the Baseline and Guadalupe roads stations are credited to Gilbert, which borders Mesa at these locations. All boarding numbers are rounded to the nearest ten.

The patterns shown in Table 10 are similar for the Enhanced land use scenario, but the greater concentration and transit orientation of development gives rail ridership a boost. Daily boardings would rise from 8,660 to 10,100 in Scenario 1 and from 7,450 to 8,600 in Scenario 2. Throughout the corridor, Scenario 1 claims 17 percent more boardings than Scenario 2, a result similar to that under the 2040 Base condition.

TABLE 10 2040 LIGHT RAIL WEEKDAY RIDERSHIP FORECASTS, BASE AND ENHANCED LAND USE SCENARIOS

Variable	Scenario 1 (Dobson/Southern)		Scenario 2 (Country Club)	
	Base	Enhanced	Base	Enhanced
<i>Land Use Scenario</i>				
Boardings	8,660	10,100 ¹	7,450	8,600
-Chandler (number/% of total)	2,850/33	3,190/32	3,400/46	3,900/45
-Gilbert (number/% of total)	980/11	1,100/11	960/13	1,180/14
-Mesa (number/% of total)	4,830/56	5,810/58	3,090/41	3,520/41
Weekday boardings/station	720	840	750	860
Weekday boardings/route mile	820	960	880	1,010

¹ Percents by city do not add precisely to 100 due to rounding.
Source: Valley Metro, 2016

Figures 4 and 5 show light rail weekday boardings by station under each combination of 2040 routing and land use scenarios. Each shaded circle in Figures 4 (Base land use) and 5 (Enhanced land use) represents a proposed station area, with the size of the circle corresponding to the range of expected ridership. The largest circles represent boardings of more than 2,000 per weekday and the smallest fewer than 300. Table 11 shows the range of daily boarding forecasts and station rankings in each HCT scenario. Ridership is again rounded to the nearest multiple of ten. Some ties exist.

TABLE 11 FORECAST 2040 RAIL BOARDINGS AND RANK BY STATION

Proposed Station	Boarding Range per Weekday	Boardings Ranked by HCT Scenario	
		1 Dobson/Southern	2 Country Club/Arizona
Main/Dobson	2,060-2,500	1	No station
Southern/Dobson	1,280-1,610	2	No station
Alma School/Southern	690-800	6	No station
Main/Country Club (new)	2,230-2,560	No station	1
Southern/Country Club	800-960	3	3
Baseline/Country Club	590-750	7	5
Guadalupe/Arizona	310-450	9	8
Elliot/Arizona	500-620	8	6
Warner/Arizona	130-340	12	9 or 10*
Ray/Arizona	310-470	11	7 or 8*
Chandler/Arizona	340-430	10	7 or 9*
Frye/Arizona	770-870	4	4
Pecos/Arizona	770-1,280	4 or 5*	2

*Rank differs by 2040 land use scenario (Base versus Enhanced).
Source: Valley Metro, December 2016

FIGURE 4 FORECAST WEEKDAY LIGHT RAIL BOARDINGS, MAG BASE 2040 LAND USE SCENARIO

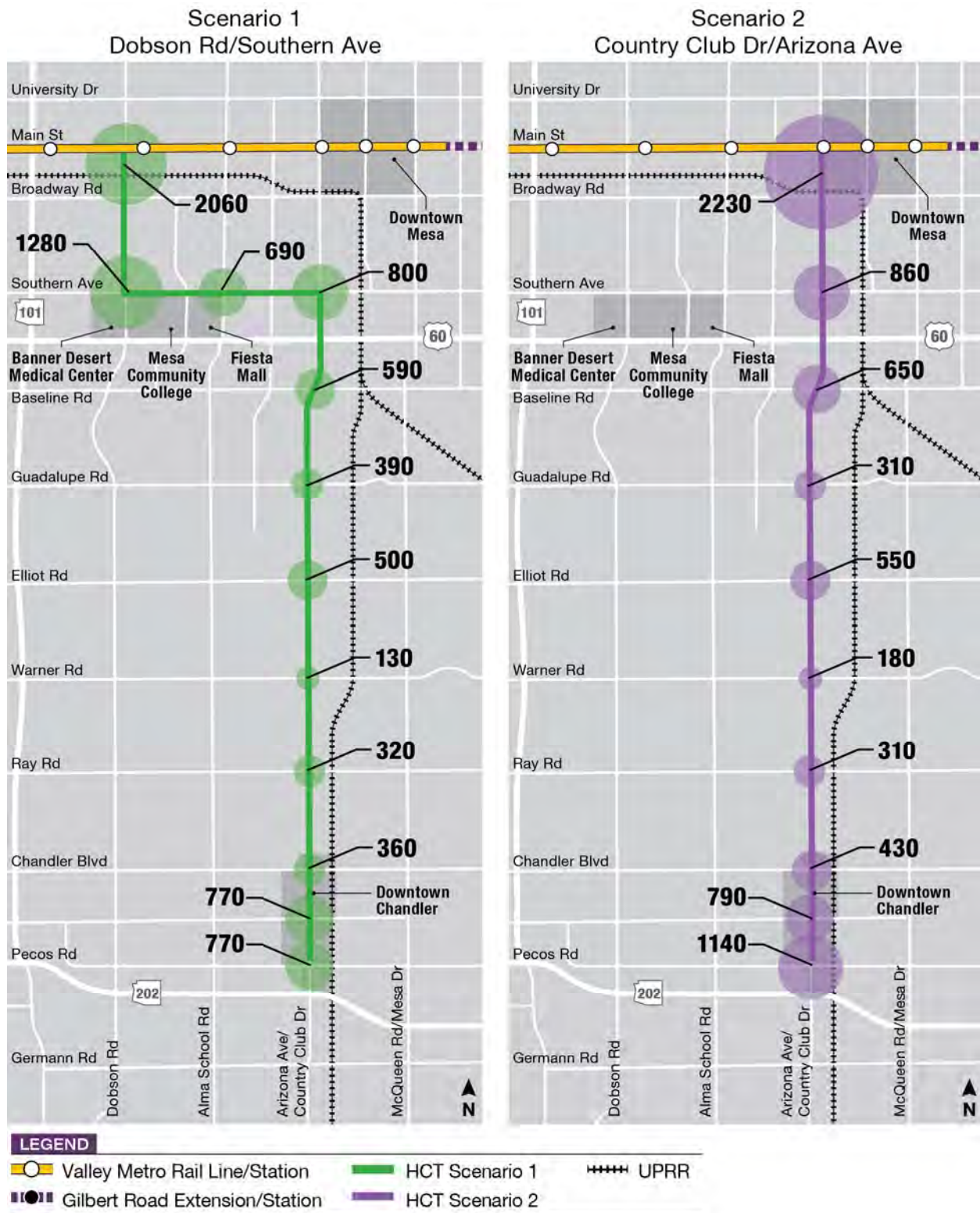


FIGURE 5 FORECAST WEEKDAY LIGHT RAIL BOARDINGS, ENHANCED 2040 LAND USE SCENARIO



LEGEND

-  Valley Metro Rail Line/Station
-  HCT Scenario 1
-  HCT Scenario 2
-  Gilbert Road Extension/Station
-  UPRR

Source, Valley Metro team, December 2016

4.4 CAPITAL COST

Valley Metro estimated capital costs for improvements to bus service and to provide HCT (BRT or light rail) service under the two routing scenarios. The costs to implement HCT were calculated according to FTA standard cost categories. Valley Metro used industry standard and local data to develop unit costs for each category. This method produced order-of-magnitude cost estimates, which should not be considered a formal estimate of costs and are not for programming purposes.

The total estimated capital cost to support the proposed, long-term enhanced bus service network is approximately \$164,000,000 in 2016 dollars. Valley Metro calculated fleet and bus stop needs for each recommended bus enhancement. An industry standard of 20 percent for spare vehicles is included in all fleet calculations.

For the two HCT modes, Valley Metro calculated separately the costs for light rail and BRT in each land use scenario (2040 Base and Enhanced), using unit costs in 2016 dollars. Valley Metro estimated HCT fleet needs with appropriate adjustments for the larger capacity and higher cost of light rail vehicles. A typical, two-car light rail train can carry more than twice as many passengers as an articulated bus, so to compare the two modes fairly, each was assumed to require the same number of vehicles, with a two-car train counted as two vehicles.

4.5 OPERATING COST

Valley Metro calculated the net operating (including maintenance) cost of each alternative by estimating the total revenue miles and then multiplying by a gross cost per mile. A 15 percent farebox recovery ratio was applied to the enhanced bus and BRT options and 20 percent farebox recovery ratio was applied to light rail. Table 11 shows the annual operating costs reported herein include both weekday and weekend service expected in 2040. For enhanced bus service in the study area, existing service in December 2015 was used as a base to calculate the projected revenue miles for the 2020, 2030 and 2040 time horizons.

Valley Metro added the capital and operating costs of enhanced bus service to those of the No Build scenario. Similarly, the costs of BRT and light rail were added to those of the enhanced bus option, which is incorporated in all the HCT modes and scenarios. As in the capital cost estimates, Valley Metro assumed the same number of vehicles for each HCT mode and counted each rail car as one vehicle. BRT and rail operating costs are based respectively on \$6.30 and \$5.25 per vehicle revenue mile (or \$10.49 for a two-car train) in 2016 dollars. Because labor is the principal component of transit operating cost, these figures account for the greater carrying capacity of rail per labor dollar expended, but also for the higher cost of maintaining rail infrastructure, including tracks, overhead catenary, signal systems and vending/validation machines.

5.0 RECOMMENDATIONS

5.1 RECOMMENDED HCT SCENARIO

Both HCT scenarios would take advantage of substantial population and employment growth over the long term, but Scenario 1 (Dobson Road/Southern Avenue/Country Club Drive/Arizona Avenue) has the greatest potential for serving a large population and connecting riders to activity centers, especially in the Enhanced 2040 land use scenario. In comparison, Scenario 2 (Country Club Drive/Arizona Avenue) has a lower capital cost, resulting from the reduced length of the corridor, which is two miles less than that of Scenario 1. Table 12 summarizes the key Tier 2 evaluation criteria that helped determine which scenario should move forward for further analysis. The left-hand panel of Figure 5 above shows ridership by station for the recommended scenario using Dobson Road and Southern Avenue to reach Country Club Drive, and travel south along Arizona Avenue to Pecos Road. The figure does not assume interlining with existing light rail on Main Street. With interlining, total ridership in Scenario 1, Dobson/Southern, could increase by five percent to 10,580. Some boardings at individual stations are higher and others are lower than in the same scenario with no interlining.

TABLE 12 TIER 2 EVALUATION SUMMARY

Performance Criterion	BRT ¹	Light Rail			
		Scenario 1 (Dobson/Southern)		Scenario 2 (Country Club/Arizona Ave)	
		MAG Base (2015)	Enhanced (2040)	MAG Base (2015)	Enhanced (2040)
Population served	Same as rail	72,000	87,000	56,000	68,000
Employment served	Same as rail	36,000	43,000	30,000	35,000
Zero-auto households (% year 2015)	Same as rail	13		10	
Activity centers unique to scenario	Same as rail	BDMC, Fiesta Mall, MCC		Downtown Mesa	
2040 weekday ridership	Not tested	8,660	10,100	7,450	8,600
--per station	Not tested	720	840	750	860
--per route mile	Not tested	820	960	880	1,010
Capital cost (\$M) ²	\$201-222	\$1,080		\$921	
Annual net operating cost (\$M) ¹	\$5.54-6.85	\$11.4		\$9.2	
Pedestrian and bicycle access	Provided by all scenarios, but enhanced bus lacks stations as focal points for active transportation.				
Bus transit connections	Much improved in all scenarios, but HCT provides new focal points for multimodal links.				

¹See Technical Memorandum No. 2 for detailed cost estimates and assumptions behind them. All costs (capital and operating) are in millions of 2016 dollars. HCT costs are over and above those of enhanced bus service.

²See Technical Memorandum No. 3 for detailed cost estimates and assumptions behind them. Capital costs are in millions of 2016 dollars.

Sources: MAG, 2015 and Valley Metro, 2016

As Table 12 shows, population and employment, percent of zero and one-car households, connection to activity centers and overall ridership are greater in Scenario 1 than Scenario 2. Therefore, Scenario 1, whether light rail or BRT, is the preferred HCT corridor that will move forward into a more detailed analysis. This routing, using Dobson Road and Southern Avenue, was chosen as the Build scenario for further analysis, partly because it would serve the most activity and employment centers, which may represent higher ridership potential. The next chapter summarizes a high-level traffic analysis and proposed phasing for future development to 2040.

5.2 SUPPLEMENTARY FINDINGS

- BRT can carry as many or nearly as many riders as light rail, but forecasts of actual BRT ridership have not yet been prepared.
- If BRT is ultimately selected for the study area, the preferred corridor remains Scenario 1 unless ridership forecasts are unexpectedly different.
- Either form of HCT offers substantially greater mobility than the No Build or Enhanced Bus transit network.
- Light rail has four to five times the capital cost of BRT, which in turn adds substantial capital cost to enhanced bus by itself.
- Annual operating cost per year ranges from \$9 million to \$12 million for rail and from \$6 million to \$7 million for BRT, if the capacities of the two modes are assumed to be about the same.
- The lower capital and operating costs associated with Scenario 2, for both BRT and light rail, reflect the approximately 20 percent greater length of Scenario 1.
- With light rail, at least, the transit-supportive changes in the Enhanced 2040 land use scenario pays off in substantial ridership gains for both HCT scenarios.

5.3 RECOMMENDATIONS FOR ACHIEVING 2040 LAND USE SCENARIO

Valley Metro recommends that local land use plans and policies, including each municipality's general plan and zoning code, be updated to encourage TOD and higher densities along the Fiesta-Downtown Chandler corridor. Higher densities and transit-supportive development would lead to higher populations near transit stations, greater economic activity and a more walkable environment. It is also recommended, based on FTA's New Starts land use and economic development rating process, that each jurisdiction encourage or require affordable housing and decrease the availability of downtown parking.

Specifically, the following items should be included in any future land use plans or policies along the Fiesta-Downtown Chandler corridor:

- High-density TOD should be concentrated within one-fourth to one-half mile of stations and focus on the downtowns and activity centers along the corridor.
- Land uses should be primarily mixed-use, providing commercial space on the ground floor and residential or office space above.

- Dwelling units per acre for residential and mixed use development should be at least 40, but preferably higher, especially in downtown station areas, where 60 to 120 units per acre is desirable.
- Buildings should be at least four stories tall, going up to eight stories or higher in downtown station areas.
- FARs should be at least 1.50, going up to 4.00 or higher in downtown station areas.
- Streetscapes should provide multimodal transportation opportunities (walk, bike, bus, rail and car).
- The pedestrian environment should create a pleasant, walkable experience by requiring narrow building setbacks, encouraging shade, constructing large sidewalks and bike lanes and providing pedestrian amenities (benches, lighting, trash cans, etc.).

Lastly, Valley Metro recommends that these policy changes be implemented via an overlay zone and new land use designation. Due to Arizona's unique property rights laws, these types of codes usually succeed when they are on an opt-in basis. The overlay zone would incentivize the development of TOD by giving developers and land owners near transit stations greater densities and lot coverage. Better design features could also be encouraged by providing bonuses to developers who construct TOD or provide specific transit-supportive features.

6.0 IMPLEMENTATION

6.1 HCT FEASIBILITY WITH RESPECT TO TRAFFIC IMPACTS

The FDCTCS recommended HCT scenario would reduce lanes in the study corridor along the proposed alignment at seven segments in the 2040 Build. Based on the high-level segment analysis, only one of these seven segments where lane reductions occur degrades in Level of Service (LOS) (Country Club Drive/Arizona Avenue from Baseline Road to Guadalupe Road). These seven segments have average daily traffic (ADT) volume decreases ranging from 13% to 24%. Other alignment segments where lane reductions do not occur have 0% to 5% less ADT in the 2040 Build.

Between the 2040 No-Build and the 2040 Build, there are three segments that degrade in LOS:

- Country Club Drive/Arizona Avenue from Baseline Road to Guadalupe Road degrades from an LOS C in the 2040 No-Build to an LOS E in the 2040 Build.
- Alma School Road from Guadalupe Road to Elliot Road degrades from an LOS C in the 2040 No-Build to an LOS E in the 2040 Build.
- Ray Road from Alma School Road to Country Club Drive/Arizona Avenue degrades from an LOS D in the 2040 No-Build to an LOS E in the 2040 Build.

The anticipated change in LOS at these three segments is based on corridor trends of diversion away from the alignment segments onto neighboring arterials and a decrease in capacity from the reduction of through travel lanes. Alignment segments in the study area had a percent change in ADT from 0% to 24%, regardless if the segment had a lane drop (although segments with lane drops had a higher percent change). The Country Club Drive/Arizona Avenue segment (four travel lanes) is immediately south of two, six-lane segments that exceed the LOS E threshold in both the 2040 No-Build and 2040 Build. Both the high ADT at these segments to the north, and the lane drop from six to four lanes, contribute to the degradation to LOS E in the Build Alternative. The Alma School Road and Ray Road segments had increases in ADT from the introduction of HCT in the corridor. Although the increases were relatively small compared to other percent changes along study area segments, they were close enough to LOS E thresholds for four-lane segments in the No-Build Alternative to result in a degradation of LOS in the Build Alternative.

Segments that are parallel with, and perpendicular to, the alignment in the study area experienced volume increases from >1% to 6% between the 2040 No-Build and Build. Only two segments' LOS were negatively affected by these volume increases (Alma School Road from Guadalupe Road to Elliot Road; Ray Road from Alma School Road to Country Club Road/Arizona Avenue). The high-level segment analysis performed did not result in LOS A, B or F. Table 13 shows segments that have an LOS E in either the 2015 Existing, 2040 No-Build and Build Alternatives, the changes in the number of lanes, ADT and LOS between each scenario.

TABLE 13 ROADWAY SEGMENT LOS: 2015, 2040 NO BUILD AND 2040 BUILD

Street	Segment	2015			2040 No-Build			2040 Build			2040 Build vs. No-Build		
		Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS
Country Club Dr/ Arizona Ave	Southern Ave to US 60	6	46.0	C	6	55.2	E	6	55.4	E	0	0.2	Similar
	US 60 to Baseline Rd	6	49.2	E	6	53.1	E	6	50.3	E	0	-2.8	Similar
	Baseline Rd to Guadalupe Rd	6	40.3	C	6	43.6	C	4	35.7	E	-2	-7.9	Worse
	Ray Rd to Chandler Blvd	4	32.7	C	4	37.2	E	4	36.0	E	0	-1.2	Similar
	Chandler Blvd to Frye Rd	4	33.7	D	4	36.3	E	4	34.6	E	0	-1.7	Similar
	Frye Rd to Pecos Rd	4	33.7	D	4	40.5	E	4	39.7	E	0	-0.8	Similar
	Pecos Rd to Loop 202	5	37.0	E	5	44.4	E	5	43.6	E	0	-0.8	Similar
Alma School Rd	Southern Ave to US 60	6	41.8	C	6	54.5	E	6	55.4	E	0	0.9	Similar
	Baseline Rd to Guadalupe Rd	4	32.3	C	4	34.3	E	4	36.3	E	0	2.0	Similar
	Guadalupe Rd to Elliot Rd	4	31.0	C	4	33.3	C	4	35.2	E	0	1.9	Worse
	Ray Rd to Chandler Blvd	4	30.8	C	4	34.9	E	4	35.2	E	0	0.3	Similar
	Frye Rd to Pecos Rd	4	30.0	C	4	36.8	E	4	36.8	E	0	0.0	Similar
	Pecos Rd to Loop 202	4	35.3	E	4	48.5	E	4	48.4	E	0	-0.1	Similar
Mesa Dr/McQueen Rd	Broadway Rd to Southern Ave	4	30.7	C	4	36.3	E	4	36.4	E	0	0.1	Similar
	Southern Ave to US 60	5	34.4	E	5	41.1	E	5	41.0	E	0	-0.1	Similar
	Warner Rd to Ray Rd	4	24.0	C	4	36.3	E	4	37.5	E	0	1.2	Similar
	Ray Rd to Chandler Blvd	4	24.7	C	4	38.4	E	4	38.6	E	0	0.2	Similar
	Frye Rd to Pecos Rd	5	22.5	C	5	36.2	E	5	36.4	E	0	0.2	Similar
Warner Rd	Alma School Rd to Arizona Ave/Country Club Dr	4	32.6	C	4	36.2	E	4	36.5	E	0	0.3	Similar
Ray Rd	Alma School Rd to Arizona Ave/Country Club Dr	4	29.6	C	4	33.9	D	4	34.1	E	0	0.2	Worse

Note: Segments in dark gray are along HCT alignment.

¹ Numbers shown are in thousands

6.2 PROPOSED HCT PHASING

Results of the analysis presented in Section 5.0 indicated a potential to phase a HCT investment within the FDCTCS area based on potential ridership, existing transit and land use characteristics, and activity centers. This section summarizes the analysis performed for a phased option.

6.2.1 Definition of Phases

Phase I

Phase I consists of an approximately 3.5- to 4.5-mile LRT alignment that would travel south from the existing light rail line on Main Street on Dobson Road, east along Southern Avenue, and then south on Country Club Drive with a potential end of line station at either Southern Avenue or Baseline Road. The trackway is assumed as median-running, maintaining two through traffic lanes in each direction along Dobson Road and Southern Avenue; three through lanes would remain along Country Club Drive to Baseline Road. Left-turn lanes would be maintained to control traffic flow and allow entrance into local businesses or residential properties. Four to five potential stations have been identified along Dobson Road, Southern Avenue and Country Club Drive through the FDCTCS. The following list outlines the location of potential LRT stations:

- **Dobson Road** – Broadway Road
- **Southern Avenue** – Dobson Road immediately north of MCC and Alma School Road
- **Country Club Drive** – Southern Avenue and Baseline Road (for Phase I, the stations are dependent on the eventual end of line selection)

Phase II

Phase II consists of alignment options (depending on the Phase I terminus) that extend south through Chandler along Arizona Avenue to Pecos Road. The trackway would be median-running and would reduce the roadway configuration from three through traffic lanes to two through traffic lanes in each direction from Baseline Road to Chandler Boulevard. Two through traffic lanes would be maintained in each direction through downtown Chandler from Chandler Boulevard to Pecos Road, and left turn lanes would be maintained at major intersections to sustain traffic flow and entrances to business and residences along the corridor. There are seven potential stations spaced every one mile between Baseline Road and Chandler Boulevard, and every one-half mile between Chandler Boulevard and Pecos Road in downtown Chandler. Potential LRT stations are considered along Arizona Avenue intersecting with either Guadalupe Road, Elliot Road, Warner Road, Ray Road, Chandler Boulevard, Frye Road or Pecos Road.

A detailed evaluation of potential station locations would be included in an Alternative Analysis (AA) if project recommendations move forward for further analysis.

6.2.2 Capital Cost by Phase

Costs were estimated for the development of a standalone HCT service for the phasing options as defined in the previous section based on a minimal design effort. Similar to the methodology to estimate costs for the full alignment options, the costs to implement phased options were calculated for individual expense categories based on the US Department of Transportation Federal Transit Administration Standard Cost Categories format. Unit costs for each category were developed based on local data such as recent comparable Valley Metro projects. Valley Metro utilizes industry standards and local unit costs to anticipate and forecast future transit expenditures. This method produces “order of magnitude” cost estimates to provide a general framework for review and planning purposes. These capital costs should not be considered a formal estimate of costs and are not for programming purposes. The subsequent alternatives analysis phase will advance HCT guideway design to provide additional information that would likely result in updated cost estimates.

Four cost estimates for a standalone HCT service were developed for the phased options. Two for Phase I, depending on the alignment’s end of line, and two for Phase II. Costs were calculated based on the unit costs for each category in current year, 2016 dollars, enabling a comparison of costs across each phase. The Standalone routes assume a hard transfer at Dobson Road/Main Street. Table 14 summarizes the costs estimated for the two Phase I end of line options. Table 15 summarizes the costs to continue the LRT line from the two Phase I end of lines (Southern Avenue or Baseline Road) to Pecos Road/Arizona Avenue. Both tables include costs per mile, however, various project elements were held constant and independent of the project length. When evaluating a project on a per mile basis, costs such as bridge structure crossing over the Union Pacific Railroad and US 60 become a greater portion of the overall cost, increasing the project cost per mile.

TABLE 14 PHASE I CAPITAL COST ESTIMATES (2016)

Cost Category	Phase I Southern/Country Club EOL (3.5 miles)	Phase I Baseline/Country Club EOL (4.5 miles)
Construction*	\$168	\$215
Right-of-Way ¹	\$43	\$55
Vehicles ²	\$58	\$70
Professional Services ³	\$57	\$68
Contingency ⁴	\$94	\$117
Total⁵	\$420	\$525
Total Cost Per Mile	\$120	\$117

Total costs in millions of 2016 dollars. Doesn't include finance costs. The subsequent AA phase will refine these costs based on updated design concepts.

*Fare collection systems, sitework, transit signal priority, operation and maintenance center, LRT stops and guideway are included in the LRT "Construction" cost estimate category.

Assumes existing park-and-ride at Juanita Avenue will be utilized at no additional cost for the Baseline Road option; and a 500-stall park-and-ride is assumed for the Southern Avenue option.

¹ Based on per mile estimate.

² Assumes 10 vehicles for Southern EOL, and 12 vehicles for Baseline EOL.

³ Approximately 30% of construction cost.

⁴ Applied approximately 30% at conceptual stage.

⁵ Assumes an additional station at Broadway Road/Dobson Road, which wasn't assumed in the full alignment estimates in Technical Memo #3.

Source: Valley Metro, 2016

TABLE 15 PHASE II CAPITAL COST ESTIMATES (2016)

Cost Category	Phase II From Southern Ave./Country Club Rd. to Pecos Rd. (7 miles)	Phase II From Baseline Rd. /Country Club Rd. to Pecos Rd. (6 miles)
Construction*	\$301	\$250
Right-of-Way ¹	\$87	\$72
Vehicles ²	\$52	\$41
Professional Services ³	\$93	\$82
Contingency ⁴	\$149	\$125
Total	\$682	\$570
Total Cost Per Mile	\$97	\$95

Total costs in millions of 2016 dollars. Doesn't include finance costs. The subsequent AA phase will refine these costs based on updated design concepts.

*Includes fare collection systems, 500- stall park-and-ride at Pecos Rd, sitework, transit signal priority, operation and maintenance center. LRT stops and guideway are also included in the LRT "Construction" cost estimate category.

¹ Based on per mile estimate.

² Assumes an additional 9 vehicles for Southern Avenue and 7 for Baseline Road.

³ Approximately 30% of construction cost.

⁴ Applied approximately 30% at conceptual stage.

Source: Valley Metro, 2016

6.2.3 Federal Funding Competitiveness

Using the existing FTA Capital Investment Grant (CIG) program guidelines for New Starts projects, multiple options for the Dobson Road – Southern Avenue – Arizona Avenue scenario were analyzed to determine the probability that they would be competitive for federal funding. It is important to note that this analysis is purely conceptual at this point. Certain assumptions and datasets were used that would not be eligible for inclusion in an actual grant application, such as long-range socioeconomic projections, enhanced land use figures and bus routes that do not currently exist. It is also very likely that by the time a formal application for this project would be initiated, the process will have changed. FTA continually updates the relative guidance to improve rating processes or other components of the law, while Congress may pass new legislation that changes eligibility requirements. As such, this analysis only provides a general idea of relative strengths and weaknesses of each criteria for each corridor for federal funding. In areas of weakness, this analysis also recommends certain actions that would improve its standing within these criteria.

One general corridor was analyzed for a standalone option for the FDCTCS: the Dobson Road Alternative, which is the Complete Project alignment along Dobson Road, Southern Avenue and Country Club Drive/Arizona Avenue. A separate analysis was also performed on this corridor to determine if phasing the project may be beneficial. The two standalone end of line options for Phase I were analyzed, which include Southern Avenue/Country Club Drive and Baseline Road/Country Club Drive. Lastly, a separate analysis was performed on the Phase I options to determine if interlining the opt into a future light rail corridor running from Main Street/Dobson Road, where the FDCTCS meets with the existing CP/EV line, to 79th Avenue/I-10 freeway, the future end-of-line station for the Capitol/I-10 West project, would make the FDCTCS project more competitive. The results of the analyses are provided in Table 16.

TABLE 16 SUMMARY OF NEW STARTS ANALYSIS RESULTS

Categories	Phase 1/Phase 2 Combined	Phase I	
		Southern Avenue EOL	Baseline Road EOL
Mobility	●	●	●
Cost Effectiveness	●	●	●
Congestion Relief	●	●	●
Environmental Benefits	●	●	●
Land Use	●	●	●
Economic Development	●	●	●
Competitiveness	●	●	●

- = Favorable
- = Needs Improvement
- = Not Competitive

Generally, the entire 10.5-mile scenario from Main Street in Mesa to downtown Chandler does not rate competitively as a light rail project due to mobility and cost-effectiveness ratings, while other criterion are somewhat lower in their ratings as well. The phased options show a large improvement in ratings and would seem to perform well enough to be favorable. Although the Mobility and Cost-Effectiveness ratings are still somewhat lower in the phased approach, the improvements to the other ratings, especially Congestion Relief, Land Use and Environmental Benefits help make the overall project more favorable.

6.3 COMMUNITY PLANNING FOR ENHANCED LAND USE

Table 17 recommends actions for the three participating municipalities to prepare for transit-supportive land uses, to ensure that a future HCT system will succeed at attracting ridership and maximizing mobility in the community and region. The table classifies recommended steps as short-term (to 2020), mid-term (2020-2030) or long-term (2030-2040). Although cities and towns bear the responsibility for land use planning and regulation, Valley Metro and MAG have a knowledge base on TOD and related topics, and are available to assist.

TABLE 17 PHASED PLANNING RECOMMENDATIONS: ENHANCED LAND USE SCENARIO

Recommendations to Participating Municipalities	Timeframe
Familiarize selected staff members with basic TOD concepts and principles, with assistance from Valley Metro and MAG. (Applies especially to Chandler and Gilbert.)	Short-term
Using Valley Metro and related websites as resources, compile applicable examples of best practices and lessons learned elsewhere.	Short-term
Establish relationships with key property owners and developers in potential station areas.	Short-term
With help from Valley Metro, investigate recent efforts around the country to support BRT-related station area development.	Short-term
For the recommended alternative, develop a station area typology, with the help of examples such as the one used by Phoenix.	Short-term
Adopt qualitative and quantitative planning principles covering: <ul style="list-style-type: none"> • Land use • Mobility and connectivity • Building design • Housing affordability • Parking 	Short-term
Work with cooperating jurisdictions and agencies to refine and expand this list for all phases of planning and development. Consider an ad hoc working group.	Short-term
Continue short-term activities.	Mid- and long-term
Develop community-specific guidelines for potential station areas in the corridor: <ul style="list-style-type: none"> • Definition and characteristics of desirable mixed uses • Dwelling units/acre based on station area typology • Building heights based on station area typology • FAR based on station area typology • Multimodal transportation opportunities and accessibility Transit-friendly streetscapes and amenities near stations	Mid-term
As the three municipalities update their general plans, incorporate mid- and long-term land use objectives and policies that support the recommended HCT alternative and its stations.	Mid-term
Revisit and amend zoning codes to better support HCT.	Mid-term

TABLE 17 PHASED PLANNING RECOMMENDATIONS: ENHANCED LAND USE SCENARIO CONTINUED

Recommendations to Participating Municipalities	Timeframe
Consider form-based codes as appropriate at locations where high HCT ridership is anticipated, such as the Southern Avenue corridor.	Mid-term
Enact policies and incentives to encourage affordable housing near station sites.	Mid-term
Investigate tools, such as density bonuses, to promote higher residential and commercial densities around future stations	Mid-term
Continue mid-term activities	Long-term
Reduce or eliminate fees to tap into water and sewer near stations.	Long-term
Reduce or remove parking minimums around stations.	Long-term
Use management techniques such as shared parking to reduce demand.	Long-term
Consider municipal participation in redevelopment financing near stations.	Long-term
Work closely with existing property and business owners to ensure their needs are met during design and construction.	Long-term
If BRT or LRT is the selected mode, consider the impact of intermodal transfers on station access and adjacent development.	Long-term

Source: Valley Metro, December 2016

6.4 POTENTIAL FUNDING FOR ENHANCED TRANSIT SERVICES AND HCT

Transit service capital and operating needs are funded in the context of the Chandler, Gilbert and Mesa annual budgets. Each community’s contribution to Valley Metro’s operating budget is predominantly derived from its portion of the regional Public Transportation Fund, but local general funds and transit fares collected within municipal limits also contribute toward covering capital and operating costs. Decisions on transit investments, either through capital or operations funding, are subject to the policies of each community.

As an initial step toward identifying available funding to enhance transit, the study area municipalities have expressed an interest in identifying options that can diversify the revenue stream and possibly support service enhancements. Potential sources of funding may come from various resources, including:

- **Local Property Taxes** – Land development policies that encourage higher housing or commercial densities around transit facilities can foster growth in property tax revenues, as well as stimulating ridership and therefore farebox revenue.
- **Local Sales Taxes** – Some municipalities in Arizona and elsewhere have instituted new or modified sales taxes to fund transit improvements. The MAG region anticipates continued growth in the sales tax base. On the other hand, population growth also raises demand for government services funded with the sales tax.

- **Regional Sales Taxes** – A regional sales tax is in place under Proposition 400 that continues the one-half cent sales tax for 20 years. Local municipalities can work with MAG to help plan the next funding proposition that will support public transportation through a regional sales tax.
- **Parking Fees** – Some transit agencies collect parking revenue from the operation of park-and-rides. Currently, cities in the Valley Metro service area do not charge for parking at transit facilities.
- **Debt Financing** – Debt financing refers to bonds, notes and interest-bearing leases involving a pledge of future revenue. Public entities use debt financing because it provides the ability to access capital markets and secure sufficient resources to implement capital projects when needed.
- **TIFIA Credit Assistance** – The Transportation Infrastructure Finance and Innovation Act is a federal credit assistance program designed to help finance large transportation projects by loaning funds to cities, metropolitan regions or states where future revenue sources may be uncertain. These loans are meant to attract non-federal investment and accelerate projects, which may not be scheduled in the immediate future or even constructed at all because of their size and scale.
- **Value Capture** – Value capture tools capitalize on the increased value of private land created by public infrastructure investments. While Arizona law does not currently permit value capture, cities and states elsewhere are employing this financing strategy to recoup transit capital costs and to help offset operating expenditures for a set period. Cities may wish to undertake market assessment studies to determine the ability of adjacent land development to maximize return on investment.
- **Public - Private Partnerships** – Transit providers and cities across the country are looking to leverage limited financial resources by forging partnerships that can bring non-traditional sources of support (including cash, facilities and equipment, in-kind services and financing mechanisms) that pay partially or fully for new services or facilities. Local governments and transit agencies are expanding their partners to include developers, major employers, universities, non-profit social service agencies, utilities, property managers and others.
- **Benefit Assessment Districts** – May be used by cities to enhance transportation facilities within a specified district, as specified in the Municipal Improvement and Revitalization chapters of Arizona Revised Statutes, Title 48.
- **State Funds** – Funding from the state of Arizona, such as the Arizona Lottery Fund, which uses lottery proceeds, may be available as a financial resource to help pay for capital and operating costs.
- **Federal Aid Discretionary Grants** – Funds for large capital improvements are available from the federal government, typically in the form of discretionary grants, such as the New Starts program offered through the FTA. The CP/EV and Central Mesa Extension projects are direct recipients of federal aid funds for HCT capital improvements. Federal grants covered 46% of the first project and 52% of the second.

- **Other Revenue** – Advertising sales and other resources can also contribute to the capital costs for construction of a transit project.

The identification of a preferred set of funding options is contingent upon each community's ability to meet several key objectives. The funding strategies selected to implement an enhanced transit network, including HCT, must yield the necessary revenues and have the required legal framework to cover the costs of the improvements while maintaining sufficient funds for the existing network. It may be necessary to evaluate the funding options presented herein to identify a short list of strategies for further study. While each revenue option is subject to economic cycles, the preferred strategy should be based on a revenue source that is not subject to significant volatility or assumes the least possible volatility risk.

6.5 NEXT STEPS

The next step in the planning process is to advance the recommendations presented in this Final Report into an alternatives analysis phase that will accomplish the following:

- Analyze various transit modes
- Further examine appropriate potential phasing options
- Conduct public outreach to understand community concerns, preferences and insight for recommended development
- Define a locally preferred alternative (LPA) that will identify a specific route, transit type, station locations, street configuration, and other items (e.g., future extensions)

7.0 REFERENCES

MAG. 2017a. 2017-2021. TIP Transit Listing. Available at [http://www.azmag.gov/Documents/TIP_2017-2021-Transportation-Improvement-Program-\(TIP\).pdf](http://www.azmag.gov/Documents/TIP_2017-2021-Transportation-Improvement-Program-(TIP).pdf)

2013a. MAG Population and Employment by TAZ GIS Shapefile

_____. 2013b. Existing and Planned Transit Network GIS Shapefile

_____. 2012. MAG Existing/Future Land Use GIS Shapefile

_____. 2010. MAG Population and Employment Projections GIS Shapefile

United States Census Bureau. 2011a. American Community Survey (ACS) 5 year estimates (2007-2011). Household Vehicles. GIS Data

_____. 2011b. American Community Survey (ACS) 5 year estimates (2007-2011). Median Household Income. GIS Data

_____. 2011c. American Community Survey (ACS) 5 year estimates (2007-2011). Population by Sex and Age. GIS Data

_____. 2011d. American Community Survey (ACS) 5 year estimates (2007-2011). Commute to Work. GIS Data

_____. 2000. U.S. Census SF3 file by Block Group. GIS Data

Valley Metro. 2016. System and Study Area Maps

_____. November 2016. Valley Metro Monthly Ridership Report. Available at http://www.valleymetro.org/images/uploads/ridership_reports.pdf

_____. October 24, 2016. Transit Book. Available online at <http://www.valleymetro.org>



APPENDIX A

TECHNICAL MEMORANDUM 1



Technical Memorandum No. 1

Fiesta-Downtown Chandler Transit Corridor Study

December 2015





TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Project Background	1
1.2	Project Purpose	2
1.3	Previously Completed Studies	4
2.0	OVERVIEW OF THE STUDY AREA	15
2.1	Population and Employment	15
2.2	Transit-Dependent Populations	21
2.3	Land Use and Activity Centers	28
2.4	Existing and Planned Infrastructure Improvements	34
2.5	Existing and Planned Transit Services	36
3.0	OPPORTUNITIES AND CONSTRAINTS	41
4.0	STAKEHOLDER INTERVIEWS	44
4.1	City of Chandler	44
4.2	Town of Gilbert	45
4.3	City of Mesa	45
5.0	GOALS AND OBJECTIVES	46
6.0	CONCLUSION	47
7.0	REFERENCES	48

LIST OF FIGURES

Figure 1	Planned High Capacity Transit System.....	1
Figure 2	Study Area	3
Figure 3	2010 Population per Square Mile.....	16
Figure 4	2040 Population per Square Mile.....	17
Figure 5	2010 Employment per Square Mile.....	19
Figure 6	2040 Employment per Square Mile.....	20
Figure 7	Zero and One Car Households	22
Figure 8	Median Household Income	23
Figure 9	Population Over 65	24
Figure 10	Existing Transit Use	25
Figure 11	Transit-Dependent Population	27
Figure 12	Existing Land Use	29
Figure 13	Future Land Use (2031).....	30
Figure 14	Activity Centers.....	33
Figure 15	Existing Transit Network	39
Figure 16	Planned Transit Network.....	40
Figure 17	Opportunities and Constraints	43

LIST OF TABLES

Table 1	Previously Completed Studies.....	4
Table 2	Population Growth	15
Table 3	Employment Growth	18
Table 4	Transit-Dependent Population Characteristics.....	21
Table 5	Transit Dependent Value Ranges	26
Table 6	Existing and Future Land Use.....	28
Table 7	Transportation Improvement Projects.....	34
Table 8	Existing Fixed Route Bus Service	37
Table 9	Future Local Bus Network within the study area.....	38
Table 10	Opportunities and Constraints Summary	42

APPENDICES

Appendix A: Agency and Stakeholder Interview Meeting Minutes

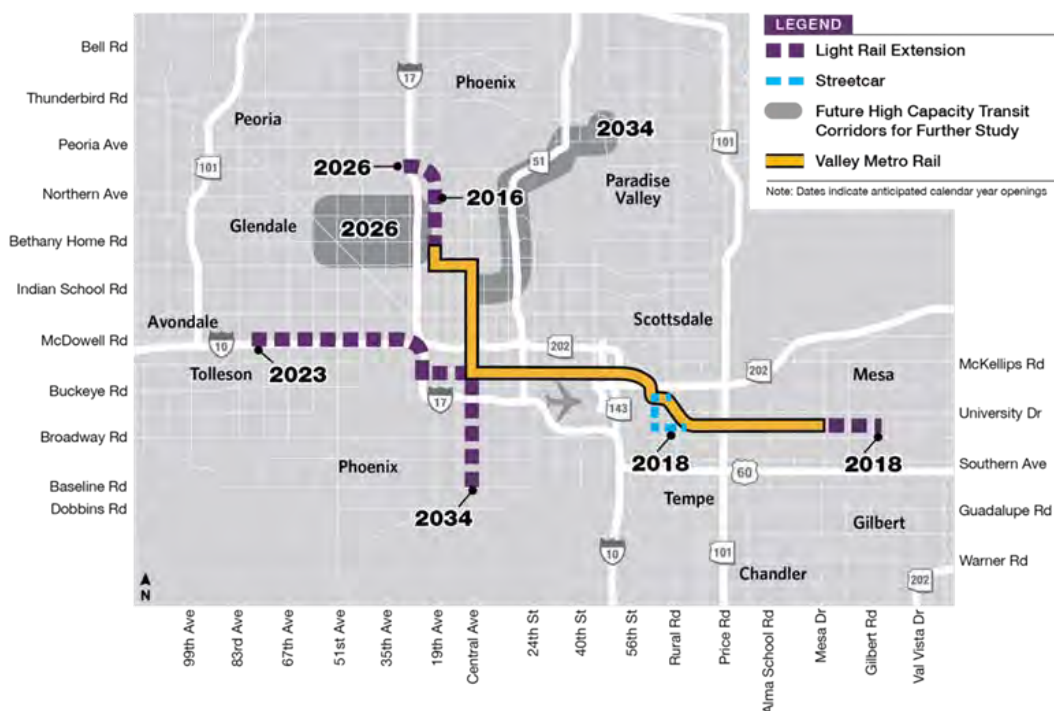
1.0 INTRODUCTION

Valley Metro, in cooperation with the municipalities of Mesa, Gilbert and Chandler, is conducting the Fiesta/Downtown Chandler Transit Corridor Study (FDCTCS). The study will evaluate a variety of transit types and corridors to determine the appropriate transit option that will provide enhanced mobility to the study area. Study partners will identify potential land use adjustments and transit investments, including local bus service and high capacity transit (HCT) appropriate in the short-, mid- and long-term to meet the anticipated public transportation demand. This document provides background information on the study area and identifies the goals and objectives for advancing higher levels of transit service within the study area.

1.1 PROJECT BACKGROUND

In November 2004, Maricopa County voters approved Proposition 400, a 20-year one-half cent sales tax extension to fund proposed projects in the 2003 Maricopa Association of Governments (MAG) Regional Transportation Plan (RTP). The RTP, which was last amended in June 2015, identifies the major HCT corridors within the MAG region, of which 23 miles are currently operating. Under the RTP, additional corridors are planned or under study. The HCT corridors identified for future study are shown in Figure 1.

FIGURE 1 PLANNED HIGH CAPACITY TRANSIT SYSTEM

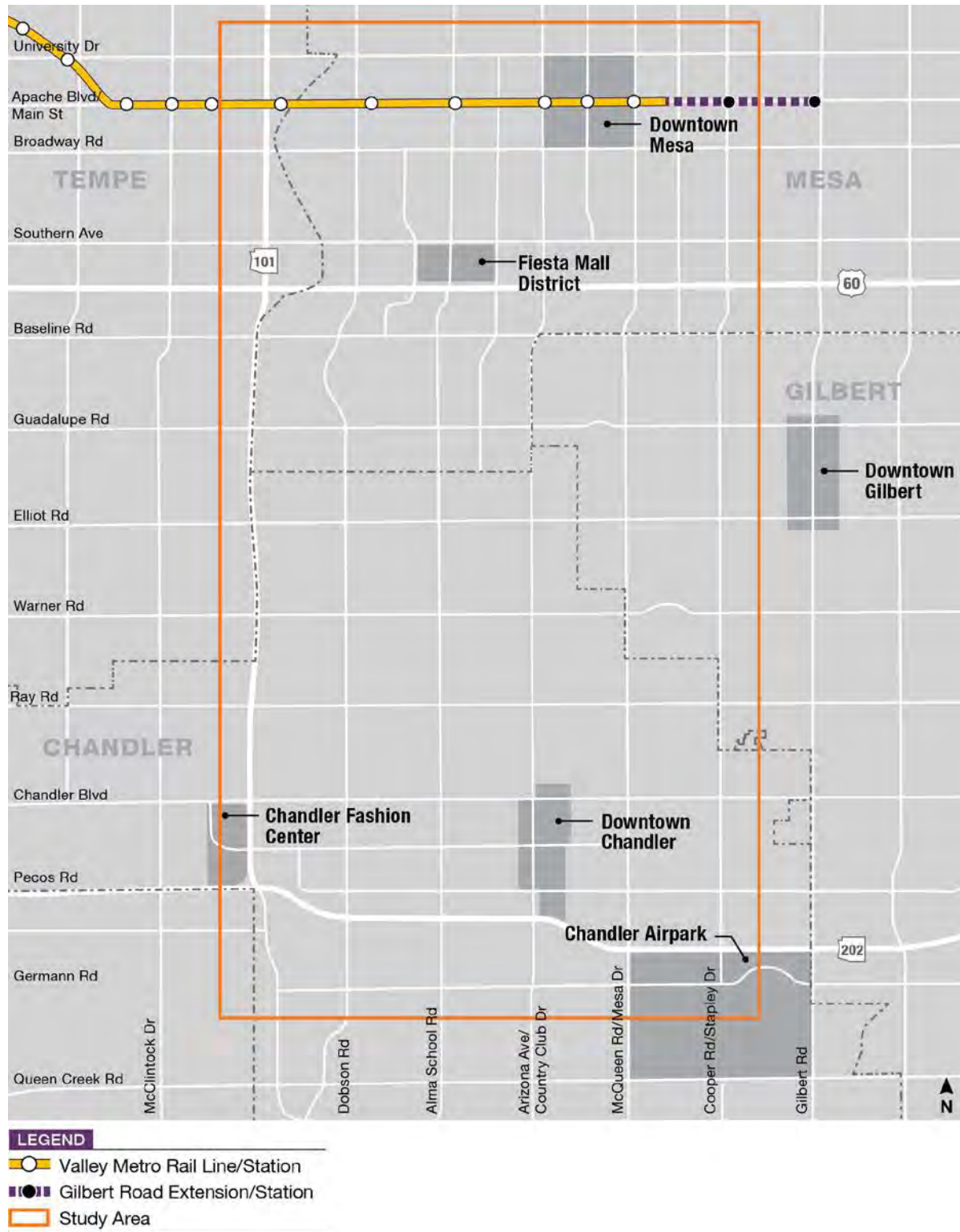


Source: Valley Metro, 2015

1.2 PROJECT PURPOSE

A transit investment would serve existing and projected travel demand throughout the study area. The study area, shown in Figure 2, extends approximately two miles beyond Arizona Avenue/Country Club Drive to the east and west, respectively, and ½ mile south of Germann Road in Chandler, and approximately ½ mile north of University Drive in Mesa. This corridor provides opportunities for connections between major activity centers located in the study area and the existing regional transit system, including links between downtown Chandler, the Arizona Avenue employment core and Mesa destinations such as downtown, Mesa Community College and other places within the Fiesta District.

FIGURE 2 STUDY AREA



The FDCTCS will document recommendations that support a potential HCT corridor in the future; a strategic implementation plan will be incorporated into the FDCTCS Final Report. The plan will outline the incremental steps and/or actions necessary, including changes in local land use along Arizona Avenue, to build the level of demand necessary along that corridor to support increasingly higher levels of transit investment. The strategic plan will address potential land use policy actions and the phasing of higher levels of transit service and capital improvements over the short-, mid- and long-range time periods. The ultimate conclusion of the FDCTCS will be the vote for consideration of approval of a recommended alternative from the Councils of each municipality.

1.3 PREVIOUSLY COMPLETED STUDIES

Documents and planning studies that relate to the proposed study area were reviewed to better understand the characteristics and planned transit network within the study area. The findings and relevance of each study to the FDCTCS process are summarized in Table 1.

TABLE 1 PREVIOUSLY COMPLETED STUDIES

Summary	Relevance to FDCTCS
MAG / Valley Metro Southeast Valley Transit System Study (2015)	
<p>The purpose of the study was to identify short-, mid- and long- term recommendations that will advance the transit system throughout the study area. The study included an evaluation of the existing transit conditions followed by an analysis of the transit needs for the area, including:</p> <ul style="list-style-type: none"> • A review of existing services • Analysis of current and future travel demands to determine where there might be unmet needs • Planning for future population growth and economic development • Community input <p>The final report presented recommendations for optimizing transit services in the study area in the short term.</p>	<p>The MAG/Valley Metro Southeast Valley Transit System Study documented transit performance of the existing transit network in the southeast valley through a data driven process. Based on the results of this analysis, study recommendations include extending east/west routes throughout the study area to fill in service gaps along Ray Road, Guadalupe Road, Baseline Road, and Elliot Road. New and extended north/south route recommendations in the long-term include services on Lindsey, Val Vista, Greenfield, and Higley. In addition to new service, the study also recommends adjusting service frequency to at least 30 minute frequency for local bus service throughout the study area, as well as consolidating LINK and local services along Main Street and Arizona Avenue into a higher frequency service that more closely matches light rail headways.</p>

ADOT / Passenger Rail Corridor Study (Ongoing)	
<p>In partnership with the Federal Railroad Administration, and other local, federal and planning organizations, ADOT is determining routes to study for a proposed passenger rail line between Tucson and Phoenix. Funding sources and a construction schedule have not been identified at this time.</p>	<p>Recommendations from the ADOT Passenger Rail study include the ongoing evaluation of alternatives that utilize the UPRR ROW throughout the Southeast Valley. An alternative along Arizona Avenue traversing the entire FDCTCS study area was evaluated and removed from consideration. However, the final evaluation currently in process is analyzing an alternative that crosses the FDCTCS Study Area in the vicinity of Arizona Avenue and Broadway Road along the UPRR Southeast Corridor alignment. If this alternative is selected as a preferred alternative opportunities for multimodal connections between passenger rail service and HCT are possible.</p>
City of Mesa 2040 General Plan (2014)	
<p>The City of Mesa's General Plan identifies a set of transportation goals and objectives that are essential to the future of Mesa's thriving neighborhoods and economy. The overarching goal is to promote the growth of the transportation network, while maximizing activity in and around the main corridors of Mesa, and minimizing direct impact on adjacent neighborhoods.</p>	<p>Recommendations regarding transit include the following:</p> <ul style="list-style-type: none"> • Utilize transit to promote connectivity among activity centers • Identify transit priority corridors • Connect activity centers to mixed-use and high density land-use areas • Build the future transportation network to fill gaps between activity centers and square mile neighborhoods • Complete Street Standards and Guidelines to be considered in all future reconstruction projects and new street construction projects • Land development proposals must be integrated with the street • Character area that can develop around transit with a more intense, walkable urban environment • Character types of activity, generally larger than 25 acres, serve the larger community; primarily retail areas and entertainment centers, but often include offices, multi-residential and other supporting uses • Transit is developed in context of what the future of the HCT network might look like • Establish higher density residential areas adjacent to or near side road and arterial roads and intersections to promote public transit, bicycle and walking access to nearby employment, retail, service and civic uses

City of Mesa 2040 Transit Plan (2014)

The City of Mesa's Transit Plan inventories the types of services, facilities and features needed to support a multimodal transportation system. This plan was developed with existing activity centers in mind and to connect these centers through multi-modal connections.

Recommendations from the Mesa Transit Plan that involve the FDCTCS study area are categorized as short, mid-, and long-term alternatives, as follows:

Short Term Alternatives (effective 2018):

- Extension of Route 96 along Dobson Road and also Route 120 Mesa Drive.
- Frequency Improvement: Route 30 along University Drive, Route 104 along Alma School Road, and Route 112 along Country Club Drive.
- Route Modification: Country Club Premium Bus, and Route 104 along Alma School Road.

Mid Term Alternatives (Effective 2030):

- New Route: HCT Dobson/Southern/Country Club and Southern Avenue Bus Route
- Route Extension: Light Rail along Main Street, Route 45 Broadway Road and Route 61 along Southern Avenue
- Frequency Improvement: Southern Avenue, Premium Bus Route and Route 77 along Baseline Road

Long Term Alternatives (Effective 2040):

- New Route: US 60 Passenger Rail and Phoenix Southeast Subdivision Passenger Rail
- Route Extension: Light Rail along Main Street and Southern Avenue
- Frequency Improvement: US 60 Passenger Rail and Phoenix Southeast Subdivision
- Route Modification: Route 61 along Southern Avenue

MAG Central Phoenix Transportation Framework Study (2014)	
<p>The MAG Central Phoenix Transportation Framework Study was a planning process that developed a transportation network that is sustainable, multi-modal and safe, which has the capacity to operate effectively and efficiently in the Phoenix metropolitan area. The study also provides a baseline for the next RTP.</p>	<p>The study recommended a HCT corridor along Chandler Boulevard from 56th Street to Arizona Avenue.</p>
MAG Sustainable Transportation and Land Use Integration Study Need (2013)	
<p>The purpose of this study was to highlight the potential to move the Phoenix metropolitan region towards greater use of sustainable transportation modes including transit, walking and biking. The study examined transit investments and services previously recommended for consideration, and support the creation of walkable and transit-oriented communities.</p>	<p>The study does not include any specific recommendations for the FDCTCS study area. Rather, land use planning policies relevant to supporting recommendations for the FDCTCS study area will be examined and referenced as appropriate.</p>
Valley Metro Park-and-Ride Survey (2013)	
<p>In 2013, Valley Metro undertook the first and only survey of all of the region’s public park-and-ride (PNR) facilities. The survey was focused on identifying the primary modes transit riders used to get to the PNR, the trip origin and destination, trip purpose, frequency of use, utilization levels, amenities at each facility and any improvements that were requested by PNR users. The survey had many key findings, including:</p> <ul style="list-style-type: none"> • Light rail PNRs primarily serve different travel markets than bus PNRs; • PNRs adjacent to freeways tend to do better; • Light rail PNRs users are more likely travelling to colleges than bus PNR users. 	<p>The PNR survey included three PNRs in the FDCTCS study area:</p> <ul style="list-style-type: none"> • Sycamore/Main St PNR - The second largest PNR in the system has 802 parking stalls, and at the time of study it was the eastern end-of-line for the light rail system. Trip purposes were primarily education and work with frequent destinations including downtown Tempe and ASU. Most trip origins reside within the FDCTCS study area or to the east. Utilization was approximately 38%. • West Mesa PNR - Considered an average size for the system and has 305 parking stalls. Primary trip purposes were work related with trip origins residing within the FDCTCS study area. Most trip destinations include downtown Phoenix or the State Capitol. Utilization was approximately 36%. • Chandler PNR - This facility was new when the survey was conducted and is characterized as a relatively large PNR (7th largest in the system), with covered parking available and 460 total parking stalls. Serves primarily work-based trips throughout the work week. Most of the passenger origins come from the southern portion of the FDCTCS study area or a few miles around it. Most of the passenger destinations are downtown Phoenix or the State Capitol. Utilization was about 59%.

Arizona Avenue High Capacity Transit Long Range Study (2012)	
<p>In coordination with Chandler, Mesa, Gilbert, and MAG, Valley Metro conducted the Arizona Avenue High Capacity Transit (HCT) Long Range Study in 2012. The purpose of this study was to evaluate alternative land use scenarios and transit service concepts that could result in improved trip generation and make the Arizona Avenue corridor viable for HCT service. In addition, this study provided a review of the necessary capital and operating costs that would be associated with HCT service in this corridor.</p>	<p>Study findings indicate that the Arizona Avenue corridor is a good candidate for increased transit service in the future, including HCT.</p> <p>Based on an optimized land use scenario that includes land development conducive to transit use, the Arizona Avenue corridor projects to achieve a similar number of boarding per corridor mile on HCT within Chandler, Mesa and Gilbert.</p> <p>Study recommendations suggest the following to support HCT in the future:</p> <ul style="list-style-type: none"> • Increase residential and commercial density throughout the corridor • Expand local transit network to increase access to HCT and enhance reliability • Amend current General Plans to encourage transit supportive development along Arizona Avenue • Create a more pedestrian friendly environment along Arizona Avenue • Incorporate lessons from local HCT experience • Explore alternative funding options
MAG Southeast Corridor Major Investment Study (2012)	
<p>The goal of the MAG Southeast Corridor Major Investment Study was to identify different transportation options that would improve mobility within a study area roughly bounded by I-10, SR-202, SR-101, the Gila River Indian Community and I-17. The study area included parts of Phoenix, Tempe, Chandler and all of Guadalupe. The analysis was focused on identifying potential multi-modal transportation alternatives that would address current and future congestion caused by planned increases in population and employment. The study concluded by recommending various multi-modal transportation alternatives, including improvements to highways, new HCT and roadway improvements.</p>	<p>The study identified Southern Ave and Country Club Drive/Arizona Avenue as potential HCT, indicating potential light rail or bus rapid transit investments in its proposed transportation improvements.</p>

Town of Gilbert General Plan (2012)	
<p>The purpose of the Plan is to create a comprehensive, integrated multimodal transportation system that promotes and enhances safety, mobility, efficiency, quality of life and sustainability by meeting the following goals:</p> <ul style="list-style-type: none"> • Foster economic growth with a multimodal transportation system • Work with regional transit partners to develop a transit network • Support public and private efforts to improve mobility 	<p>The plan calls for advancement in local bus services, express services, BRT/LRT, circulators and commuter rail the following areas directly related to FDCTCS:</p> <ul style="list-style-type: none"> • Baseline Road • McQueen Road • Ray and Warner Road • Arizona Avenue • US 60 East and West
MAG Commuter Rail System Study (2010)	
<p>The MAG Commuter Rail System Study provides a framework for the development of commuter rail in the Maricopa County region. The study analyzed multiple corridors as both standalone options, as well as part of an interlined network. These corridors were compared based on travel forecasts, savings in travel time, cost-effectiveness and their ability to be constructed and maintained. The study included final recommendations with phasing options and provided some implementation steps.</p>	<p>The study identifies two potential commuter rail corridors in the FDCTCS study area:</p> <ul style="list-style-type: none"> • The Phoenix Subdivision (SE) route, which serves downtown Mesa and the northern part of the FDCTCS area. This alternative was noted as having the most ridership potential of every alternative analyzed; and • The Chandler route, which serves downtown Mesa, downtown Chandler and the entire FDCTCS study area. This alternative rated in the middle tier of final recommendations with less overall ridership potential compared to other corridors. <p>The recommendations designated commuter rail options within the study area demonstrate an interest in a long-term transit investment.</p>
City of Chandler South Arizona Avenue Design Guidelines (2010)	
<p>These design guidelines establish a vision for the development of the corridor between downtown Chandler and the SanTan Freeway (SR 202), located ¾ mile to the south. The City of Chandler has plans to develop this corridor with mixed residential and commercial uses to create a dynamic new “front door” for Chandler.</p>	<p>Centered on Arizona Avenue, future development in this corridor has the potential to support future transit investments. The entire South Arizona Avenue study area falls within the FDCTCS study area.</p>

City of Chandler Transportation Master Plan (2010)	
<p>This document outlines the transportation goals and strategies for the City of Chandler. Transit is one of the components of the master plan, and transit service expansion was identified as a goal. The document discusses the feasibility of the future possibility of implementing HCT on multiple corridors within the city.</p>	<p>The plan identified Arizona Avenue, Rural Road, and Chandler Boulevard as potential future HCT corridors. This plan recommended expanding these services and routes:</p> <ul style="list-style-type: none"> • New local bus service on Warner Road and Ray Road • Add a trip to Chandler Express Route 542, 540 and 541 • Planned circulator service connecting downtown Chandler and the Chandler Fashion Center, downtown Chandler and Chandler Gilbert Community College, and circulator service in the Chandler Airport Area.
MAG Regional Transit Framework Study (2010)	
<p>The Regional Transit Framework Study identifies current and future transit deficiencies in an effort to define a long range regional approach for addressing transit needs in the MAG region. Three transit scenarios were developed as alternative long range approaches for the region's 2030 transit program. Each scenario addresses at least some of the region's transit needs and deficiencies; however, the scope of each scenario differs significantly.</p>	<p>Gilbert, Chandler and Mesa all have 2030 level 2 need areas, which include necessary headway improvements and new local services in areas with infrequent headways and minimal service coverage.</p>

Valley Metro System Configuration Study (2009)

Valley Metro completed the second phase of the System Configuration Study in 2009. The study's goal was to determine the optimal configuration of the 57 mile light rail system that was proposed to be complete by 2025. Each corridor and end-of-line was evaluated based on multiple criteria, including projected ridership, operating costs, average trip length, number of transfers, and trip producers and attractors. This produced 10 possible configuration scenarios. The study concluded the core configuration should be the current CP/EV and Northwest Extension Phase 1 at 10 minute frequency. Phase 3 of the study, which is ongoing, will finalize a preferred system configuration for the 57 mile light rail system.

Although the System Configuration Study does not evaluate HCT corridors that are not in the Regional Transportation Plan (RTP), the study did evaluate the Central Mesa Extension, which serves downtown Mesa and the northern portion of the FDCTCS study area.

The overall configuration of the HCT system will be important in evaluating future interlining options of potential HCT in the FDCTCS study area.

RPTA Comprehensive Arterial BRT Planning Study (2009)	
<p>This study evaluates and identifies the demand for bus rapid transit (BRT) service and defines operational characteristics, capital infrastructure needs, and fleet requirements for arterial BRT corridors throughout the region. The study considers how operational characteristics and corridor needs may change as the regional transit network develops. This study describes the vision for the BRT system and each of the corridors planned for future implementation</p>	<p>Initiated in July 2010, the Arizona Avenue LINK (AZ AVE LINK) provides limited stop service along the Arizona Avenue/Country Club Road corridor. This study also identifies recommended elements associated with BRT services for the AZ AVE LINK including:</p> <ul style="list-style-type: none"> • Limited stops at major arterials • Recommended transit priority treatments • Incorporate real-time passenger information at stations • Transit-supportive development • All-day service over local arterial service • Branding treatments to stations, vehicles, and passenger information
City of Chandler General Plan (2008)	
<p>The Chandler General Plan is currently in the process of being updated. The most recent version of the General Plan from 2008 establishes a clear direction that spells out public expectations and preferences to sustain a desirable community. Through a series of public forums and work sessions, Chandler residents have set Goals and Objectives and focus on these elements:</p> <ul style="list-style-type: none"> • Land Use • Redevelopment • Circulation/Bicycling • Cost of Development • Growth Areas • Recreation and Open Space • Neighborhood Planning • Housing 	<p>The Circulation Element identifies the Arizona Avenue corridor and the Chandler Boulevard corridor as HCT corridors. The plan notes that feeder bus routes will be necessary to support not only future HCT routes in these corridors but support future extensions to the light rail system as well. In addition, the plan allows higher densities along these corridors than other areas of the City (over 18 du/acre) with no maximum specified.</p>

City of Chandler Downtown-South Arizona Avenue Corridor Area Plan (2006)

This plan identifies the opportunities to redevelop the section of Arizona Avenue from Pecos Road to Boston Street as a new entryway to downtown from the San Tan/SR 202 Freeway.

Recommendations included the following:

- Development of an entertainment commercial zone on Arizona Avenue and Fry Road and making Chicago Street a pedestrian corridor.
- Commercial Zone connected by shaded pedestrian walkways.
- High density commercial and mixed-use development
- Bring in high and medium density residential development to the southern half of the corridor along South Arizona Avenue.
- Create opportunities for new development along South Arizona Avenue and reinforce the development of the Corridor.
- Create a cultural and entertainment commercial zone and develop zone with pedestrian walkway connections.
- Study the feasibility of a performing arts center and a convention center.
- Create Public and Private Design Standards to guide the quality and functionality of the development in the Corridor, both for private and public sector buildings and for streetscape and open space design.
- Preserve and enhance the neighborhoods in the southern half of the corridor through single family residential infill on small lots and renovation of existing homes.

City of Chandler High Capacity Transit Major Investment Study (2003)	
<p>This study was done to provide a framework for considering long range transit improvements and compliments the Transit Plan Update adopted by the Chandler City Council on August 8, 2002. It included three levels of analysis: Tier 1, Tier 2, and Tier 3. The Tier 1 analysis, completed in October 2002, narrowed a wide range of technologies and corridors to the ones most suitable for further study. The Tier 2 effort combined the technologies and corridors into seven specific alternatives. Completed in January 2003, this analysis recommended the five alternatives considered in the Tier 3 analysis.</p>	<ul style="list-style-type: none"> • LRT service would be provided between Downtown Tempe and Downtown Chandler. It would begin at the connection with the Central Phoenix/East Valley (CP/EV) LRT line and the Tempe Branch Railroad in Tempe • BRT service would operate on Chandler Boulevard and Williams Field Road between Desert Foothills Parkway in Ahwatukee (at the current terminal of Route 156) and Power Road at Williams Gateway Airport • The CP/EV LRT line would be extended from the Main Street/Country Club Drive LRT Station in Mesa to the Chandler Airpark area via Country Club Drive and Arizona Avenue • This alternative is similar to Alternative 3A, but with BRT instead of LRT on Arizona Avenue and Country Club Drive. The service would extend from the Main Street/Country Club Drive LRT Station in Mesa to the Chandler Airpark area • An LRT line would be constructed between Mesa and the Chandler Airpark using the Chandler Branch Railroad right-of-way for an extensive portion of the alignment
Phoenix, Arizona Central Phoenix/East Valley Corridor Major Investment Study (2000)	
<p>The Regional Public Transportation Authority (RPTA) is proposing to implement a 25-mile at-grade light rail system to connect the cities of Phoenix, Tempe, and Mesa. As a first step, the RPTA is undertaking preliminary engineering on a 20.3 mile segment from the Chris-Town Mall area, through downtown Phoenix and downtown Tempe, to Mesa. The proposed project would have 28 stations and serve major activity centers including downtown Phoenix, the Sky Harbor Airport, Papago Park Center and downtown Tempe.</p>	<ul style="list-style-type: none"> • The CP/EV project was not evaluated for this Annual Report on New Starts because issues regarding the size and scope of the proposed MOS and the regional travel demand model are currently being resolved. FTA has evaluated this project as being in preliminary engineering. • The Not-Rated project justification was assigned pending definition of the size and scope of the MOS and refinement of the regional travel demand model.

2.0 OVERVIEW OF THE STUDY AREA

An evaluation of the study area was conducted to understand existing and future characteristics of the area as well as the potential for future transit investments. The analysis presented in this section outlines the socioeconomic characteristics, land use patterns, transit needs and transportation network conditions of the study area.

2.1 POPULATION AND EMPLOYMENT

A review of existing and projected future population, and employment, was conducted to understand the socioeconomic trends within the study area. Transportation Analysis Zones (TAZs) and Census Block Groups within the study area are the geographies for the analysis depending on the data source.

2.1.1 Population

The 2010 Census showed the FDCTCS study area population was approximately 371,000, which indicates an increase from 2000 of 29%. The population is expected to increase roughly 17% to nearly 448,000 people by 2040, accounting for 7% of the MAG's region population growth. Comparatively, the MAG region as a whole is forecast to grow by 38% over that same timeframe.

TABLE 2 POPULATION GROWTH

Area	2000 Census	2010 Census	2040 Projections**	Percent Change 2010-2040
MAG Region	3,072,149	3,822,146	6,174,940	38%
FDCTCS Study Area	263,086	371,708	447,876	17%

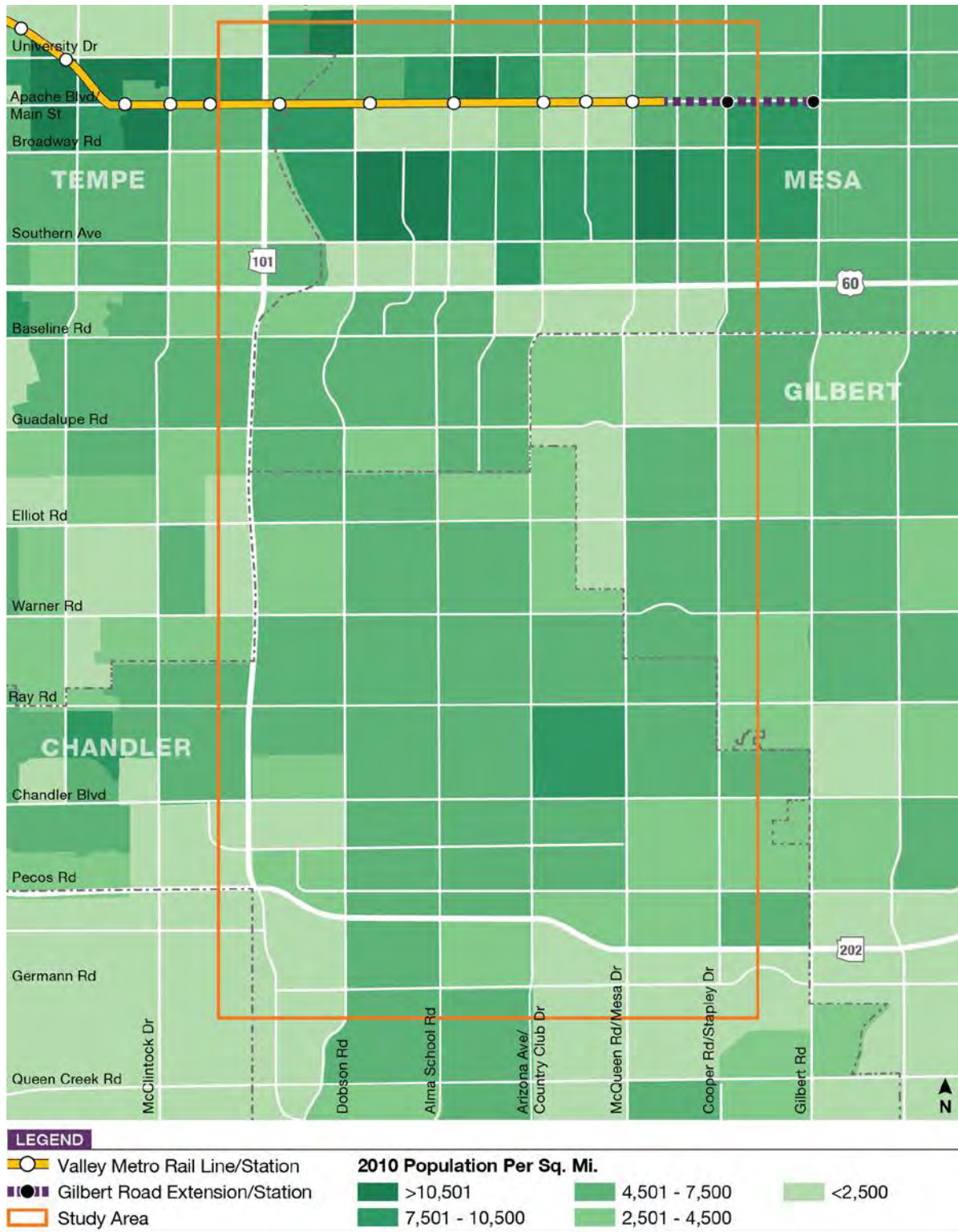
*Projections based on MAG Study

**Projections based on 2010 Census.

Source: US Census Bureau 2000; MAG TAZ, 2013a.

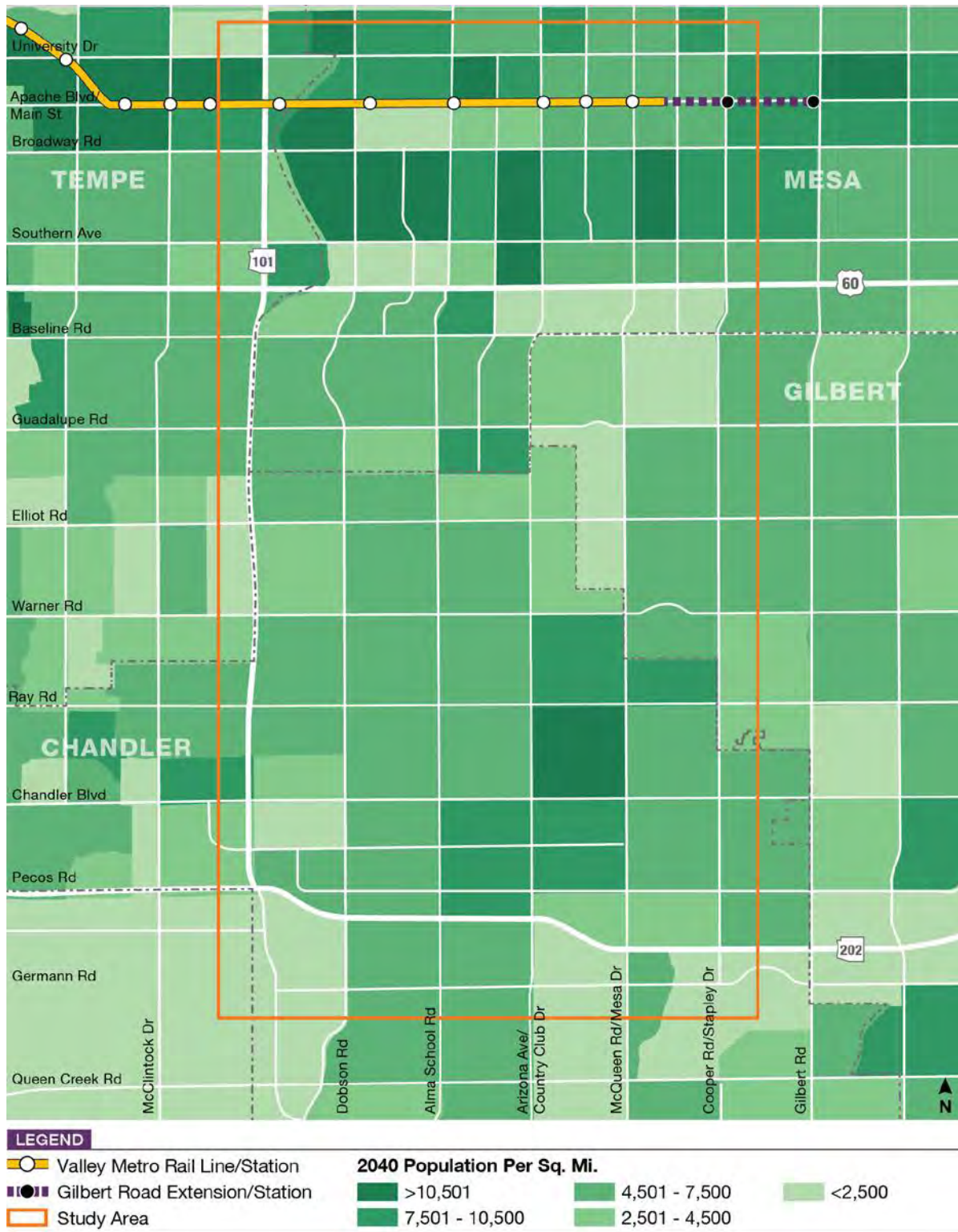
As shown in Figure 3, the most populated portions of the study area are located around downtown Mesa and northeast of downtown Chandler. Generally, population is densest in the northern portion of the study area between Broadway Road and Southern Avenue. Figure 4 illustrates the projected population density in 2040. Compared to the study area as a whole, the distribution of population is expected to grow most notably surrounding downtown Chandler.

FIGURE 3 2010 POPULATION PER SQUARE MILE



Source: MAG, 2013a.

FIGURE 4 2040 POPULATION PER SQUARE MILE



Source: MAG, 2013a.

2.1.2 Employment

According to 2013 MAG data, employment in the FDCTCS study area totaled over 191,000 jobs. Based on MAG projections, the total combined employment for the study area is expected to increase by 33% and is forecast to eclipse 284,000 jobs by 2040. Total employment throughout the MAG region is expected to increase 47% to over 3 million jobs in comparison.

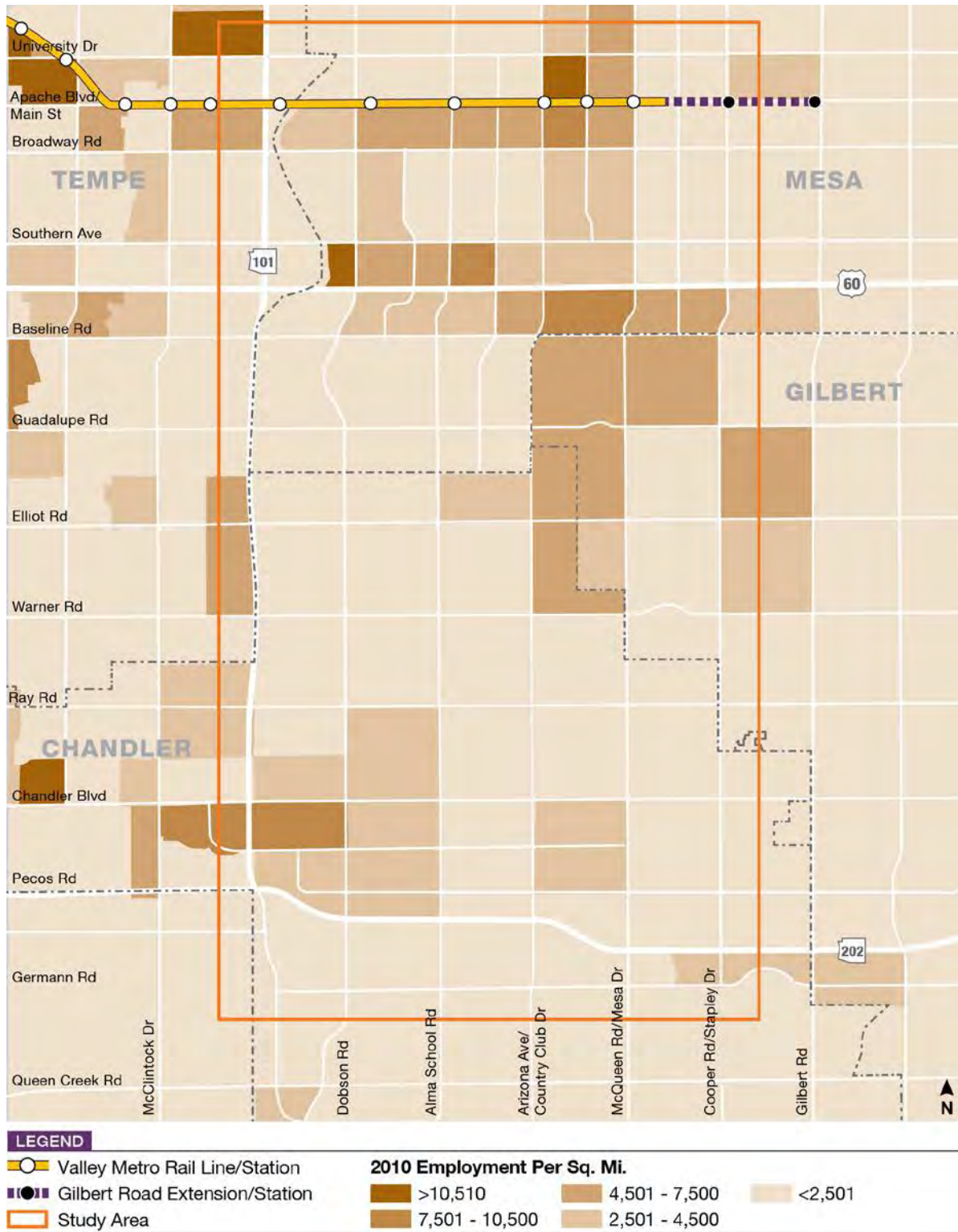
TABLE 3 EMPLOYMENT GROWTH

Area	MAG 2010	2040 Projections	Percent Change 2010-2040
MAG Region	1,652,958	3,096,757	47%
FDCTCS Study Area	191,952	284,832	33%

Source: MAG TAZ, 2013a.

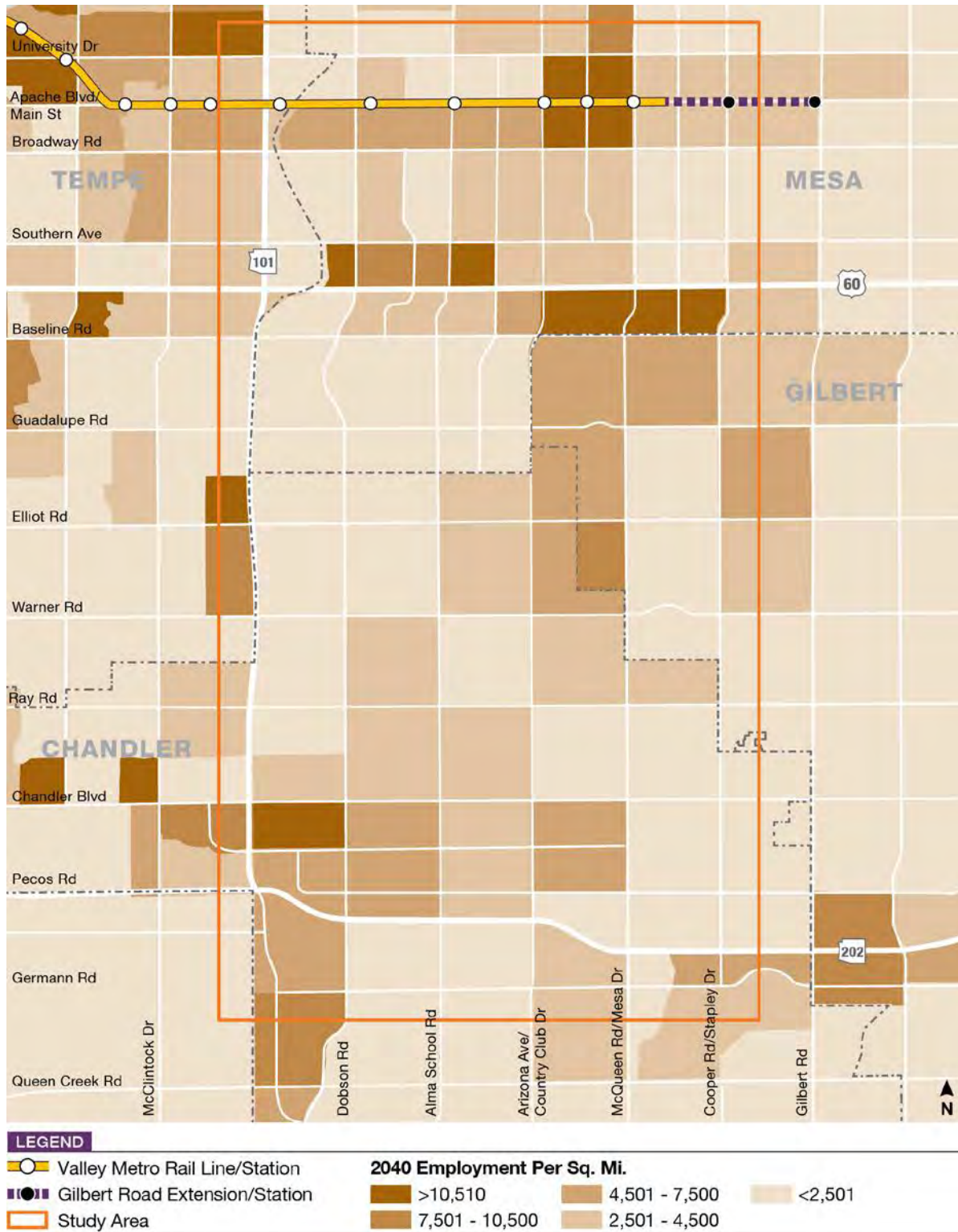
Figure 5 illustrates 2010 employment density in the FDCTCS study area. The corridors with the densest employment throughout the study area are located along Arizona Avenue, US 60 and the existing LRT line in Mesa. In addition, there are clusters of higher density employment near downtown Chandler and the Price Road corridor as well. As shown in Figure 6, key areas predicted for future employment growth in the study area include downtown Mesa, the US 60 corridor between Dobson Road and Stapley Drive/Cooper Road as well as the portion of Arizona Avenue south of Elliot Road and west of downtown Chandler.

FIGURE 5 2010 EMPLOYMENT PER SQUARE MILE



Source: MAG, 2013a.

FIGURE 6 2040 EMPLOYMENT PER SQUARE MILE



Source: MAG, 2013a.

2.2 TRANSIT-DEPENDENT POPULATIONS

Transit dependency refers to sections of the population that rely on transit service to increase their overall mobility. The FDCTCS study area population is diverse and includes population groups with a propensity to use transit. Such groups include households with zero or one cars, lower household incomes and seniors. The transit-dependent characteristics evaluated for the study area are identified in Table 4.

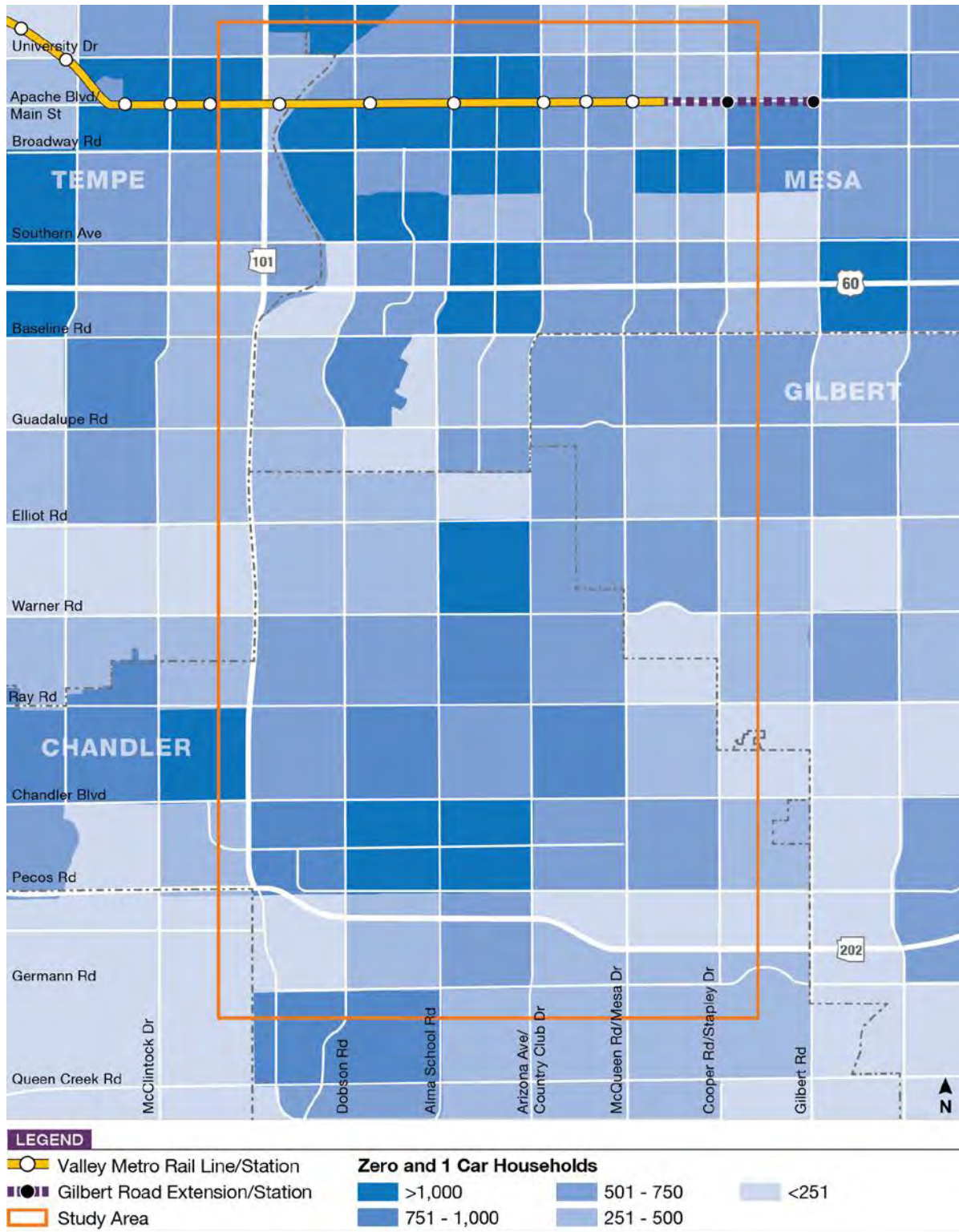
TABLE 4 TRANSIT-DEPENDENT POPULATION CHARACTERISTICS

Population Characteristic	Transit Dependent Population			
	FDCTCS Study Area	Percent of Study Area	MAG Region	Percent of MAG Region
Zero and One Car Households	55,223	30%	464,783	27%
Median Household Income (<\$35,000 Annually)	22,949	25%	359,345	21%
Over Age 65	27,909	8%	490,222	13%
Public Transit Use (Workers 16+)	3,923	2%	40,105	2%

Source: US Census Bureau, 2013a; 2013b; 2013c; 2013d.

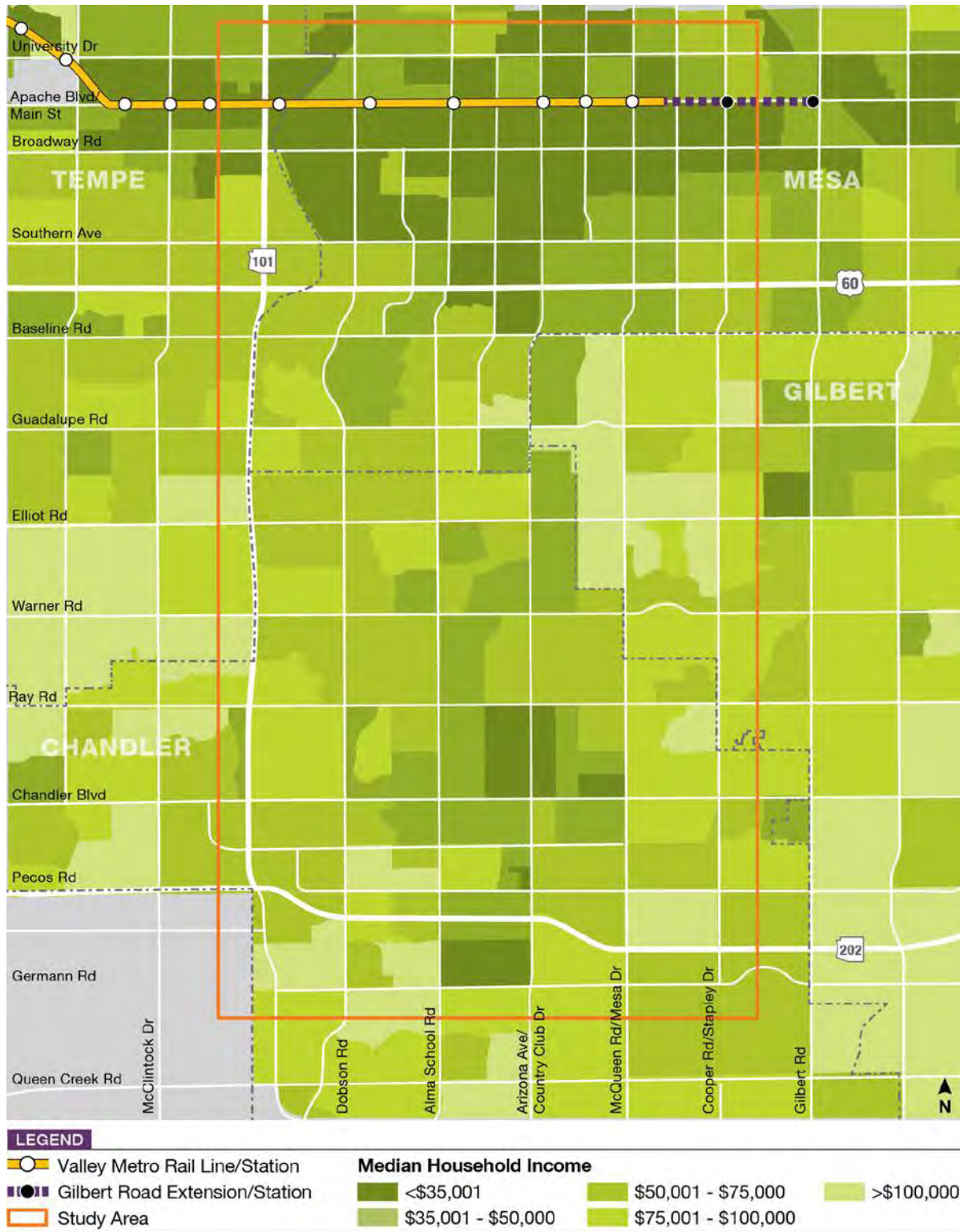
Figure 7, Figure 8, Figure 9 and Figure 10 illustrate the concentrations of transit dependent population characteristics throughout the FDCTCS study area. As shown in Table 4, the percentage of the population with a median household income under \$35,000 annually and households with zero and one car in the study area is higher than the proportions in the region overall. The population in the study area over the age of 65 years old is less than the MAG region as a whole.

FIGURE 7 ZERO AND ONE CAR HOUSEHOLDS



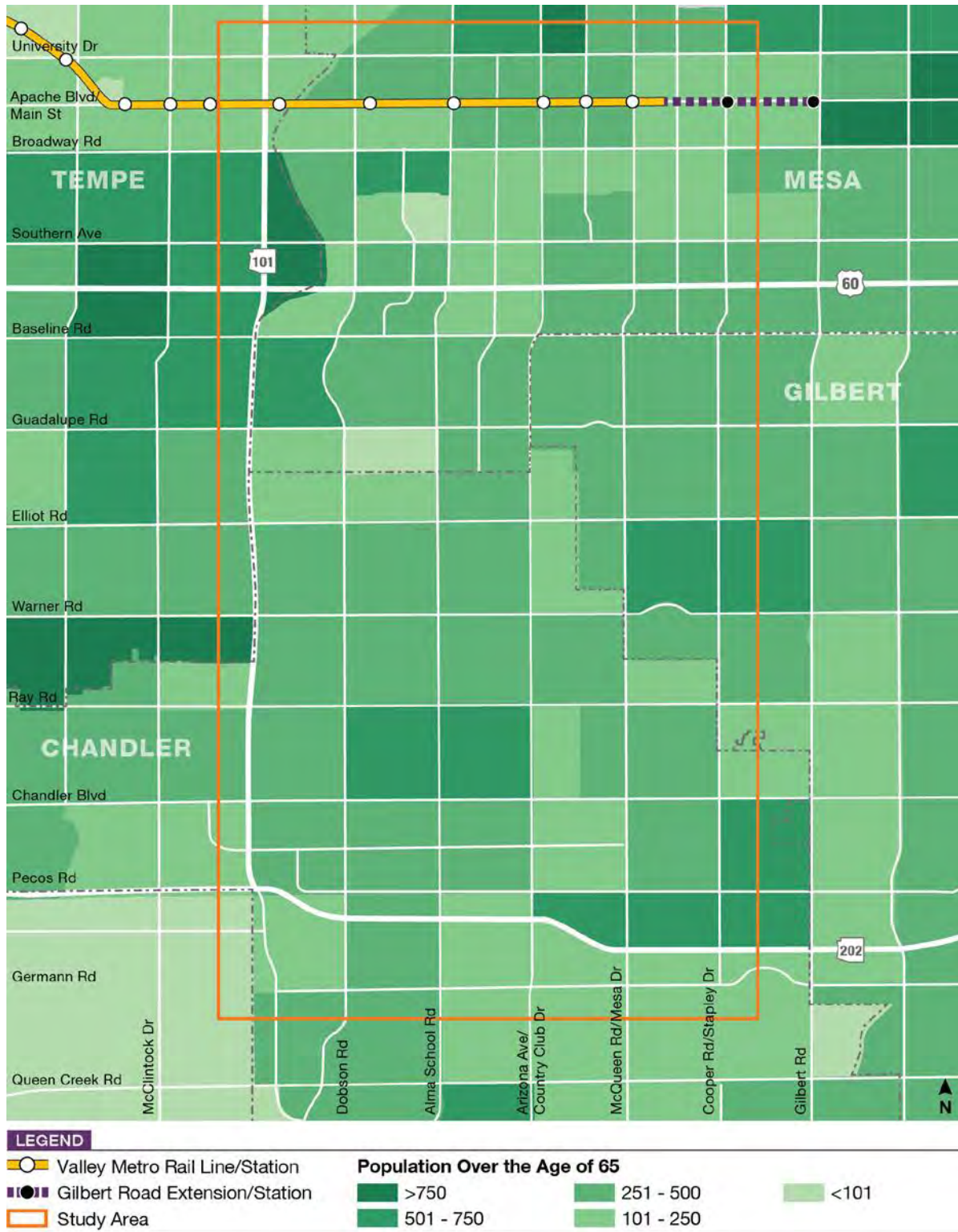
Source: US Census Bureau, 2013a.

FIGURE 8 MEDIAN HOUSEHOLD INCOME



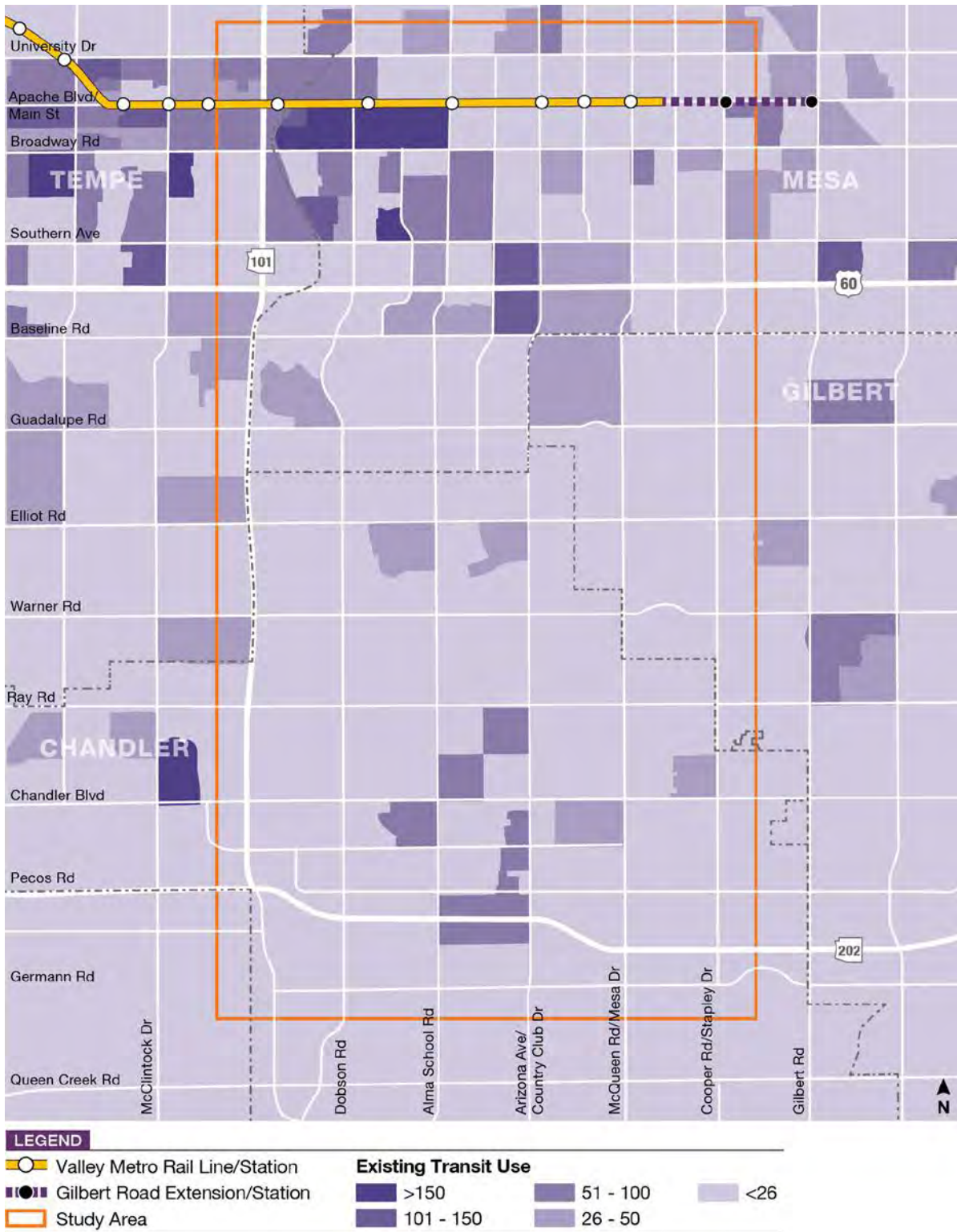
Source: US Census Bureau, 2013b.

FIGURE 9 POPULATION OVER 65



Source: US Census Bureau, 2013c.

FIGURE 10 EXISTING TRANSIT USE



Source: US Census Bureau, 2013d.

Each population characteristic summarized in Table 4 was broken down into five value ranges which represent individual varying levels of transit dependency by Census Block. The most transit-dependent range of each characteristic was rated a value of five, the second highest dependency was rated a four, and so on through a value of one (least transit-dependent). Table 5 illustrates the levels of transit dependency for each population characteristic analyzed in the FDCTCS study area.

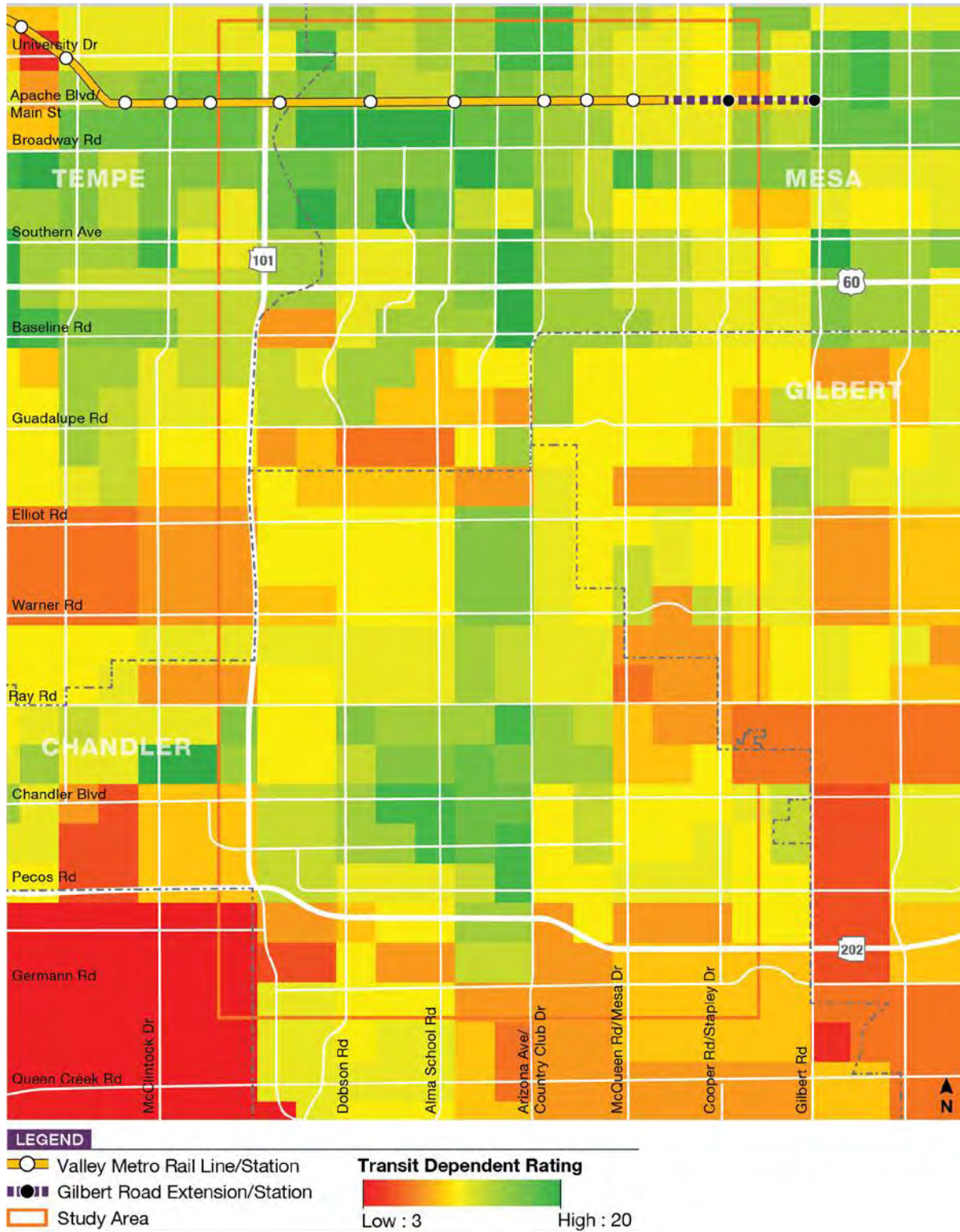
TABLE 5 TRANSIT DEPENDENT VALUE RANGES

Population Characteristic	Transit Dependent Population				
	5	4	3	2	1
Median Household Income	\$0 - \$35,000	\$35,000- \$50,000	\$50,001- \$75,000	\$75,001- \$100,000	\$100,000 +
Over Age 65	1200 +	600 - 1,200	300 - 600	150 - 300	0 - 150
Public Transit Use (Workers 16+)	4,000 +	2,000 - 4,000	1,000 - 4,000	500 - 1,000	0 - 500
Zero and One Car Households	1,000 +	750 - 1,000	500 - 750	250 - 500	0 - 250

Source: US Census Bureau, 2013a; 2013b; 2013c; 2010d.

Within the FDCTCS study area, each Census Block was assigned a value for each characteristic as shown in Table 5. The sum of those four population characteristic values determined an overall transit dependent value for each Census Block within the study area. The result of that calculation is represented in Figure 11, which illustrates the sections of the FDCTCS study area that may have the greatest propensity to use transit. Based on this analysis, the areas to the west of the Arizona Avenue corridor as well as north of Baseline Road appear to have the most transit dependent characteristics of the study area.

FIGURE 11 TRANSIT-DEPENDENT POPULATION



Source: US Census Bureau: 2011a; 2011b; 2011c; 2011d

2.3 LAND USE AND ACTIVITY CENTERS

Land use contributes to the productivity of transit systems and is considered as an integral element of this study. Land uses are correlated with the potential for ridership as well as employment or activity center destinations. Land use policies that are compatible with transit and transit-oriented development may promote the success of, and support, transit investments within the study area in the future.

2.3.1 Existing and Planned Land Use

The most prevalent existing land use in the FDCTCS study area is Single-Family Residential, which comprises 45 percent of the total area. According to the MAG future land use dataset, Single-Family Residential is expected to remain the most prominent land use and is projected to encompass approximately 48 percent of the total area. Table 6 summarizes the existing and planned land uses throughout the FDCTCS study area.

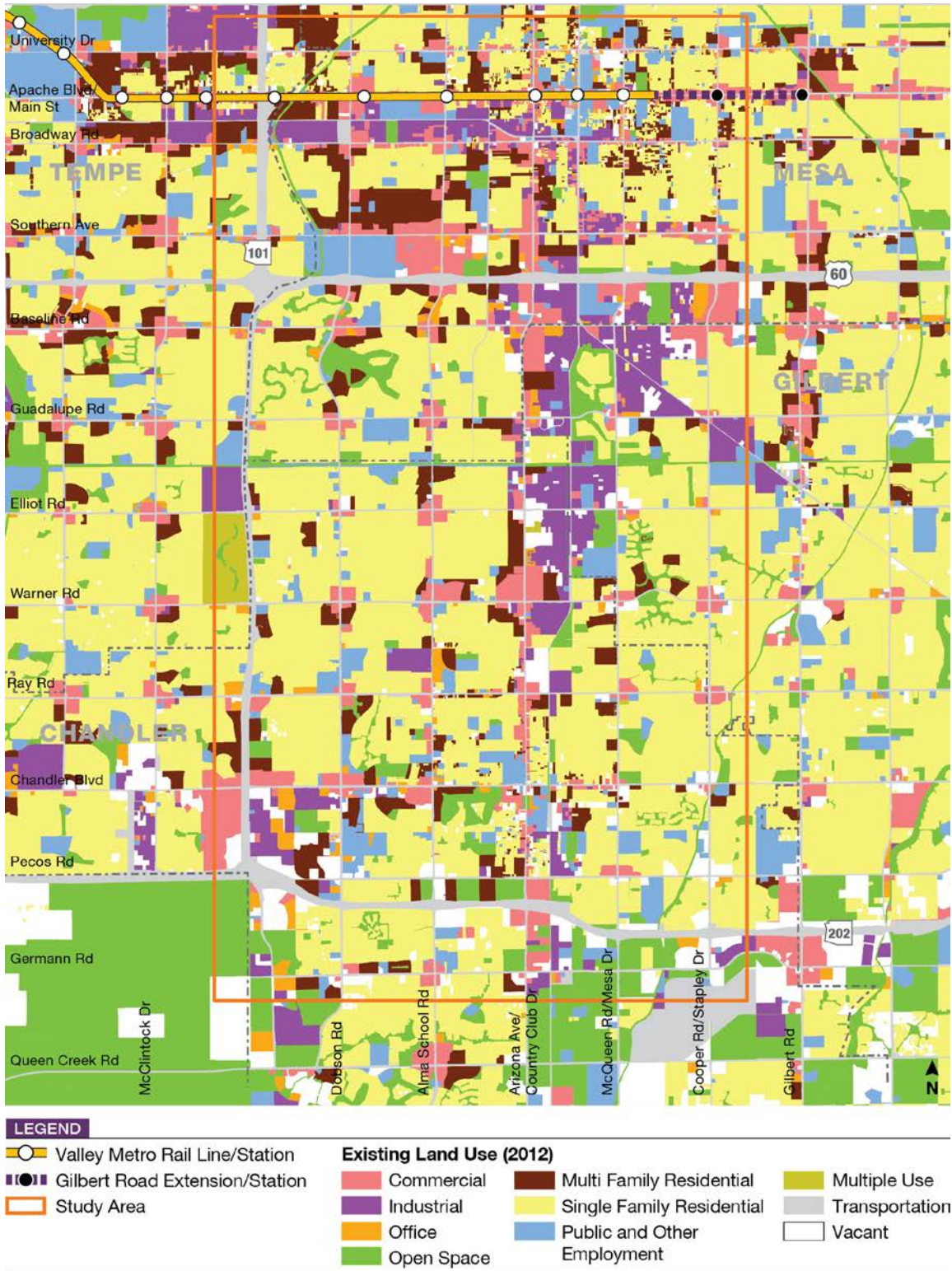
Figure 12 and Figure 13 illustrate the existing and planned land uses throughout the FDCTCS study area.

TABLE 6 EXISTING AND FUTURE LAND USE

Land Use Category	Existing Land Use (2012)		Future Land Use (Buildout)	
	Acres	Percent of Total	Acres	Percent of Total
Agriculture	1,245	2%	3,970	8%
Open Space	4,349	9%	1,353	3%
Airport	525	1%	544	1%
Developing Land	263	1%	0	0%
Industrial	3,462	7%	1,193	2%
Educational	1,531	3%	1,529	3%
Institutional	1,139	2%	1,273	3%
Office	719	1%	886	2%
Commercial	3,657	7%	4,604	9%
Multi-Family Residential	3,643	7%	3,835	8%
Single-Family Residential	22,600	45%	24,371	48%
Mixed-Use	0	0%	1,557	3%
Public	818	2%	944	2%
Tourist	649	1%	657	1%
Transportation	3,306	7%	3,314	7%
Water	466	1%	480	1%
Vacant	2,174	4%	36	0%
Total	50,547	100%	50,547	100%

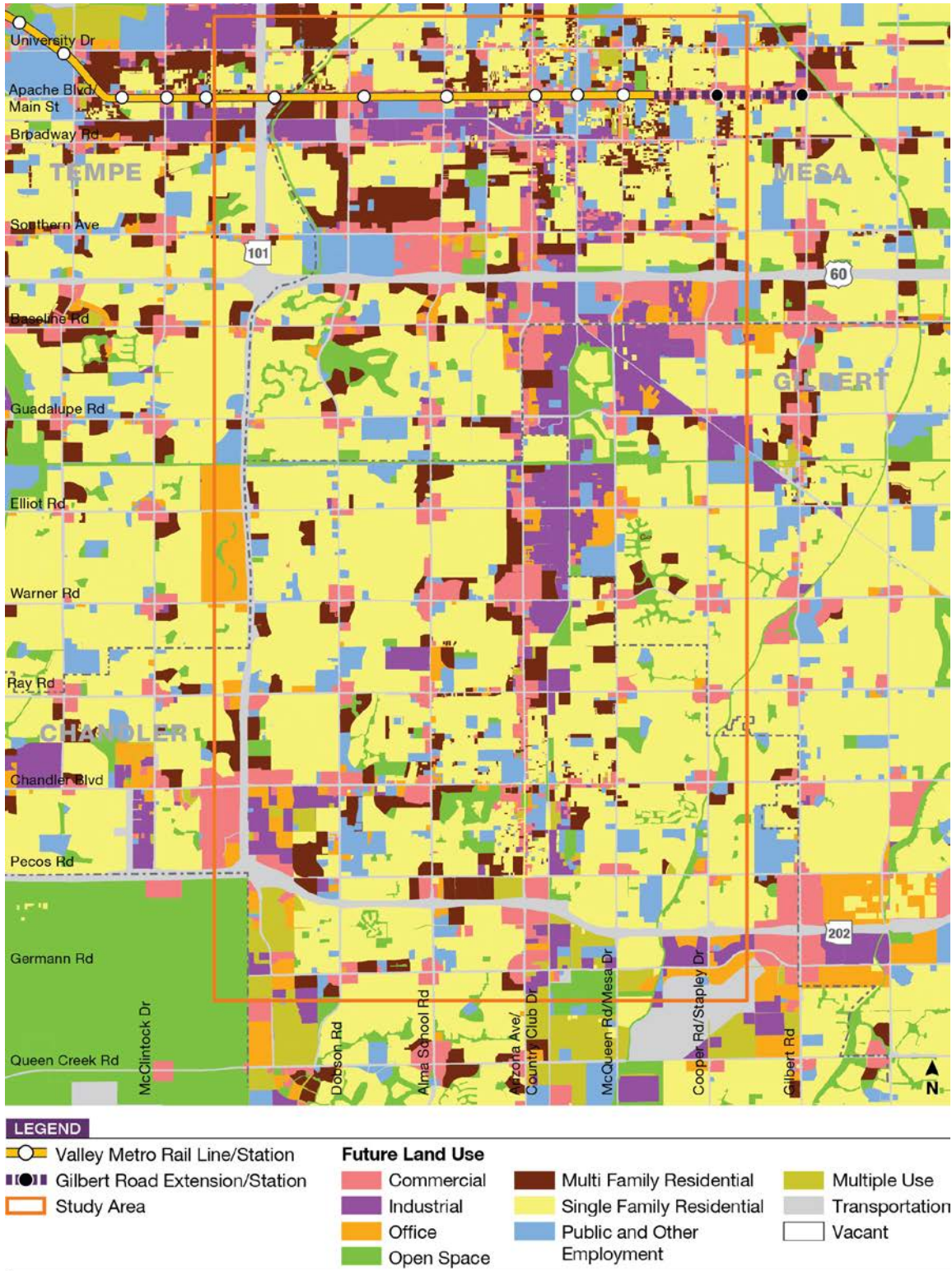
Source: MAG, 2012

FIGURE 12 EXISTING LAND USE



Source: MAG, 2012b.

FIGURE 13 FUTURE LAND USE (2031)



Source: MAG, 2012.

2.3.2 Activity Centers

Existing Activity Centers

Activity centers within the FDCTCS study area are generally composed of both local and regional destinations. Local areas of interest include retail, grocery, restaurants, and employment centers. Several key regional activity centers are associated with both downtown Chandler and Mesa, including entertainment venues such as Mesa Arts Center and Chandler Center of the Arts that provide numerous special events throughout the year. Mesa Community College (MCC), the largest community college in the county serving a dynamic range of ages and demographics, is located within the study area at Dobson Road and Southern Avenue. Of its approximately 23,000 students in 2014, more than half attend classes regularly on campus. MCC is directly adjacent to the Mesa Fiesta District which continues to develop as well. The downtown corridors of Mesa and Chandler provide mixed-use opportunities including residential, shopping, restaurants, and entertainment.

Existing activity centers within the FDCTCS study area include:

- Downtown Mesa
 - Mesa City Council Chambers
 - Arizona Museum of Natural History
 - Mesa Arts Center
 - Mesa Amphitheater
 - Nile Theater
- Mesa Community College (MCC)
- Dobson High School
- Chandler Fashion Center
- Price Road Corridor
- East Valley Institute of Technology (EVIT)
- Fiesta Mall
- Desert Banner Medical Complex
- Downtown Chandler
 - Chandler Chamber of Commerce
 - Chandler Public Library
 - Community Center
 - Chandler Center of the Arts
- Chandler Airpark

Planned Activity Centers and Land Use Trends

The most significant areas of planned redevelopment within the FDCTCS study area are located in downtown Chandler along Arizona Avenue; the Price Road Employment Corridor near the intersection of Chandler Boulevard and Price Road; and the Fiesta District along Southern Avenue in Mesa. There are large parcels of vacant land east of Arizona Avenue between Guadalupe and Ray Roads that are currently designated for Industrial land uses.

The area bound by Chandler Boulevard to the north and Pecos Road to the south along the Arizona Avenue corridor is considered the downtown Chandler Redevelopment Area. There are several planned projects within this area that include mixed-use/high density residential, mixed-use entertainment, office space and medium density residential developments. This area has been planned under the South Arizona Avenue

Area Plan and also includes pedestrian corridors and planned connections to transit corridors.

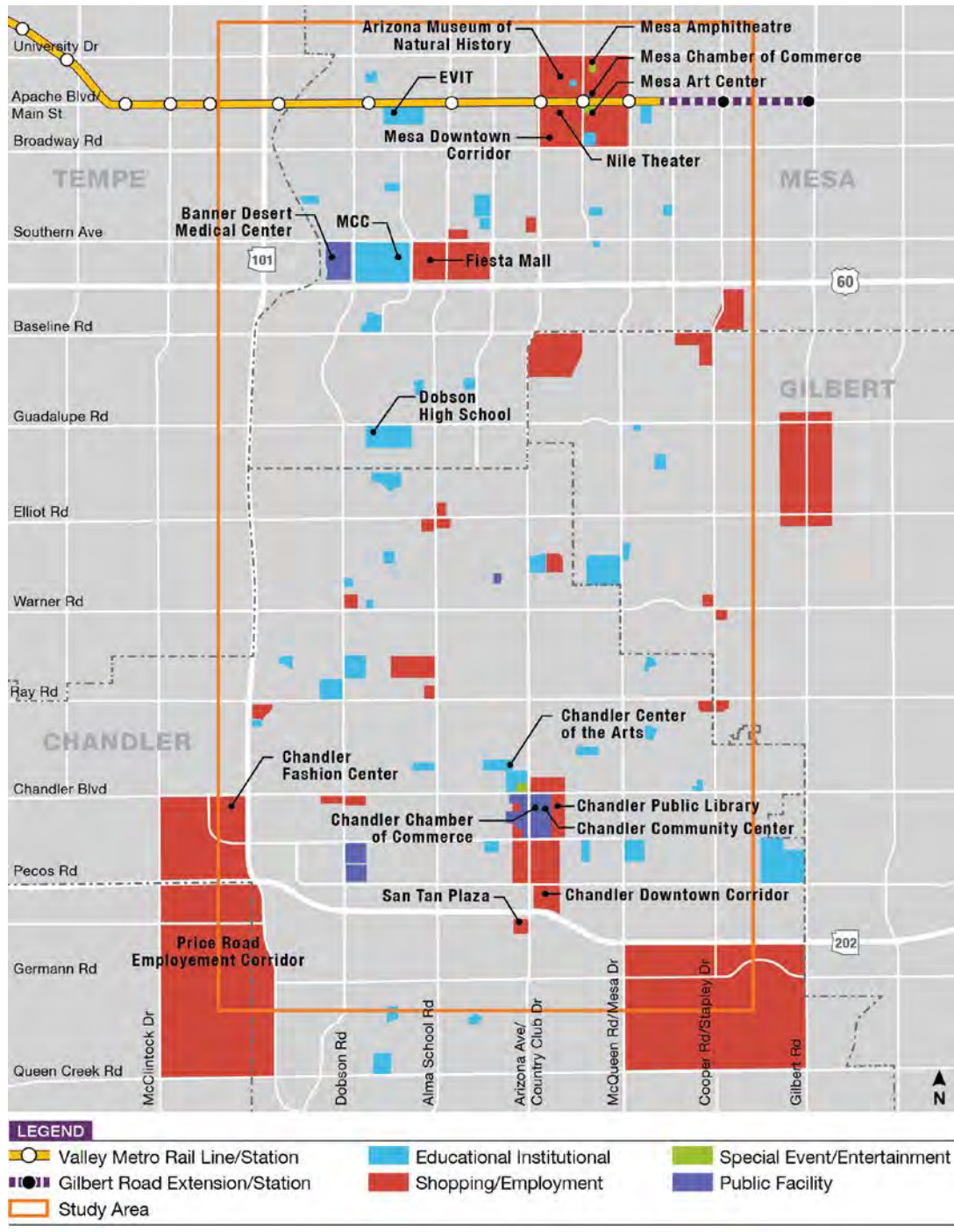
The Price Road corridor in Chandler is bound by Ray Road to the north, Chandler Heights Boulevard to the south, Price Road to the west and Alma School Road to the east. Development within this corridor is mostly centered along Price Road between Chandler Boulevard and Queen Creek Road, with a focus on Mixed-Use and Industrial Land Use developments.

The Fiesta District within the City of Mesa is centered on Southern Avenue between Dobson Road and Extension Road (1 block east of Alma School Road). Within this district streetscape improvement, multi-family housing, improvements to Fiesta Mall, retail, and office space land uses are all under development.

As development plans throughout the entire FDCTCS study area are realized, increased population and employment will be a driving force behind improved and increased transit investments.

Figure 14 illustrates the activity centers located throughout the FDCTCS study area.

FIGURE 14 ACTIVITY CENTERS



2.4 EXISTING AND PLANNED INFRASTRUCTURE IMPROVEMENTS

A summary of the recently completed and planned transportation projects throughout the FDCTCS study area was compiled to understand the ongoing infrastructure improvements in the corridor. Table 7 lists the recently completed and programmed transportation projects throughout the study area.

TABLE 7 TRANSPORTATION IMPROVEMENT PROJECTS

Project Name	Description	Year (s) Programmed
Regional Projects		
202 (Red Mountain): Gilbert Rd to Broadway Rd	Construct HOV lanes and construct general purpose lanes (Design Build)	Complete (2013)
Arizona Avenue	Right of way improvements including busway and station construction for LINK service	Complete (2013)
Dobson Road (Mesa)	Design and construction of new railroad gates, flashers and new cantilevers by the Union Pacific Railroad	Complete (2013)
Dobson Road	Railroad safety project	Complete (2013)
MAG Region	Dynamic Message Signs (DMS), Travel Times	2014-2018
Arterial Street Widening Projects		
Chandler Blvd: Colorado Street to McQueen Road	Design and construction roadway widening	2014-2020
Broadway Rd: Dobson Road to Country Club Drive	Pre-Design, Design, and Construction roadway widening	2019-2022
Mesa Drive: US-60 (Superstition Fwy) to Southern Ave	Construct roadway widening	Complete (2013-2014)
Southern Ave, Dobson Road to Alma School Road	Narrow roadway from 6 lanes to 4 lanes and construct new, wider sidewalks and install new landscaping behind the new curbs.	Complete (2014)
ITS (Intelligent Transportation Systems)/Intersection Projects		
Elliot Road at Cooper Drive	Design intersection improvement	2015-2017



Project Name	Description	Year (s) Programmed
Dobson Road (Mesa)	Acquisition and construction of right-of-way for sidewalk adjustments necessary for the installation of railroad gates and flashers and cantilevers.	Complete (2013)
Chandler Blvd at Alma School Road	Design and construct intersection improvement	2014-2016
Ray Road at Dobson Road	Design and construct intersection improvement	2017-2020
Elliot Road at Cooper Drive	Design and construct intersection improvement	2015-2017
Guadalupe Road at Cooper Road	Design and construct intersection improvement	2013-2014
Mesa Drive at Broadway Road	Design and construct intersection improvement	2013-2018
Southern Ave at Country Club Drive	Construct intersection improvement	2013-2016
Southern Ave at Stapley Drive	Design and construct intersection improvement	2013-2017
Stapley Drive at University Drive	Design and construct intersection improvement	2016-2019
Other Infrastructure Projects		
Main St/Mesa Drive	Construct regional transit center	2014
Route 56	Route 56 Extension - Bus Shelter	2013
US60/Country Club Drive	Acquisition of land and construct regional park-and-ride	2013
Dobson Road (Broadway Road to Main Street)	Bicycle and Pedestrian Route Improvements	2012
101 & Chandler Blvd	Construct sign rehabilitation	2016
City of Chandler	Procure traffic signal controllers	2015
Citywide	Signal Equipment Upgrades	2016
Conceptual Planning Projects		
101 & Chandler Blvd	Preliminary Engineering, Ph. 1 & 2 for sign rehabilitation	2013

Source: MAG TIP – MAG Transportation Improvement Plan Highway and Transit Listing, 2014.

2.5 EXISTING AND PLANNED TRANSIT SERVICES

This section provides a summary of existing and planned transit services included in the RTP within the study area. Fixed route bus service, demand response and transit passenger facilities are currently provided or planned for future implementation in the FDCTCS study area. Table 8 identifies the transit routes that serve the study area and summarizes annual ridership from fiscal year 2013-2014.

2.5.1 Existing Fixed Route Bus

Fixed route bus service within the FDCTCS study area is comprised of local bus, circulators and express bus service.

Local Bus

The local bus routes within the study area provide mainline transit service along the MAG region's one-mile arterial street network. Bus service operations vary with many routes offering service Monday through Friday, and some offering service seven days a week as late as 11:30 p.m. Twelve local bus routes currently serve the study area.

Circulators

Mesa uses local circulator services that serve the study area. Mesa's BUZZ circulator serves residents in the downtown Mesa area. The BUZZ offers a free bi-directional service at 30-minute frequency on the weekdays and 60-minute frequency on Saturdays, with weekday operation from 5:30 a.m. to 8 p.m. and Saturday service from 7 a.m. to 9:30 p.m.

Express Bus

Generally, Express bus routes provide weekday peak period commuter service to downtown Chandler. Express service crosses through the study area on US 60 and SR 202. Four Express commuter bus routes pass through, or serve, the FDCTCS study area.



TABLE 8 EXISTING FIXED ROUTE BUS SERVICE

Route	FY 14-15 Ridership	Revenue Miles	Passengers per Mile
Local Routes			
30 – University	752,282	485,359	1.5
40 - Apache/Main St	415,989	238,950	1.7
45 – Broadway	1,106,037	568,300	1.9
61 – Southern	1,637,982	686,033	2.4
77 – Baseline	794,763	371,319	2.1
96 – Dobson	538,336	262,403	2.1
104 - Alma School	332,257	208,400	1.6
108 - Elliot Rd	331,823	419,308	0.8
112 - Country Club/Arizona Ave	479,346	193,339	2.5
120 - Mesa Drive	108,340	53,530	2.0
128 – Stapley Drive	96,720	72,250	1.3
156 - Chandler/Williams Field	298,214	351,347	0.8
LINK Routes			
Main St	352,011	295,627	1.2
Arizona Ave	317,686	183,382	1.7
Express Routes			
531 - Mesa/Gilbert Express	62,500	76,711	20.8
533 - Mesa Express	97,968	87,833	32.7
541- Chandler Express	37,992	53,253	19.0
542 - Chandler Express	85,587	82,993	28.5
Circulators			
Buzz - Mesa Downtown	92,354	56,075	1.6

Source: Valley Metro, 2014.

Table 8 summarizes annual ridership data from Fiscal Year 2015 for existing transit operations within the FDCTCS study area. The routes with the highest overall ridership operate in the northern portion of the study area along Broadway Road (Route 45) and Southern Avenue (Route 61), which both serve over 1.1 million riders per year. Route 61 is one of the top ten routes in terms of total ridership in the entire Valley Metro network. In terms of route productivity or boardings per mile, Route 61 and Country Club Drive/Arizona Avenue (Route 112) are the most productive in the FDCTCS study area, carrying nearly 2.5 passengers per mile across their entire route. In addition to the routes identified in Table 8, Table 9 shows local bus networks that currently exist within the study area and identified future improvements.

TABLE 9 FUTURE LOCAL BUS NETWORK WITHIN THE STUDY AREA

Route	Route	Notes
30	University Dr	Existing Service
45	Broadway Dr	Existing Service
61	Southern Ave	Existing Service
62	Hardy/Guadalupe Rd	Existing Service
77	Baseline Rd	Existing Service/Service Extension
96	Dobson Rd	Existing Service
104	Alma School Rd	Existing Service/Service Extension
108	Elliot Rd	Existing Service
112	Country Club Dr/ Arizona Ave	Existing Service
120	Mesa Dr	Existing Service
128	Stapley Rd	Existing Service
156	Chandler Blvd/Williams Field Rd	Existing Service
-	Ray Rd	New Service
LINK AZ	Valley Metro LINK- Arizona Ave/Country Club Drive	Existing Service
Main Street	Valley Metro LINK- Main Street	Existing Service

Figure 15 and Figure 16 illustrate the existing and planned transit network throughout the FDCTCS study area.

FIGURE 15 EXISTING TRANSIT NETWORK

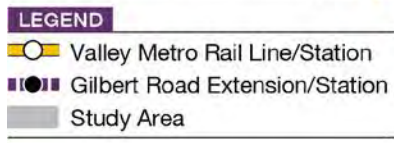
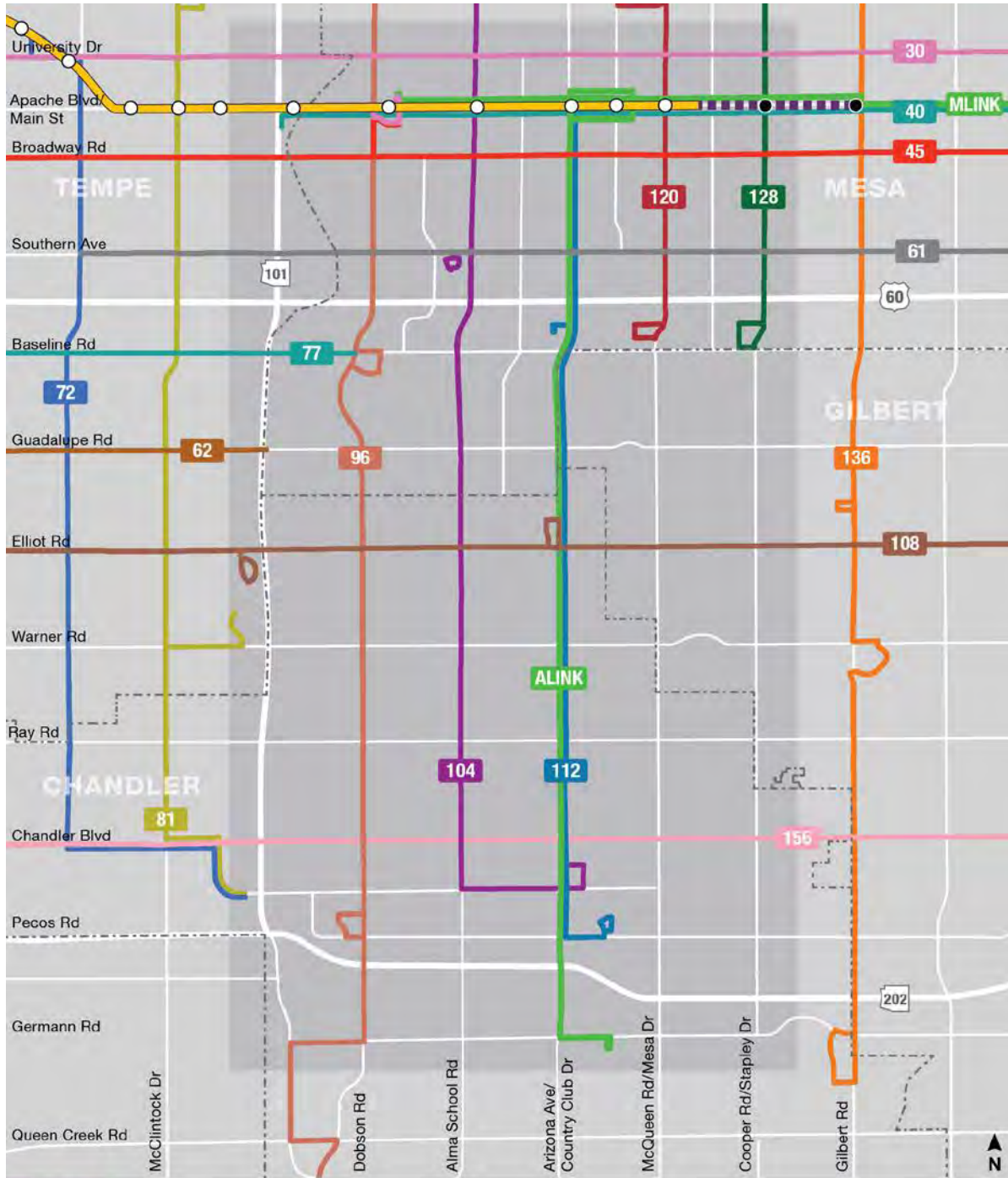
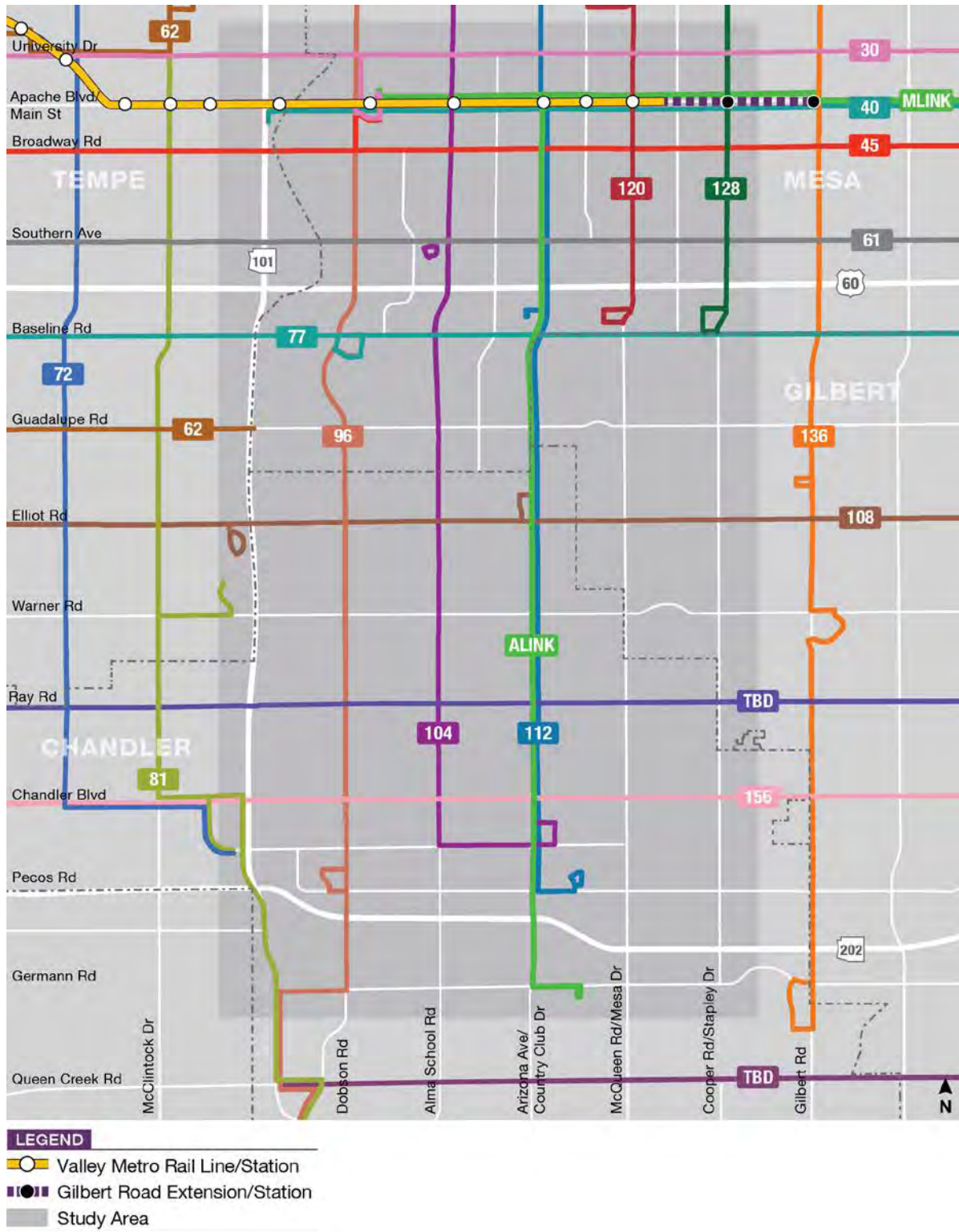


FIGURE 16 PLANNED TRANSIT NETWORK



3.0 OPPORTUNITIES AND CONSTRAINTS

To understand the conditions of the study area in terms of supporting additional transit investment in the future, an opportunities and constraints analysis was conducted. The study team conducted a field tour to document physical connections; land use issues and opportunities; transportation and right-of-way conditions; and activity centers along major arterial roadways. As summarized in Table 10, the north/south major arterial roadways that are west of Arizona Avenue do not serve the Town of Gilbert and would include an at-grade crossing of the existing freight rail tracks. The Arizona Avenue corridor provides good connections to activity centers in all three jurisdictions, has a grade separated crossing of the existing freight tracks and has large areas of vacant land that could be developed to support increased transit service.

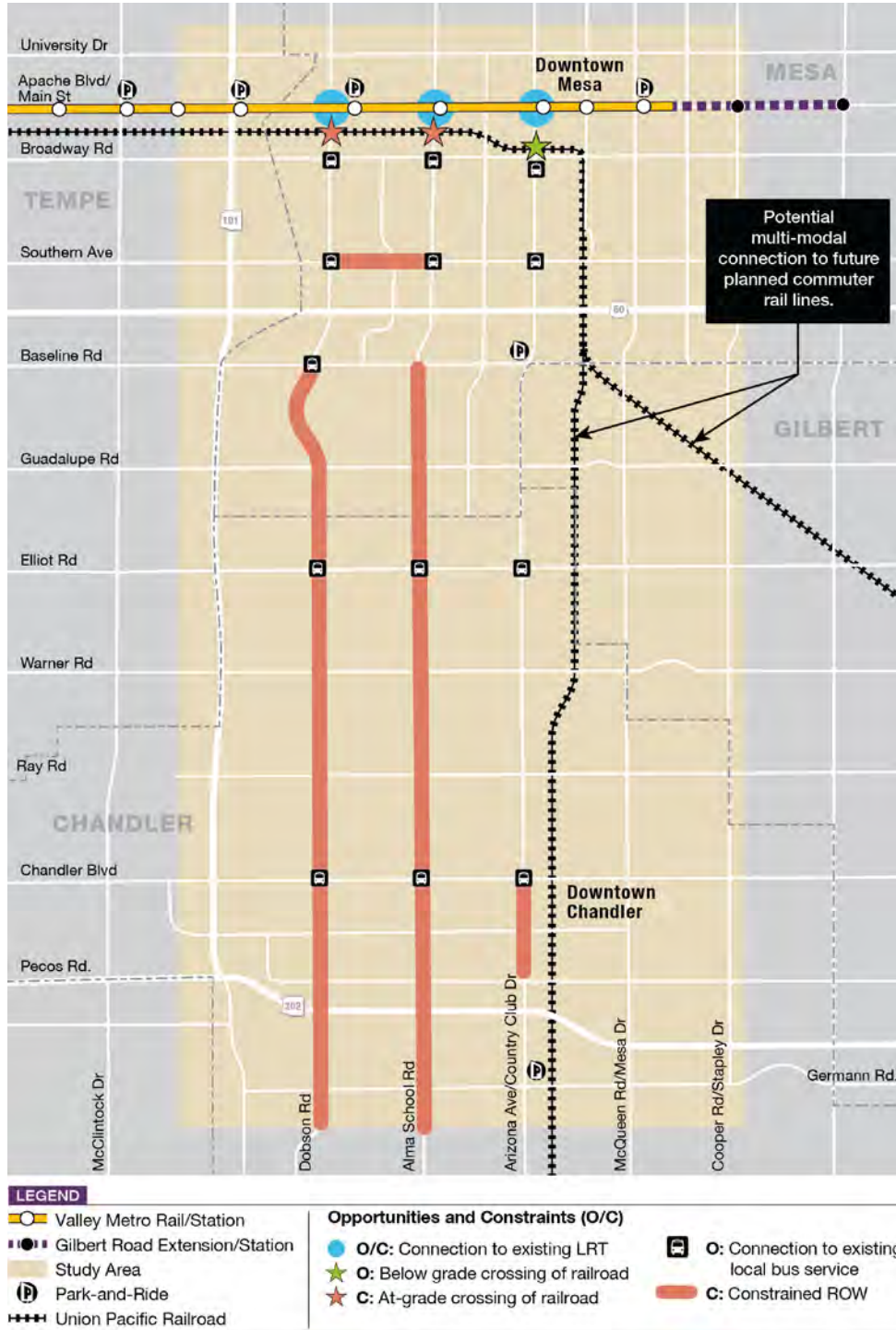
As documented, the east/west corridors located throughout the study area provide access to many activity centers and are located along existing bus routes with high productivity on Baseline Road and Southern Avenue. Access to the Fiesta District in Mesa along Southern Avenue could be viewed as an opportunity to support an increased transit investment along that corridor. The US 60 corridor offers a unique opportunity in that available ROW may reduce the need for expensive land acquisition and increase travel speeds.

Table 10 and Figure 17 summarize and illustrate locations of opportunities and constraints along major arterial roadways throughout the study area.

TABLE 10 OPPORTUNITIES AND CONSTRAINTS SUMMARY

Major Arterial	Physical Connections	Land Use	Transportation/ROW	Activity Centers	Existing Bus Ridership
Dobson Road	<ul style="list-style-type: none"> Does not serve the Town of Gilbert Easier connection with current LRT line Currently there is no below grade crossing of railroad tracks 	<ul style="list-style-type: none"> Lower density residential housing prevalent 	<ul style="list-style-type: none"> Small ROW on Dobson, especially south of Baseline Rd Primarily 2+1+2 lane configuration with flared intersections 	<ul style="list-style-type: none"> Fiesta Mall Mesa Community College Banner Desert Medical Center Dignity Health Chandler Regional Medical Center Dobson High School Anderson Elementary, Junior High and High Schools Seton Catholic Prep High School Chandler Fashion Center (CFC) 	<ul style="list-style-type: none"> Local Route 96 Approximately 1,209 weekday boardings in study area in October 2014 Approximately 148 boardings per mile each weekday
Country Club/ Arizona Avenue	<ul style="list-style-type: none"> Serves all three communities that are participating in the FDCTCS Country Club provides narrow below grade crossing of railroad tracks Existing West Mesa PNR 	<ul style="list-style-type: none"> Downtown Mesa and Downtown Chandler have are major high density land uses in the study area Country Club is predominantly fronted by commercial or high density residential Some vacant or agricultural land 	<ul style="list-style-type: none"> Wide ROW accommodates 6 travel lanes Downtown Chandler has ROW constraints that would possibly require removal of travel lane or on-street parking Higher congestion, especially in the evening 	<ul style="list-style-type: none"> Downtown Mesa Downtown Chandler Chandler High School Country Club/Baseline Road Retail Node CFC Chandler Airpark Area Businesses at Elliot and Warner roads Retail node at Pecos Road Chandler Center for the Arts 	<ul style="list-style-type: none"> Local Route 112 AZ Ave LINK Approximately 1,761 weekday boardings in study area in October 2014 Approximately 206 boardings per mile each weekday
Alma School Road	<ul style="list-style-type: none"> Easier connection with current LRT line Currently there is no below grade crossing of railroad tracks Does not serve the Town of Gilbert 	<ul style="list-style-type: none"> Single-family housing prevalent in southern part of road Industrial uses in northern part 	<ul style="list-style-type: none"> ROW restrictions in southern portion Primarily 2+1+2 lane configuration with flared intersections 3+1+3 lane configuration in northern portion 	<ul style="list-style-type: none"> Fiesta Mall Bank of America Building Freescale Corporate Campus Arizona College Prep - Erie Campus Retail nodes at Elliot, Warner, Ray and Chandler Blvd Freescale plant at Knox Road 	<ul style="list-style-type: none"> Local Route 104 Approximately 811 weekday boardings in study area in October 2014 Approximately 95 boardings per mile each weekday
Southern Avenue	<ul style="list-style-type: none"> Provides a connection to the Fiesta District including Mesa Community College and Fiesta Mall Easy connection with existing Route 61 which is one of the most productive routes it the southeast valley No direct connection to existing LRT 	<ul style="list-style-type: none"> Directly serves commercial, education, and medical centers in the Fiesta District New office development through adaptive reuse project Higher density housing to the north Large amounts of vacant land, large parking lots and underutilized parcels 	<ul style="list-style-type: none"> Recent lane removal and streetscape improvements make it more difficult to fit HCT in the road Walkable, pedestrian-friendly streetscape Primarily 2+1+2 lane configuration 	<ul style="list-style-type: none"> Fiesta Mall Mesa Community College Banner Desert Medical Center Bank of America Building 	<ul style="list-style-type: none"> Local Route 61 Approximately 1,993 weekday boardings in study area in October 2014 Approximately 507 boardings per mile each weekday
U.S. 60	<ul style="list-style-type: none"> Increased distance from activity centers Faster travel time 	<ul style="list-style-type: none"> Adjacent to commercial, education, and medical centers No residential impacts Limited TOD opportunities in freeway corridor Not pedestrian friendly 	<ul style="list-style-type: none"> Large amounts of ROW available via parking lots, canal, and side streets Less likely to encounter major utility issues No at grade crossings 	<ul style="list-style-type: none"> Fiesta Mall Mesa Community College Banner Desert Medical Center 	<ul style="list-style-type: none"> None
Baseline Road	<ul style="list-style-type: none"> Existing West Mesa PNR 	<ul style="list-style-type: none"> Single-family housing and low-density shopping centers prevalent throughout 	<ul style="list-style-type: none"> Primarily 3+3 with center median and left turn pockets lane configuration 	<ul style="list-style-type: none"> Rhodes Junior High School Country Club/Baseline Road Retail Node 	<ul style="list-style-type: none"> Local Route 77 Approximately 81 weekday boardings in study area in October 2014 Approximately 72 boardings per mile each weekday

FIGURE 17 OPPORTUNITIES AND CONSTRAINTS



4.0 STAKEHOLDER INTERVIEWS

To ensure the full understanding of opportunities and constraints of the jurisdictions within the study area, stakeholder interviews were conducted with staff from the City of Chandler, Town of Gilbert, and City of Mesa. Interviews included:

- Overview of the Valley Metro transit system including the productivity of the existing light rail system;
- Overview of Federal Transit Grants Programs and FTA project evaluation process;
- Overview of the FDCTCS; and
- Staff discussion on the opportunities and constraints of each jurisdiction with respect to future land use priorities, major infrastructure projects, and other considerations regarding future transit investment within the study area.

This section will summarize the information provided by each jurisdiction. The full set of meeting minutes from each interview are provided in Appendix A.

4.1 CITY OF CHANDLER

The interview with the City of Chandler staff included representatives from separate departments, including Planning and Development, Transportation and Transit, Economic Development and Public Works. The discussion centered on future development plans for the City, as well as a general discussion regarding City needs to be in a position to support future transit investments. Through the discussion, the following information was provided and/or discussed:

- Chandler recognizes the importance of Arizona Avenue as a future HCT corridor
- Density maximums increased along the corridor
- New activity centers are under consideration for Arizona Avenue
- The General Plan update is underway and the city is including policies that support future transit investments and supportive land use actions
- Support of increased transit service and identification of Ray Road as a candidate for additional transit investment
- Acknowledgement that the existing ROW along Arizona Avenue is not conducive to a transit/pedestrian oriented environment
- Support of a future transit investment and willingness to make necessary land use adjustments as needed throughout the General Plan update process.

4.2 TOWN OF GILBERT

The discussion with the Town of Gilbert staff included representatives from separate departments, including Planning, Economic Development, Transportation/Traffic Engineering and Public Works. The discussion focused on areas of priority redevelopment within the study area and how increased transit service could support those initiatives. The following information was provided and/or discussed:

- Several sections of the General Plan need to be updated to specifically address transit issues
- The Northwest Employment Corridor has been identified as a high priority area in terms of employment, development and future transit connections
- Several existing bus routes stop at the border of Mesa and Gilbert, and as development and employment grow, there may be opportunities to extend these services
- HCT service on Arizona Avenue will impact adjacent parallel arterial streets in terms of traffic impacts
- The Town will focus on developing other transit options that can support HCT in the future.
- Any type of major transit or transportation infrastructure investment will require close coordination with the Public Works Department to either identify potential conflicts or opportunities for joint construction solutions.

4.3 CITY OF MESA

The meeting with the City of Mesa staff included representatives from separate departments, including Economic Development, Planning/Community Development, Transit, Transportation and Engineering. The discussion concentrated on Mesa redevelopment plans within the study area as well as the connection to the existing LRT system along Main Street. The following information was provided and/or discussed:

- Work has commenced on a redevelopment plan that centers along Country Club Drive and west on Southern Avenue
- The Fiesta District and Country Club Drive are key employment areas
- Many existing sites are undergoing adaptive reuse including areas within and surrounding Fiesta Mall and the Desert Banner Health Campus
- Country Club Drive is categorized as a transportation character corridor
- In the last decade, Mesa City Council has become more supportive of higher density development which can support increased transit service
- Support of future transit investment

- The freight railroad tracks and US 60 are physical constraints within the corridor
- A connection to existing LRT at the intersection of Country Club Drive and Main Street is not supported due to potential impacts to existing track alignment and station location just east of Country Club Drive

5.0 GOALS AND OBJECTIVES

This transit corridor study will identify potential land use modifications and transit investments appropriate in the short-, mid- and long-term to meet increasing demand within the study area. One of the outcomes of the long-term recommendations will include the potential for a HCT option.

The specific goals and objectives that will guide the FDCTCS process include:

Goal: Refine and expand recommendations from the 2012 *Arizona Avenue High Capacity Transit Long Range Study*.

Objectives:

- Engage staff representing various municipal departments from Chandler, Gilbert and Mesa throughout the study to lend guidance with respect to previous decisions and updated recommendations provided through the FDCTCS.
- Evaluate previous recommendations in comparison with updated land use, transportation, socioeconomic conditions and other relevant information to support the outcome of the FDCTCS.

Goal: Identify short- to long-term (1) transit demand within the corridor, (2) land use adjustments, and (3) recommendations for transit investments (e.g., enhanced bus service, BRT, LRT) in the study area.

Objectives:

- Identify current and forecasted travel patterns including origins and destinations in and around the study area.
- Identify transit demand within the corridor, focusing on existing ridership and relevant trends relating to light rail and local/express bus service.
- Coordinate with municipal staff representing Community Development and/or Planning Departments to identify planned transit supportive near- and long-term land use developments.

- Evaluate the feasibility of long range transit alternatives (e.g., enhanced bus service, BRT, LRT) through development and analysis of qualitative evaluation criteria including opportunities and constraints, cost and other relevant factors.

Goal: Engage stakeholders throughout the process.

Objectives:

- Identify and coordinate with a select group of stakeholders representing agencies/organizations, the general public and the business community to receive input throughout the study process.
- Maintain communication with the general public through regular updates to online materials, including project fact sheets and updates, as requested by the Project Management Team.

6.0 CONCLUSION

The Fiesta/Downtown Chandler area of the MAG region demonstrates existing transit use and includes economic development opportunities that would support transit investment in the future. Recently completed studies and recommendations also document support for increased transit investment in this corridor. The population characteristics of the study area suggest a propensity to use transit in some areas; currently an existing LRT line, two LINK routes and other top performing routes in the region are within the project study area. Jurisdictions within the study area have demonstrated substantial progress, development and priority for planning for increased transit investment in the future through transit supportive policies and programs. Mesa, Chandler, and Gilbert all understand the land use adjustments necessary to support increased transit service levels in the future.

This study will identify potential transit investments and land use adjustments necessary in the short-, mid- and long-term to support the potential of HCT in the future. As alternative transit improvements are evaluated, the analysis will assess which options best meet the goals and objectives for the project. In summary, the project is intended to:

- Enhance mobility by serving active travel patterns and as a reliable source of transportation for transit dependent populations
- Connect the existing HCT system from downtown Mesa to downtown Chandler activity centers
- Support local economic and community development priorities and goals

7.0 REFERENCES

Maricopa Association of Governments (MAG). 2014a. 2014-2018. TIP Transit Listing. Available at http://www.azmag.gov/Documents/TIP_2014-02-06_January-2014_FY2014-FY2018-MAG-TIP-Transit-Listing.pdf

2013a. MAG Population and Employment by TAZ GIS Shapefile.

_____. 2013b. Existing and Planned Transit Network GIS Shapefile.

_____. 2012. MAG Existing/Future Land Use GIS Shapefile.

_____. 2010. MAG Population and Employment Projections GIS Shapefile.

United States Census Bureau. 2011a. American Community Survey (ACS) 5 year estimates (2007-2011). Household Vehicles. GIS Data

_____. 2011b. American Community Survey (ACS) 5 year estimates (2007-2011). Median Household Income. GIS Data.

_____. 2011c. American Community Survey (ACS) 5 year estimates (2007-2011). Population by Sex and Age. GIS Data.

_____. 2011d. American Community Survey (ACS) 5 year estimates (2007-2011). Commute to Work. GIS Data.

_____. 2000. U.S. Census SF3 file by Block Group. GIS Data.

Valley Metro. 2013. System and Study Area Maps.

_____. 2014. Valley Metro Annual Ridership Report FY 2013-2014. Available at http://www.valleymetro.org/images/uploads/ridership_reports/FY__2013-2014_Annual_Ridership_Report.pdf

APPENDIX A

STAKEHOLDER INTERVIEW SUMMARIES



Date: August 20, 2015

Time: 10:00 AM – 11:30 AM

Location: Town of Gilbert, 50 E. Civic Center Drive, Meeting Room 300

Re: Fiesta-Downtown Chandler Transit Corridor Study
Agency Stakeholder Interview – Town of Gilbert

In Attendance:

Leslie Bubke, Gilbert
Linda Edwards, Gilbert
Jennifer Graves, Gilbert
Dan Henderson, Gilbert
Wulf Grote, Valley Metro
Deron Lozano, Valley Metro
John McNamara, Valley Metro
Kenneth Morgan, Gilbert
Kristin Myers, Gilbert
Vijayant Rajvanshi, Valley Metro
Nathan Williams, Gilbert

Minutes:

Introductions

- Kristen Myers (Gilbert) opened the meeting and thanked everyone for responding to the questionnaires provided in advance of the meeting. The participants then introduced themselves and their roles.

Transit Overview

- Wulf Grote (Valley Metro) provided a background on the overall transit system in the Phoenix Metro Area, and how it serves the metropolitan population.
- Wulf mentioned that the existing light rail system serves about 46,000 riders per day, and the highest daily ridership was recorded on the day of the Super Bowl when the system carried approximately 120,000 riders in a day.
- He also informed the group that according to recently released statistics, the light rail transit (LRT) system has induced an investment of \$8.2 Billion along the light rail corridor.
- An overview of the Federal Transit Grants Program, and the project evaluation process was provided. Wulf stressed that the federal pool of money from which grants are awarded is limited, and the application process is extremely competitive. The federal government's focus is on providing financial support to transit systems in communities that have a robust existing bus transit system to support high-capacity transit, and have policies in place to support transit-oriented development.

Overview of the Fiesta Downtown Chandler Transit Corridor Study (FDCTCS)

- Deron Lozano, Project Manager for the FDCTCS provided an overview of the study, and mentioned that the current study is a follow-on study of the Arizona Avenue HCT Long Range Study that was completed in 2012.
- Deron outlined the purpose of this study and presented a summary of tasks that will be completed as part of this project.
- Participants were informed that the study team is interviewing key planning, transit, economic development, and public works staff from all three communities that have jurisdiction within the study area, including Chandler, Gilbert, and Mesa.
- Two alternative routes are currently under consideration for high-capacity transit service:
 - Arizona Avenue Alternative – From Main street in Mesa to Downtown Chandler
 - Dobson Road/Arizona Avenue Alternative – Dobson Road to Southern Avenue, then east to Arizona Avenue, and then south to Downtown Chandler
- As part of this project, the team will look at an enhanced land use scenario which will be based on the responses received from the three communities, and will reflect the most likely infrastructure investments and policy framework for land-use, economic development, and development of a transit system.

Gilbert Staff Discussion

- The presentation from Wulf and Deron were followed by brief presentations by the Gilbert staff representing the various departments.
- Planning Department – Linda Edwards
 - The department realizes that there is a need to update several sections of the General Plan (including community design, revitalization, and circulation) in conjunction with other departments to specifically address future transit investments, particularly light rail. Gilbert is currently half way through the current General Plan 10-year planning horizon.
 - The Northwest Employment Corridor has been identified as a high priority area in terms of employment concentration by both planning and economic development departments. The Town also has an economic development policy in place for this corridor.
 - Since this project is a tri-community effort, Gilbert will need to partner with bordering cities to coordinate development efforts to support HCT.
 - The department wants to focus on the next update of the General Plan with emphasis on key factors specific to LRT.
 - The General Plan is due for an update in FY 2017-18.
- Economic Development – Jennifer Graves, Economic Development Manager
 - The Northwest Employment Corridor is one of four high-priority corridors within Gilbert from an economic development perspective.

- It is the oldest employment center in Gilbert, and has the highest total job count amongst all four corridors.
- The department sees huge opportunities for redevelopment and economic development incentives in this corridor.
- The department has identified a need for tolls to encourage infill development in the corridor.
- Development requirements need to be reviewed, including reduction of setback requirements and parking ratios. Existing parking ratios do not make sense for large warehouses/manufacturing units.
- The Town is often asked about transportation and public transit infrastructure when dealing with potential employers who would like to locate in Gilbert. Large employers are increasingly concerned about existing transit/transportation infrastructure to get employees to their locations.
- The location of the Northwest Employment Corridor makes it prime candidate for future connections to LRT and express bus systems in nearby jurisdictions.
- Transportation/Traffic Engineering – Leslie Bubke
 - Valley Metro has an existing bus route on McQueen Road that stops on the border of Mesa and Gilbert.
 - The planned Spectrum Development at Elliot/McQueen Roads will provide employment for approximately 4,000 +/- employees, and could provide opportunity for extension of the existing bus route.
 - Even though the Town does not have an adopted Complete Streets policy, the town's street standards require including of bike paths, bus stops and other complete streets type facilities.
 - The 2012 General Plan spawned the need for a Transportation Master Plan that was completed in 2014. The Town plans to initiate a Transit Master Plan in FY 2017.
- Public Works Department – Kenneth Morgan
 - The department has focused its efforts on long-range infrastructure planning, and is planning infrastructure for the ultimate build-out conditions.
 - It is important to keep in mind that LRT on Arizona Avenue will impact other parallel streets as well.
 - The department plans to upgrade the infrastructure to a level that accommodates the demands of the population increase due to increased development densities.
 - The department is in the process of modeling utility infrastructure needs for build-out conditions.
 - Other factors that need to be considered include right-of-way constraints, political will and support of community for a HCT corridor.
 - Gilbert needs to improve transportation options to become a more attractive community.

- The Town needs to ensure that it does not fall behind in upgrading infrastructure, but also ensure that they don't upgrade too much in advance and then have to redo when a HCT corridor is finalized.
- The Town needs to focus on developing other transit options that will support a future LRT.

Follow-up Discussion

- Wulf pointed out that relocation of utilities is typically 15% to 20% of any LRT project budget, and usually precedes the construction work. Gilbert has the opportunity to plan its infrastructure in a way that future relocation may not be required once we reach the stage of LRT construction.
- He also pointed out that an LRT system cannot be successful in a highway environment when placed in the median of a six-lane roadway. Valley Metro tried doing that on Camelback Road, and was not successful in creating a pedestrian friendly environment.
- Wide roads do not support pedestrian environment, and therefore communities need to look at other parallel roadways to be the major vehicular traffic carriers.
- Kristen Myers asked that since this is a tri-community effort, what has been Chandler's reaction to the idea of reducing number of lanes along the potential HCT corridor. Deron notified that that will be a part of the discussion when the team meets with Chandler.
- Gilbert staff wondered whether this observation was specific to LRT or BRT. Wulf mentioned that developers are more likely to invest in land along fixed-guideway transit systems due to the permanence of the transit system.
- Kristen asked about the difference between an LRT system and a Streetcar system. John McNamara informed that streetcar systems typically function as circulator systems within a small area, supporting local economic development. Unlike LRT, they are not intended to be fast and cannot move people quickly.
- John asked the Gilbert staff about how the Commuter Rail discussion had gone with the Town Council. Linda Edwards mentioned that:
 - Two locations were identified for potential Commuter Rail Stations in the 2012 General Plan that was adopted by the Town Council.
 - Gilbert has planned uses around the station locations, and intendeds to hold onto those land parcels for future station area development.
 - There is a need to take council members on educational trips to other big cities to showcase the value of transit systems in developing the community.
- It was mentioned that ridership on a future HCT system would be higher if an enhanced transit system existed in the community to support HCT.
- Gilbert staff also mentioned that they would like to know what Chandler thinks will be the percentage of various trip purposes (employment, educational, recreational, etc.) along this corridor.



-
- Wulf and Deron thanked everyone for participating and engaging in a good discussion for the future of transit in Gilbert.



Date: September 22, 2015

Time: 10:30 AM – 12:00 PM

Location: City of Mesa, Transportation Training Room, 300 E 6th St, Mesa

Re: Fiesta-Downtown Chandler Transit Corridor Study
Agency Stakeholder Interview – City of Mesa

In Attendance:

Trevor Collon, Mesa
Jason Crampton, Chandler
Abhishek Dayal, Valley Metro
Lori Gary, Mesa
Erik Guderian, Mesa
Ed Jones, Mesa
Ann Kurtenback, Valley Metro
Deron Lozano, Valley Metro
Jeff Martin, Chandler
John McNamara, Valley Metro
Jeff McVay, Mesa
Vijayant Rajvanshi, Valley Metro
Shahir Safi, Mesa
Jodi Sorrell, Mesa
John Wesley, Mesa

Minutes:

Introductions

- Deron Lozano (Valley Metro) opened the meeting and thanked everyone for responding to the questionnaires provided in advance of the meeting. The participants then introduced themselves and their roles.

Transit Overview

- Deron Lozano (valley Metro) provided a brief overview of transit systems funding in the Phoenix Metro Area, and how Mesa has been working on transit initiatives for years.

Overview of the Fiesta Downtown Chandler Transit Corridor Study (FDCTCS)

- Deron Lozano, Project Manager for the FDCTCS provided an overview of the study, and mentioned that the current study is a follow-on study of the Arizona Avenue HCT Long Range Study that was completed in 2012.
- Deron outlined the purpose of this study and presented the key differences between the current study and the previous Arizona Avenue study effort.
 - Greater involvement and outreach with agency departments
 - Targeted stakeholder involvement
 - Development of an enhanced land use scenario
- Attendees were informed that the study team is interviewing key planning, transit, economic development, and public works staff from all three communities that have jurisdiction within the study area, including Chandler, Gilbert, and Mesa.
- Two alternative routes are currently under consideration for high-capacity transit service:
 - Arizona Avenue Alternative – From Main street in Mesa to Downtown Chandler
 - Dobson Rd/Arizona Avenue Alternative – Dobson Road to Southern Avenue, then east to Arizona Avenue, and then south to Downtown Chandler
- Other east-west options are also being looked at. Jason Crampton (City of Chandler) asked whether there were other options (e.g., Alma School Road) should be considered, if a straight route along Country Club Drive is not an option.
- As part of this project, the team will look at an enhanced land use scenario which will be based on the responses received from the three communities, and will reflect the most likely infrastructure investments and policy framework for land-use, economic development, and development of a transit system.

Gilbert Staff Discussion

- The presentation from Deron was followed by brief presentations by the Gilbert staff representing the various departments.
- Economic Development (Lori Gary)
 - The Economic Development department is responsible for the Fiesta District (73 acres) and the West Mesa Redevelopment (between Dobson and Country Club Drive)
 - Numerous projects are currently in the works:
 - Mesa has issued RFP to create a new redevelopment area from existing redevelopment area, south on Country Club, West on Southern
 - Responses to the RFP are due during the last week of September, and work is expected to start before the end of the year.
 - Intent is to have a designated geographic area and redevelopment plan by early next year.
 - Fiesta District and the Country Club Drive are key employment areas for the City.
 - Big box stores in the Fiesta District are currently going through Adaptive Reuse. About 1,600 new jobs will be created.
 - Big box retail spaces are being converted to hi-tech office spaces. One lease has been signed, and a second is in process.
 - The mall is also undergoing adaptive reuse. (approximately 160,000 sq.ft. of space)
 - Three stores (Bed Bath and Beyond, Macy's and Circuit City) have also gone through adaptive reuse to create of about 100,000 sq.ft. office space.
 - Building east of the Police Station (90,000 sq.ft) has been converted to office space. Tenancy negotiations are on.
 - The City has a Business Development Plan in place for Fiesta District.
 - The Fiesta Mall is envisioned as a mixed-use office, retail, residential space.
 - Walkable
 - Higher densities/minimum setbacks
 - Alternative transportation options
 - Higher density homes/apartments are also coming up one block off the commercial district between Dobson and Alma School Roads.
 - Southern Avenue Villas is a new project.
 - New projects are planned in the vicinity of the Community College.
 - Art building
 - Banner Health Campus is being converted to office space and redevelopment space.
- Planning/Community Development Department (John Wesley)

- The new General Plan was approved in 2014.
- Chapter 3 of the General Plan references creating a sense of place, and transit improvements.
- General Plan includes a general Land Use character map.
- Country Club Drive is categorized as a transportation character corridor.
- The City has developed the following plans:
 - West Main Plan
 - Central Main Plan
- Mesa adopted the Form Based Code a few years back.
- Redevelopment is ongoing along corridors for transit-oriented development.
- Mesa has developed a toolbox of options for TOD to decide what kind of development is best for a corridor.
- The City generally has political support for transit investments:
 - Sometimes not as strong as desired.
 - Council is supportive of transit oriented development (e.g., supportive of Starbucks on street, but not a drive-thru).
 - In the last decade, Council has become more supportive of higher density development.
 - Form Based Code addresses reducing parking requirements.
 - Other TOD supportive development standards may be required.
- Jeff Martin spoke to Scott Butler, Deputy City Manager
 - Supportive of Dobson/Southern/Country Club Drive option for transit investment
- Transit (Jodi Sorrell)
 - Enough flexibility in the Transit Plan exists.
 - City has identified corridors for HCT investments. Country Club Drive is identified as a HCT corridor.
 - Challenge for the City to extend to another route, each time a new extension is opened.
- Transportation (Eric Guderian)
 - Transportation Master Plan was adopted by the City in 2014.
 - Mesa reducing Southern Avenue from 6-lanes to 4-lanes to make it more walkable and livable.
 - Transportation Master Plan also calls for reducing number of lanes on Dobson Road from Main Street to Southern Avenue, and accompanying streetscape improvements.
 - Would not want to reconstruct Dobson Road at this time, if LRT is expected to come down on Dobson Road.
 - The City does not have any plans for reconstruction of Country Club Drive. Majority of the traffic in Mesa is north-south bound due to the existence of SR 202L.

- Traffic volumes along Southern Avenue have reduced to lower than what they were in the 1990s.
- Southern Avenue is the highest bus ridership route for Mesa.
- Engineering
 - Engineering department is currently working on LRT projects.
 - Working with planning and transit departments.
 - Infrastructure upgrades will be required for TOD.
 - Master Plan updates will also be required.
 - Utility improvements will vary by the transit route.
 - Railroad and US 60 are two obstacles for utilities.

Follow-up Discussion

- John McNamara asked about the City's experience relative to infrastructure and adaptive reuse.
 - Mesa did not need upsizing of utilities for LRT.
 - No major utility upgrades were required by developers.
 - Hi-tech office uses are interested in hi-speed fiber optics; where they go; how many carriers available.
 - Prefer to have at least three service providers for service redundancy
 - Prefer electrical infrastructure for electrical redundancy.
 - Existing fiber optics lines run along Southern Avenue.
 - SRP has not had a challenge serving higher density development.
 - Infrastructure around Fiesta Mall dates back to 1978-79 (original).
- Jeff McVay (City of Mesa) said that Mesa is hesitant at putting HCT along Country Club Drive.
 - It is the gateway into Downtown
 - LRT turn on Main Street would impact properties.
 - Not supportive to Country Club Drive alternative
- Jeff's position is 6-months old, and was specifically created to promote redevelopment –shows City's commitment to redevelopment.
- Jeff Martin provided the following comments:
 - This is a good transit investment corridor from the perspective of a future Prop 500 funding initiative (next RTP).
 - Scott Butler is interested in this project. Question is to figure out what phase of the RTP would this project would fall in.
 - Country Club does not have an existing underlying bus service.
 - Dobson/Southern have good bus service.
- Transit Plan does not prioritize HCT corridors.
 - City has had internal discussions about what that means.

Next Steps



-
- The Valley Metro Team will now begin to develop the Enhanced Land Use Scenario.
 - A workshop will be planned in October 2015 to develop the Enhanced Land Use scenario in coordination with the three cities.



Date: September 10, 2015

Time: 1:00 PM – 2:30 PM

Location: City of Chandler, 215 E. Buffalo Street, South Atrium CR

Re: Fiesta-Downtown Chandler Transit Corridor Study
Agency Stakeholder Interview – City of Chandler

In Attendance:

Greg Capps, Chandler
Jason Crampton, Chandler
Dan Cook, Chandler
Abhishek Dayal, Valley Metro
David Delatorre, Chandler
John Knudson, Chandler
Patrice Kraus, Chandler
Ann Kurtenbach, Valley Metro
Jeff Kurtz, Chandler
Kevin Lair, Chandler
Deron Lozano, Valley Metro
Jeff Martin, Chandler
Micah Miranda, Chandler
Kim Moyers, Chandler
John McNamara, Valley Metro
Vijayant Rajvanshi, Valley Metro
Ann Marie Riley, Chandler

Minutes:

Introductions

- Jason Crampton (Chandler) opened the meeting and thanked everyone for responding to the questionnaires provided in advance of the meeting. The participants then introduced themselves and their roles.

Transit Overview

- Abhishek Dayal (Valley Metro) provided a background on the overall transit system in the Phoenix Metro Area, and how it serves the metropolitan population.
- Abhi mentioned that the existing light rail system serves about 46,000 riders per day, and the highest daily ridership was recorded on the day of the Super Bowl when the light rail system carried approximately 120,000 riders in a day.
- He also informed the group that according to recently released statistics, the light rail system has induced an investment of \$8.2 Billion along the light rail corridor.
- An overview of the Federal Transit Grants Program, and the project evaluation process was provided. Abhi stressed that the federal pool of money from which grants are awarded is limited, and the application process is extremely competitive. The federal government's focus is on providing financial support to transit systems in communities that have a robust existing bus transit system to support high-capacity transit, and have policies in place to support transit-oriented development.

Overview of the Fiesta Downtown Chandler Transit Corridor Study (FDCTCS)

- Deron Lozano (Valley Metro), Project Manager for the FDCTCS provided an overview of the study, and mentioned that the current study is a follow-on study of the Arizona Avenue HCT Long Range Study that was completed in 2012.
- Deron outlined the purpose of this study and presented a summary of tasks that will be completed as part of this project.
- Participants were informed that the study team is interviewing planning, transit, transportation, economic development, and public works staff from all three communities that have jurisdiction within the study area, including Chandler, Gilbert, and Mesa.
- Two alternative routes are currently under consideration for high-capacity transit service:
 - County Club/ Arizona Avenue Alternative – From Main Street in Mesa to Downtown Chandler

- Dobson Road/Arizona Avenue Alternative – Dobson Road to Southern Avenue, then east to Arizona Avenue, and then south to Downtown Chandler
- As part of this project, the team will look at an enhanced land use scenario which will be based on the responses received from the three communities, and will reflect the most likely infrastructure investments and policy framework for land-use, economic development, and development of a transit system.

Chandler Staff Discussion

- The presentation from Abhi and Deron was followed by brief presentations by the Chandler staff representing the various departments. John McNamara mentioned that through this interview, Valley Metro is trying to understand what the City is doing, and what is the level of receptivity for transit in the City. Valley Metro will use that information to develop an enhanced land use scenario that is in-sync with the General Plan Update.
- Planning/Community Development Department – This discussion included various topics, summarized as follows:
 - High-Capacity Transit (HCT)
 - Chandler has recognized Arizona Avenue as a HCT Corridor since 2008.
 - In preparation for HCT along Arizona Avenue, Chandler has raised density maximums along the corridor.
 - Jeff Martin, Consultant to the City of Chandler, emphasized that the City needs to do everything they can to be successful in getting HCT along Arizona Avenue (including developing overlay districts, transit-oriented development (TOD) plans and policies).
 - Jeff also pointed out that not only is there competition for federal transit funding dollars at the national level, but also at the regional level since multiple jurisdictions within the Phoenix Metro are competing to expand light rail (including Phoenix, Mesa, Chandler, Glendale, Goodyear).
 - The group discussed that the first step to making HCT along Arizona Avenue a reality would be to get the project included in the next Regional Transportation Plan (RTP) which is due for an update in the 2017-2021 timeframe.
 - MAG may try to retest public opinion about extending the half-cent sales tax in the coming year, to fund the projects in the next RTP.
 - Jeff Martin pointed out that there might not be an immediate demand for light rail in the study area in the short-term, but it is important to acknowledge the long-term potential.
 - Planning and Development Activities
 - Chandler has not prepared any specific Area Plans.
 - New Activity Centers have been identified along Arizona Avenue.

- The Alta Steelyards Project, a high density residential project in downtown, is the first step towards TOD.
- Intel was identified as a key employment center in southeast Chandler.
- Pedestrian access to transit is restricted due to block walls around residential developments which limit entry/exit points. There is a need for integration of transit infrastructure into/with new development.
- John McNamara stressed that there is a need for showing synergy between the various departments. Dan Cook mentioned that the perfect example of inter-department synergy is the Intel Campus in South Chandler.
- The Downtown Arizona Avenue Design Guidelines document was recommended as a resource for this study.
- FTA wants to see that Cities have an Urban Form Vision, activity centers, and application of land use, transportation and sustainability principles in one plan.
- The Chandler Entertainment District is a good start to begin defining an overlay district.

General Plan Update

- Chandler is in the process of updating its General Plan. The City is keeping the option of promoting higher densities open, and is also keen on including language to promote TOD. The next General Plan will improve upon existing development standards, but will stay away from any drastic changes.
- The timing of the General Plan update is perfect, and presents the perfect opportunity to incorporate transit supportive policies in the document.
- It was suggested that it may be a good idea to include a recommendation in the General Plan Update that the City develop an Overlay District. Chandler would like Valley Metro's assistance in developing the Overlay District. If the City would like to stay away from an Overlay District, an Area Plan/Design Guidelines may be the next best option.
- Chandler would like to examine opportunities for including language prohibiting auto-oriented businesses along the corridor. Currently Mesa, Phoenix, and Tempe incorporate this practice.

Transit-Oriented Development

- Chandler is in the process of adding another transit route along Ray Road. The City Council is supportive of transit expansion. Transit staff is supportive of promoting TOD.
- City staff said that they may want to organize a workshop on TOD for the City Council. Valley Metro can support by providing technical information and perhaps engage Phoenix staff.
- Dan Cook asked whether there is a way to make TOD/higher-density development happen without an Overlay District. John mentioned that it

-
- can be done, but requires very tight zoning regulations. A Zoning Overlay is strongly encouraged.
- Dan asked how adaptive reuse projects are viewed as supportive of TOD by the Federal Transit Authority (FTA) while examining funding applications. John informed that adaptive reuse projects are generally viewed positively, as they support 16-hours/day type activities.
 - Existing LINK bus service along Arizona Avenue can also benefit from TOD.
- Transportation/Transit Departments
 - Development in the area has been slow.
 - The wide right-of-way along Arizona Avenue is not attractive for pedestrian-oriented activities or transit. The City will have to make concerted efforts to improve pedestrian amenities along the corridor in the long run.
 - Northern Arizona Avenue has 5-ft wide pedestrian sidewalks.
 - Economic Development Department
 - The City has developed a Downtown and Southern Arizona Avenue Corridor Plan.
 - The City has plans for developing a permanent stage in downtown that can accommodate events with 15 to 20 thousand people in attendance.
 - The City has invested in and assembled development sites.
 - There is plenty of City-owned shared parking that is leased to offices during the day, and is free for the community during evenings and nights.
 - City has received a lot of interest in mixed-use development on Site #7.
 - Downtown area is part of a 10-day expedited development review process.
 - The City is in the process of installing new infrastructure to support new development.
 - Northern Arizona Avenue accounts for 10-12 percent of the total employment in the City.
 - Vacancy rates are typically around 6 percent, with vacant properties on the market for 6-9 months.
 - Chandler has a program to incentivize the conversion of aging retail development to higher density.
 - There is a lot of interest in adaptive reuse and overlays (parking requirements, setbacks).
 - Arizona Avenue is emerging as a new destination for the private sector.
 - A light rail alignment along Arizona Avenue will help in promoting land assembly.
 - The City wants to focus on Corridor Development as employment corridor will drive development of light rail.

- Some vacant parcels along the corridor have been designated for large single family homes. Large industrial users are also interested.
- Downtown group has been promoting taking bus from parking facilities to destinations.
- Existing bus frequency is 30 minutes. Higher frequency may help with making it more attractive to users.
- A substantial amount of redevelopment opportunity along the corridor.
- Public Works Department
 - The biggest challenge to infrastructure/utilities upgrades is the ability to predict the future.
 - The City needs to update their Water/Wastewater Master Plan every 3 to 5 years.
 - The vision is to look at Arizona Avenue as a special, distinct planning area.
 - Utilities along the Northern Arizona Avenue are older and undersized. City will need to look at relocating and upgrading utilities along Arizona Avenue once development densities are known.
 - The infrastructure/utilities group is working closely with the General Plan Update Committee.
 - Should a light rail investment be identified along Arizona Avenue, the City would need to move utilities out of the right-of-way.
 - During the discussion a question was raised asking whether infrastructure upgrades count towards local matching funds towards light rail. This is not an acceptable source of matching funds.

Follow-up Discussion

- Dan Cook mentioned that if light rail goes along Arizona Avenue, it will be important to consider the cross section of the roadway, specifically:
 - Median-running (takes 2 lanes of traffic)
 - Impact on on-street parking
- The end point of the project remains a question and requires further analysis. Light rail could extend to Pecos Road or Germann Road.
- It was noted that Gilbert may want light rail to extend east. Funding may get split between Mesa, Gilbert and Chandler. This option could be a long-term possibility.



APPENDIX B

TECHNICAL MEMORANDUM 2



Technical Memorandum No. 2 Transit Service Scenarios

Fiesta-Downtown Chandler Transit Corridor Study

July 2016





TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Technical Memorandum #2 Overview.....	1
2.0	STUDY BACKGROUND	3
2.1	Previous Studies	3
2.2	Transit Modes	5
2.3	Transit Standards and Performance Measures	7
3.0	MODELING ASSUMPTIONS	9
3.1	Span of Service and Headway Improvement.....	10
3.2	Enhanced Frequency.....	14
3.3	New Routes	14
3.4	Description of Local Bus Enhancements	15
3.5	High-Capacity Transit Scenarios	21
3.6	Conceptual Cross Sections	23
4.0	COSTS	32
4.1	Capital Costs	32
4.2	Operating Costs.....	35
5.0	SUMMARY AND NEXT STEPS	38

LIST OF FIGURES

Figure 1	Study Area HCT Scenarios (Long-Term)	2
Figure 2	Bus Rapid Transit	6
Figure 3	Light Rail.....	7
Figure 4	Short-Term Transit Scenarios.....	13
Figure 5	Mid-Term Transit Scenarios.....	18
Figure 6	Long-Term Transit Scenarios	19
Figure 7	Dobson Road Alignment.....	24
Figure 8	Southern Avenue Alignment Option 1.....	25
Figure 9	Southern Avenue Alignment Option 2.....	26
Figure 10	Southern Avenue Alignment Option 1(Continued)	27
Figure 11	Southern Avenue Alignment Option 2 (Continued)	28
Figure 12	Arizona Avenue Alignment.....	29
Figure 13	Dr. A.J. Chandler Park Option 1	30
Figure 14	Dr. A.J. Chandler Park Option 2	31

LIST OF TABLES

Table 1	Recommended Service Standards by Transit Service Type.....	8
Table 2	Proposed Scenarios	9
Table 3	Proposed Changes to Service Span Hours	11
Table 4	Proposed Changes to Headway Span Hours	12
Table 5	Enhanced Bus Service Scenarios.....	20
Table 6	Long-Term High-Capacity Transit Scenarios	22
Table 7	Assumed Cross Section Dimensions	23
Table 8	Enhanced Bus Service Capital Cost Estimate	33
Table 9	LRT Capital Cost Estimate.....	34
Table 10	BRT Capital Cost Estimate	34
Table 11	Enhanced Bus Service Total Operating Costs.....	36
Table 12	LRT Operating Characteristics and Costs.....	37
Table 13	BRT Operating Characteristics and Costs	37

APPENDICES

Appendix A: Proposed Long-Term Enhanced Bus Service Changes by Route

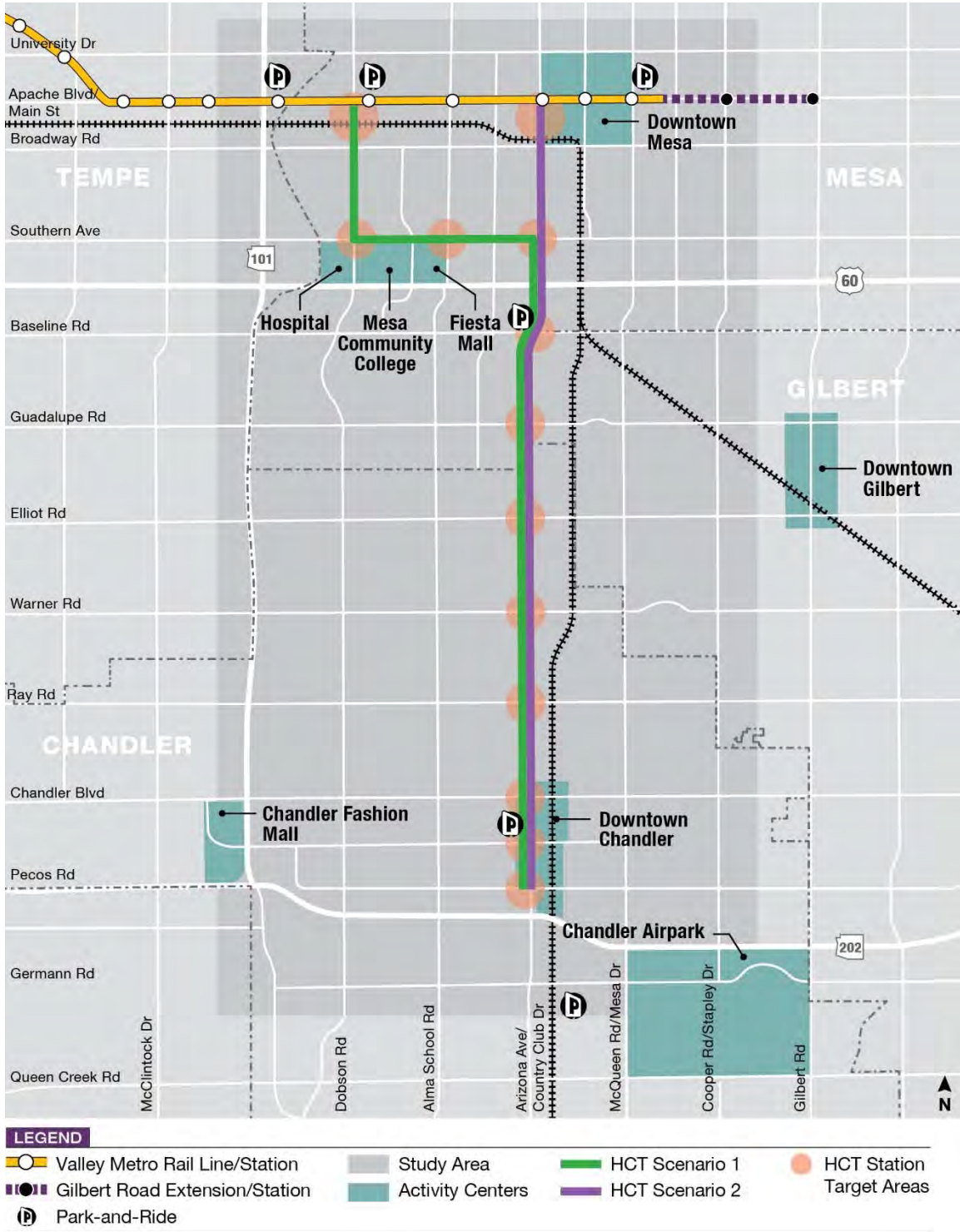
1.0 INTRODUCTION

Valley Metro, in cooperation with the municipalities of Mesa, Gilbert and Chandler, is conducting the Fiesta-Downtown Chandler Transit Corridor Study (FDCTCS). The study area extends approximately two miles east of Cooper Road/Stapley Drive and Price Road to the west, ½ mile south of Germann Road in Chandler, and approximately ½ half mile north of University Drive. The study will evaluate the corridor and a variety of transit service types to determine potential transit scenarios and ultimately a preliminary recommendation that will provide enhanced mobility to the study area. Study partners will evaluate a range of enhanced land use scenarios and transit investments, including local bus service and high-capacity transit (HCT) for short-, mid-, and long-term time periods to meet anticipated public transportation demand. This document provides information on transit service and capital improvements to support the identified alternatives within the study area. A detailed evaluation of the alternative scenarios and associated key corridors will be completed in Task 6.0 (Evaluation of Transit Alignment/Routing Scenarios).

1.1 TECHNICAL MEMORANDUM #2 OVERVIEW

As identified in Technical Memorandum #1, the Fiesta-Downtown Chandler corridor provides opportunities for connections to major activity centers located in the study area, including links between downtown Chandler, the Arizona Avenue employment core and Mesa destinations such as downtown, Mesa Community College, Banner Desert Medical Center and other destinations within the Fiesta District. Transit investment within the Fiesta-Downtown Chandler corridor will also provide a connection to the existing regional transit system, linking this corridor to destinations throughout the Valley. Two HCT alignment scenarios have been identified, shown in Figure 1, to be evaluated for the development of transit service and capital improvement scenarios for the long-term time period. Technical Memorandum #2 defines the two HCT alignment scenarios in the context of key corridor routing, passenger facility locations, and operating and capital costs; as well as, evaluating enhancements to the underlying local bus network to be modeled for productivity and further evaluation.

FIGURE 1 STUDY AREA HCT ALTERNATIVES (LONG-TERM)



2.0 STUDY BACKGROUND

The HCT scenarios include (1) the Fiesta alignment from the existing Central Phoenix/East Valley (CP/EV) light rail corridor south along Dobson Road, east along Southern Avenue with a connection to Arizona Avenue, to Pecos Road south of downtown Chandler; and (2) the Arizona Avenue/Country Club Drive alignment south from CP/EV at Country Club/Arizona Avenue to Downtown Chandler and Pecos Road south of downtown Chandler. The analysis presented in this section provides a summary of transit enhancements identified in previous studies, description of transit services and outlines standards set forth by Valley Metro's Board-adopted Transit Standards and Performance Measures (TSPM).

2.1 PREVIOUS STUDIES

The proposed local bus route enhancements and new local bus routes within the study area documented in this section reflect and expand on the assumptions identified in the *Arizona Avenue High Capacity Transit Long Range Study* (Valley Metro, 2012) and the *MAG/Valley Metro South East Valley Transit System Study* (MAG/Valley Metro, 2015). A summary of study findings and recommendations applied to the FDCTCS analysis is provided in Tables 1 through 6.

2.1.2 Arizona Avenue High Capacity Transit Long Range Study

In coordination with Chandler, Mesa, Gilbert and Maricopa Association of Governments (MAG), Valley Metro conducted a study to evaluate alternative land use scenarios and transit service concepts that could make the Arizona Avenue corridor viable for HCT service. The study developed an optimized land use scenario that examined land development intensities conducive to HCT use and associated projected boardings per corridor mile resulting in improved trip generation within the corridor. Recommendations to support HCT in the future included increasing residential and commercial density, expanding the local transit network to increase access to HCT and enhanced reliability, amending current General Plans to encourage transit-supportive development and related policies (e.g., parking) along Arizona Avenue and exploring alternative funding options.

The study findings encouraged the following actions take place to improve the viability of an HCT service:

- **New Bus Routes:** The addition of new east-west bus routes serving Guadalupe Road, Warner Road, Pecos Road, Frye Road and Germann Road, with direct connections to Arizona Avenue to help ensure future LRT stops will be served by intersecting local bus routes, extending the reach of transit to destinations beyond the corridor.

- **Enhance Peak-Period Frequency:** Provide 15-minute peak-period headways on routes that connect with a proposed future LRT station.
- **Implement Chandler Boulevard BRT:** Adding bus rapid transit (BRT) service along Chandler Boulevard will provide an expedient, high-quality transit connection between Chandler Fashion Mall, downtown Chandler and Arizona State University Polytechnic Campus\Mesa Gateway Airport.

2.1.3 MAG/Valley Metro Southeast Valley Transit System Study (SEVTSS)

The purpose of the SEVTSS study was to identify short-, mid- and long-term recommendations that would advance the transit system throughout the southeast portion of the MAG region. Communities that participated in the study were Apache Junction, Chandler, Florence, Gila River Indian Community, Gilbert, Guadalupe, Maricopa, Mesa, Phoenix, Queen Creek, Tempe and the surrounding portions of Maricopa County and Pinal County. The study included an evaluation of the existing transit conditions followed by an analysis of specific transit needs including a review of existing services, analyzing current and future travel demands, and planning for future population growth and economic development, as well as community input. The final report presented recommendations for optimizing transit service in the short-term for the Southeast Valley and outlines mid-term improvements within the next 10 years and long-term improvements that would be anticipated beyond 10 years. The study, however, did not include future HCT corridors.

The study recommended the following actions to support the implementation of an enhanced bus service network within the FDCTCS study area for the short-, mid-, and long-term time periods:

Short-term

- *Enhance Frequency:* Implement 15-minute service on segments of well-performing east/west routes including Local Route 30 serving University Drive from 52nd Street to Gilbert Road, and 15-minute service along the entire Local Route 77 serving Baseline Road to Dobson Road. This also includes north/south route segments such as Local Route 96 serving Dobson Road and Local Route 104 serving Alma School Road from Mesa Riverview to Elliot Road. All-day 15-minute frequency is along the entire length of Local Route 120 serving Mesa Drive from Mesa Riverview to Baseline Road and along Local Route 128 serving Stapley Drive from Mesa Riverview to Baseline Road. Consideration of 30-minute frequency for weekend service on north/south routes includes Local Route 120 along Mesa Drive and Local Route 128 along Stapley Drive.
- *Consolidate Routes:* Combine LINK and local bus service on Arizona Avenue/Country Club Drive (AZ Avenue LINK and Route 112) and Main Street/Apache Boulevard (Main Street LINK and Route 40) into one high-frequency

service to operate more frequently utilizing existing stops at one-quarter mile locations. This service will be an underlying local bus service, similar to Local Route 40 operating on Apache Boulevard/Main Street as an underlying service to light rail serving downtown Mesa.

- *New Routes:* New east/west route along Ray Road from 48th Street to Gilbert Road operating at 30-minute frequency.

Mid-/Long-term

- *Enhanced Peak-Hour Frequency:* Provide 15-minute peak-hour frequency along Local Route 156 serving Chandler Boulevard from 48th Street to Gilbert Road.
- *Extend Routes:* Extend east/west and north/south routes to help fill in service gaps along Local Route 77 serving Baseline Road from Dobson Road to Gilbert Road, and along Local Route 120 serving Mesa Drive from Baseline Road to Chandler Boulevard. Local Route 112 along Arizona Avenue will extend from Germann Road to Ocotillo Road.
- *New Routes:* New east/west routes operating at 30-minute frequency are along Guadalupe Road from Price Road to Gilbert Road, along Warner Road from 56th Street to Gilbert Road, and along Queen Creek Road from Price Road to Gilbert Road extending further east as population grows.

2.2 TRANSIT MODES

Three transit modes that support an enhanced transit network and HCT include enhanced local bus service, BRT and LRT. The following describes characteristics associated with each mode identified by Valley Metro and the Federal Transit Administration (FTA):

- Enhanced local bus service is defined as increased bus service to meet standards identified in the Valley Metro Board-adopted Transit Standards and Performance Measures (TSPM). Concepts include consolidating resources to invest in corridors to provide a robust and high-frequency service, explore alternatives to improve lower-productivity route segments, obtain a minimum of 30-minute service frequency, and improve frequency on high ridership routes. In addition, all routes are to support service requirements set forth by the Americans with Disabilities Act (ADA).
- BRT is categorized as an enhanced bus service that operates in designated bus lanes or within a fixed guideway in order to combine the flexibility of buses with the efficiency of rail. BRT operates at faster speeds with greater distance between stop locations, has defined stations with platform-level boarding, and uses transit signal priority (TSP) for shorter headway bi-directional service. Examples of BRT vehicles and stations are shown in Figure 2.

- LRT is defined as a transit mode that is typically operated in an exclusive or semi-exclusive guideway powered by an overhead electric contact system. Valley Metro's LRT system is characterized by passenger stations located approximately one-half mile to one-mile apart and utilizes TSP for service speed and reliability. Valley Metro operates a 26-mile light rail system that connects various activity centers in Phoenix, Tempe and Mesa, as shown in Figure 3.

FIGURE 2 BUS RAPID TRANSIT



EMX BRT Eugene, Oregon

FIGURE 3 LIGHT RAIL



Light Rail at Main Street Station in Downtown Mesa

2.3 TRANSIT STANDARDS AND PERFORMANCE MEASURES

In coordination with representatives from member agencies, Valley Metro initiated a process to establish agency transit service standards and performance measures. Valley Metro staff, working with a technical advisory group (TAG) composed of member agency representatives, drafted five goals related to Valley Metro-funded and/or operated services. The five goals established were:

- Implement services identified in the Regional Transportation Plan (RTP) in consideration of a performance-based system.
- Give high priority to services that focus on the transit-dependent population.
- Provide transit service that is desirable as an alternate mode to automobile travel.
- Improve Valley Metro's overall performance and promote the long-term financial stability of the agency.
- Promote expansion that builds existing services to meet standards and focuses new services in key areas, including higher population density areas, locations with limited auto availability, residential geographies with lower incomes, and the locations of major activity centers.



Recommended service standards for each service type are displayed in Table 1. The recommended service standards assigned to each service type are based on the anticipated demand, market served and proven industry practices employed by peer regions.

TABLE 1 RECOMMENDED SERVICE STANDARDS BY TRANSIT SERVICE TYPE

Service Type	Minimum Headway or Daily Trips	Minimum Span Week / Sat / Sun	Minimum Operating Days
Dial-a-Ride (ADA)	NA	ADA service shall be available throughout the same hours and days as fixed-route service	
Rural Connector	4 trips inbound / 4 trips outbound	NA	Mon – Fri
Community/Circulator	30 min	12 hrs / 0 hrs / 0 hrs	Mon – Fri
Local Bus	30 min*	16 hrs / 14 hrs / 12 hrs	Mon – Sun
Key Local Bus	15 min peak / 30 min base*	16 hrs / 14 hrs / 12 hrs	Mon – Sun
Limited Stop Peak	4 trips AM / 4 trips PM	NA	Mon – Fri
Limited Stop All-Day	Headways same as LRT, up to 2X Peak	16 hrs / 14 hrs / 12 hrs (Same as LRT)	Mon – Fri
Commuter Express	4 trips AM / 4 trips PM	NA	Mon – Fri
Light Rail Transit	12 min peak / 20 min base	18 hrs / 14 hrs / 12 hrs	Mon – Sun

*60 min early morning and late night service

Source: Phase I Recommendations Regional Transit Standards and Performance Measures, Valley Metro 2013

3.0 MODELING ASSUMPTIONS

The purpose of the modeling analysis is to identify the long-term supply and demand characteristics needed to support high capacity transit in the FDCTCS corridor. For the demand side, the analysis will test two sets of population and employment projections. The first set will be the 2040 socioeconomic projections adopted by MAG and used for regional transportation planning and air quality conformity analysis. The second set of socioeconomic data is a scenario that builds on the adopted growth projections. This enhanced 2040 data set has higher population and employment growth projections based on new assessments of transit-oriented development opportunities in the corridor study area made in coordination with representatives from Mesa, Gilbert and Chandler Planning, Economic Development and Transportation Departments.

On the supply side, the analysis will also test two scenarios. The first scenario will include all highway and transit capacity improvements identified in MAG’s adopted 2035 regional transportation plan. The second scenario will build on the adopted improvements to identify what enhancements may best support an Arizona Avenue high capacity transit investment. Table 2 shows the proposed transit and land use scenarios that will be modeled through travel forecasting analysis.

Once the analysis has identified the optimal supply and demand characteristics necessary to support high capacity transit in the corridor, further analysis may be conducted to identify how investments in new transit service should be staged. This analysis may use short- and mid-term population and employment projections to identify what transit service adds productivity in the study area shown in Figure 1.

TABLE 2 PROPOSED SCENARIOS

Scenario	MAG 2040 Socioeconomic Data		Study Area 2040 Socioeconomic Data	
	RTP Transit	Enhanced Transit	RTP Transit	Enhanced Transit
No Build	X	X	X	X
Dobson Rd	X	X	X	X
Arizona Ave	X	X	X	X

A set of guiding principles have been established based on input from the Project Management Team (PMT) to prioritize service enhancements over the different planning horizons. Service enhancements will be implemented in phases within the short-, mid-, and long-term time periods, with the goal of all routes meeting weekday and weekend TSPM standards, as well as improving the transit network to provide connections that support HCT within the corridor. These sets of guiding principles do not reflect what is being evaluated in the transit scenarios, but should be considered when making decisions for enhancements to local bus service in the future.

The guiding principles are as follows:

Short-Term (2020)

- Enhance local routes to meet weekday TSPM standards
- Increase to 15-minute frequency on highest ridership routes

Mid-Term (2030)

- Enhance local routes to meet weekend TSPM standards
- Implement new routes to fill in the grid system and expand the transit network
- Increase to 15-minute peak frequency on majority of routes within the study area

Long-Term (2040)

- Implement HCT along one of the alternatives identified in this study.

3.1 SPAN OF SERVICE AND HEADWAY IMPROVEMENT

Span of service and headway improvements are recommended for the short- and mid-term time periods to meet TSPM standards shown in Table 1. Enhancing service span hours and headway on selected routes are proposed for the short-term to meet weekday TSPM standards, and enhancing routes to meet weekend TSPM standards is proposed for the mid-term. Expanding local bus service span hours and improving service headway times provide riders an opportunity to further utilize public transportation options which, in turn, create a transit service that is desirable as an alternate mode to automobile travel. These enhancements will improve overall performance and service operations of a total transit network to support a future HCT corridor.

Table 3 shows the existing and proposed span of service hours for local bus routes operating for weekday, Saturday and Sunday service that currently meet/do not meet service hours outlined in the TSPM. The existing service span was calculated by averaging total service span in both directions for each route, rounded to the nearest half hour.

TABLE 3 PROPOSED CHANGES TO SERVICE SPAN HOURS

Route	Existing			Proposed		
	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
30	17.5	17.5	15.5	17.5	17.5	15.5
40	16.5	15.5	15.5	16.5	15.5	15.5
45	17.0	16.5	16.0	17.0	16.5	16.0
61	17.5	16.5	16.0	17.5	16.5	16.0
62	18.5	19.0	16.5	18.5	19.0	16.5
77	17.5	15.5	15.0	17.5	15.5	15.0
81	18.5	18.0	16.0	18.5	18.0	16.0
96	16.0	15.0	16.5	16.0	15.0	16.5
104	14.5	15.0	0.0	16.0	15.0	12.0
108	16.0	15.0	13.5	16.0	15.0	13.5
112	15.5	13.5	12.5	16.0	14.0	12.5
120	11.5	11.0	0.0	16.0	14.0	12.0
128	12.5	13.0	0.0	16.0	14.0	12.0
136	13.5	10.0	0.0	16.0	14.0	12.0
156	16.0	13.5	11.0	16.0	14.0	12.0
AZ Ave.	16.0	14.5	12.5	16.0	14.5	12.5
Main St.	17.5	0.0	0.0	17.5	0.0	0.0
	Indicates current service span hours that do not meet TSPM standards.					

Local routes that have limited stop service are excluded from the change in service span.

Source: Valley Metro, 2015

Table 4 compares existing and proposed headway times set in place by TSPM standards shown in Table 1, for weekday, Saturday and Sunday operation hours. These numbers incorporate the service span hours identified on the previous page. Proposed short-term transit scenarios are shown in Figure 4.



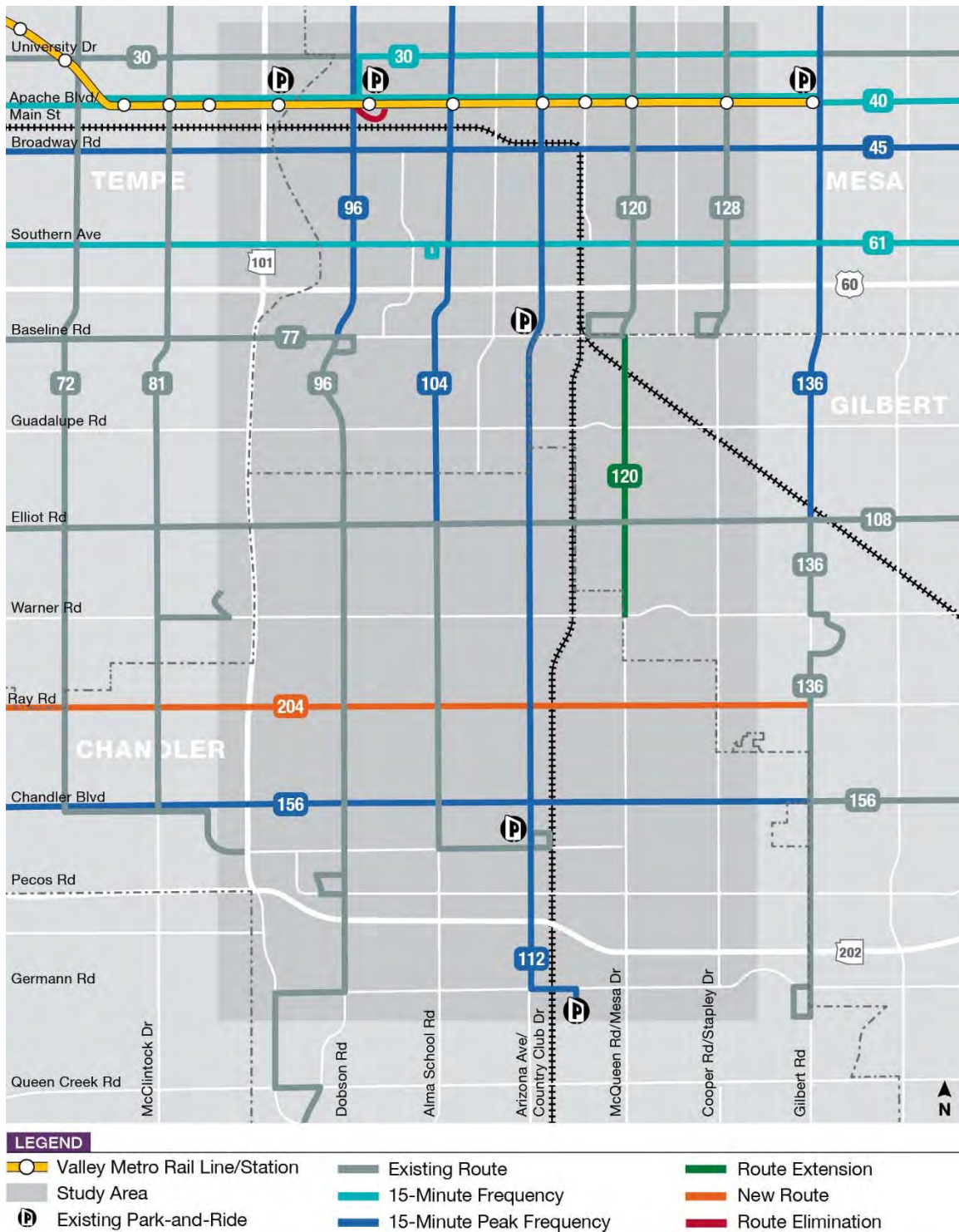
TABLE 4 PROPOSED CHANGES TO HEADWAY SPAN HOURS

Route	Service Type	Existing			Proposed (for TSPM)		
		Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
30	Local	30A	30A, 60A	60A	30A	30A	30A
40	Local	30A	30A	30A	30A	30A	30A
45	Key Local	15P, 30OP, 30A	30A, 60A	30A	15P, 30OP, 30A	30A	30A
61	Key Local	15P, 30OP	30A	30A	15P, 30OP	30A	30A
62	Local	30A	30A	30A	30A	30A	30A
77	Local	30A	30A, 60A	30A, 60A	30A	30A	30A
81	Local	15P, 30OP, 30A	30A, 60A	30A, 60A	15P, 30OP, 30A	30A	30A
96	Local	15P, 30OP, 30A	30A	30A	15P, 30OP, 30A	30A	30A
104	Local	30A	60A	NS	30A	30A	30A
108	Local	30A	60A	60A	30A	30A	30A
112	Local	30A	60A	60A	30A	30A	30A
120	Local	30A	60A	NS	30A	30A	30A
128	Local	30A	60A	NS	30A	30A	30A
136	Local	30A	30A, 60A	NS	30A	30A	30A
156	Local	30A	30A	30A	30A	30A	30A
AZ Ave	BRT	30A	60A	60A	30A	60A	60A
Main	BRT	15P, 30OP	NS	NS	15P, 30OP	NS	NS
Indicates current service span hours that do not meet TSPM standards.							

A represents All Day Service, P represents Peak Service, OP represents Off-Peak Service

Source: Valley Metro, 2015

FIGURE 4 SHORT-TERM TRANSIT SCENARIOS



Source: FDCTCS PMT, 2016

3.2 ENHANCED FREQUENCY

Increased local bus service frequency is proposed for the short-, mid-, and long-term time frames. Service enhancements identified in the SEVTSS served as the basis for determining specific local bus routes to provide increased frequency improvements. The 15-minute service enhancements were determined based on the existing service performance, as well as population and employment densities within the study area. Service enhancements include increased peak 15-minute frequency and 15-minute frequency all-day, as well as 15-minute frequency for route segments showing high ridership. Other recommendations include maintaining 30-minute frequency for all-day service for the entire route length.

Service frequency recommendations include both peak (6:00 AM – 9:00 AM and 2:00 PM – 6:00 PM), and off-peak periods. As indicated in the SEVTSS, the majority of the routes with midday productivity is just as productive as, or sometimes greater than, peak-hour operations which indicates a sustained amount of travel demand throughout the day. Maintaining high frequencies throughout the day attracts additional ridership by non-commute passengers and facilitates more frequent transfers between routes to reach destinations.

3.3 NEW ROUTES

New east/west routes are recommended for the short-, mid-, and long-term time periods. For the short-term, a new local bus route is proposed along Ray Road from 48th Street to Gilbert Road. New routes along Guadalupe Road from Price Road to Power Road, along Warner Road from 56th Street to Gilbert Road, along Queen Creek Road from Price Road to Gilbert Road, and along Pecos Road from Ellis Road to Gilbert Road are recommended for the long-term transit scenarios. A new downtown Chandler circulator route along Frye Road connecting the Chandler Transit Center with an eastern terminus at McQueen Road is proposed for the mid-term time period.

In anticipation of analysis using MAG's regional travel-demand model, the project team established the study area background bus network using the transit improvements by timeframe identified by the SEVTSS study, as well as each city's Transportation Master Plan and General Plan. Table 5 shows a summary of the background bus service and frequency improvements for short-, mid-, and long-term time frames that will be used to evaluate a comprehensive transit network that supports high-capacity transit within the corridor.

3.4 DESCRIPTION OF LOCAL BUS ENHANCEMENTS

This section provides detailed descriptions of local bus enhancements for the short-, mid-, and long-term time periods, based on the detailed information provided in Sections 3.1, 3.2, and 3.3.

Short-Term

- Route 30 – increase to 15-minute frequency from Sycamore/Main Street Transit Center to Gilbert Road.
- Route 40 – increase to 15-minute frequency along entire route to Superstition Springs Transit Center and consolidate service with Main Street LINK.
- Route 45 – increase to 15-minute peak frequency along entire route to Superstation Springs Transit Center.
- Route 61 – increase to 15-minute off-peak frequency along entire route to Superstation Springs Transit Center.
- Route 96 – increase to 15-minute peak frequency from Mesa Riverview to Baseline Road.
- Route 104 – increase to 15-minute peak frequency from Mesa Riverview to Elliot Road.
- Route 112 – increase to 15-minute peak frequency and consolidate service with Arizona Avenue LINK.
- Route 120 – extend route to Warner Road at 30-minute frequency.
- Route 136 – increase to 15-minute peak frequency to Elliot Road.
- Route 156 – increase to 15-minute peak frequency to Gilbert Road.
- Route 204 – new route along Ray Road from 48th Street to Gilbert Road at 30-minute all-day frequency.
- Arizona Avenue LINK – Consolidate service with Local Route 112.
- Main Street LINK – Consolidate service with Local Route 40.

Mid-Term

- Builds from all Short-Term enhancements.
- Route 45 – increase to 15-minute off-peak frequency to Superstition Springs Transit Center.
- Route 77 – extend route from Dobson Road to Gilbert Road and increase to 15-minute all-day frequency.
- Route 96 – increase to 15-minute off-peak frequency from Mesa Riverview to Baseline Road.
- Route 104 – increase to 15-minute off-peak frequency from Mesa Riverview to Elliot Road.
- Route 108 – increase to 15-minute peak frequency.
- Route 112 – increase to 15-minute off-peak frequency and extend route to Ocotillo Road.
- Route 120 – increase to 15-minute peak frequency to Baseline Road and extend route to Chandler Boulevard at 30-minute frequency
- Route 128 – increase to 15-minute peak frequency to Baseline Road
- Route 204 – increase to 15-minute peak frequency.
- Downtown Chandler Circulator – new route operating at 30-minute all-day frequency along Frye Road connecting to Chandler Transit Center with an eastern terminus at McQueen Road.

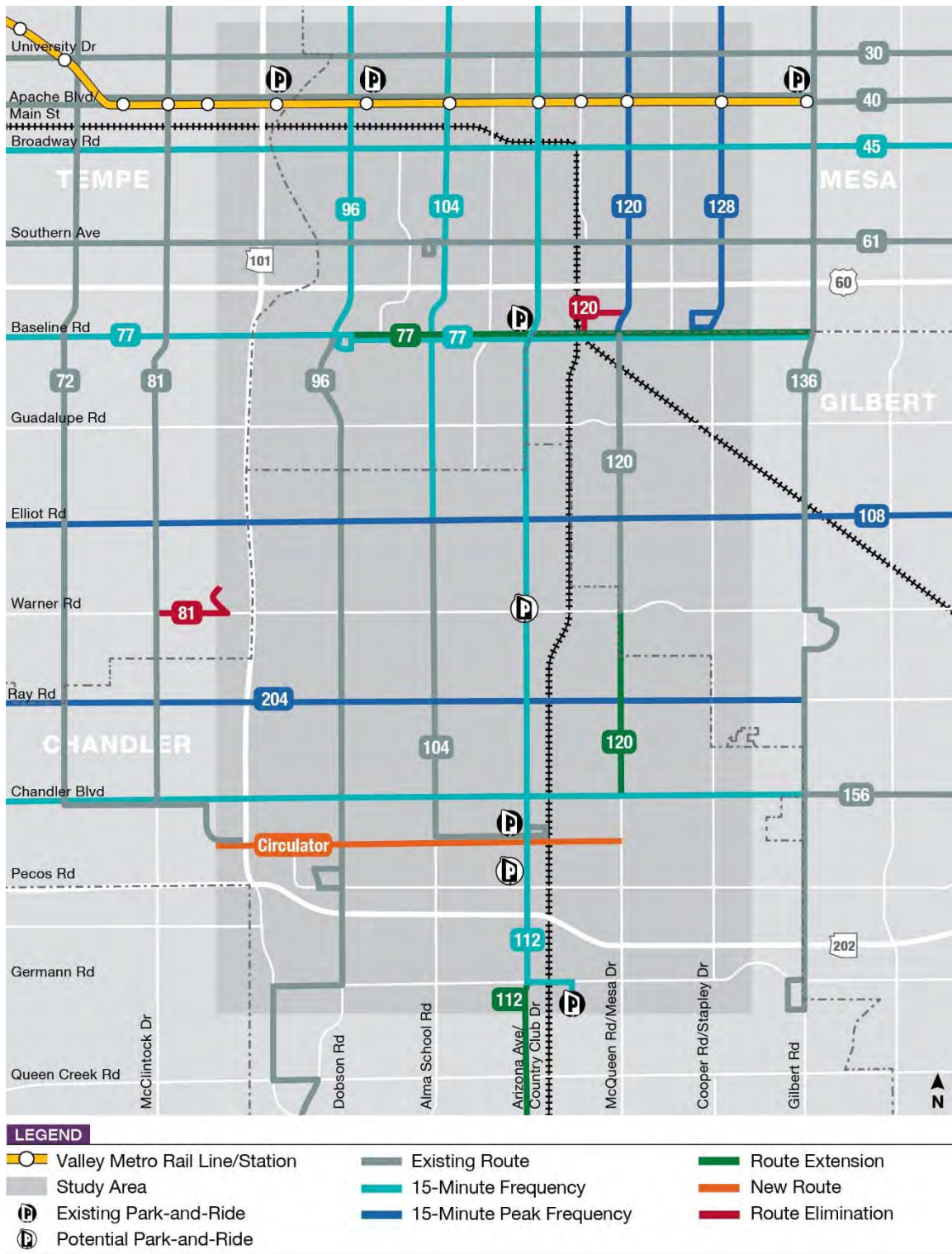
Long-Term

- Builds from all Short- and Mid-Term enhancements.
- Route 77 – extend route to Power Road operating at 30-minute all-day frequency, maintain 15-minute all-day frequency from Dobson Road to Gilbert Road.
- Route 108 – modify route alignment to serve Elliot Road from Val Vista Drive to Power Road.
- Route 112 – decrease to 20-minute frequency once HCT alternative is implemented along Arizona Avenue.

- Route 156 – extend 15-minute all-day frequency to Val Vista Drive.
- Route 204 – extend route from Gilbert Road to Power Road at 30-minute all-day frequency, maintain 15-minute peak frequency from 48th Street to Gilbert Road.
- Guadalupe Road – expand route from Price Road to Power Road with 15-minute peak frequency from Price Road to Gilbert Road and 30-minute frequency from Gilbert Road to Power Road.
- Warner Road – new route from 56th Street to Gilbert Road at 30-minute frequency, increase to 15-minute peak frequency from Price Road to Gilbert Road.
- Queen Creek Road – new route from Price Road to Gilbert Road at 30-minute all-day frequency.
- Downtown Chandler Circulator – increase to 15-minute peak frequency.
- Pecos Road – new route along Pecos Road operating at 30-minute frequency from Ellis Road to Gilbert Road.
- HCT – BRT or LRT service operating at 10-minute peak and 20-minute off-peak frequency south along Dobson Road, traveling east along Southern Avenue and connecting to Arizona Avenue and traveling south, or along Country Club Drive/Arizona Avenue with a connection to the CP/EV line.

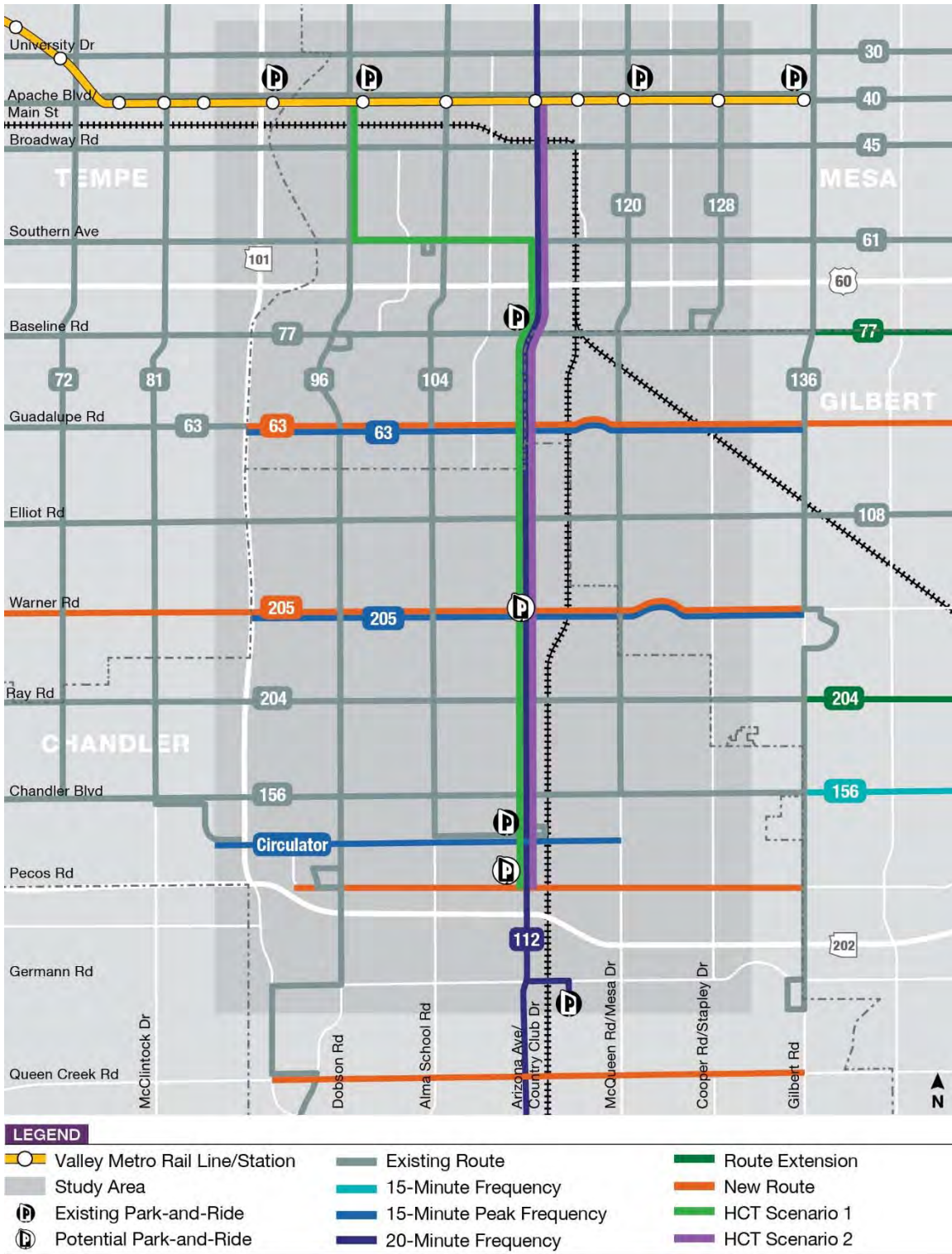
Proposed mid-term transit scenarios are shown in Figure 5 and proposed long-term transit scenarios are shown in Figure 6.

FIGURE 5 MID-TERM TRANSIT SCENARIOS



Source: FDCTCS PMT, 2016

FIGURE 6 LONG-TERM TRANSIT SCENARIOS



Source: FDCTCS PMT, 2016



TABLE 5 ENHANCED BUS SERVICE SCENARIOS

Route	Street Name	Existing (2015)		Short-term (2020)		Mid-term (2030)		Long-term (2040)	
		Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)	Peak (min)	Off-Peak (min)
30	University Drive	30	30	30	30	30	30	30	30
30 ^A		-	-	15	15	15	15	15	15
40	Main Street/Apache Boulevard	30	30	15	15	15	15	15	15
45	Broadway Road	30	30	15	30	15	15	15	15
61	Southern Avenue	15	30	15	15	15	15	15	15
77	Baseline Road	30	30	30	30	30	30	30	30
77 ^A		-	-	-	-	15	15	15	15
81	McClintock Drive	15	30	15	30	15	30	15	30
96	Dobson Road/Alma School Road	30	30	30	30	30	30	30	30
96 ^A		-	-	15	30	15	15	15	15
104	Alma School Road	30	30	30	30	30	30	30	30
104 ^A		-	-	15	30	15	15	15	15
108	Elliot Road	30	30	30	30	15	30	15	30
112	Country Club/AZ Avenue	30	30	15	30	15	15	20	20
120	Mesa Drive	30	30	30	30	15	30	15	30
128	Cooper Road/Stapley Drive	30	30	30	30	15	30	15	30
136	Gilbert Road	30	30	15	30	15	30	15	30
156	Chandler Boulevard	30	30	15	30	15	15	15	15
HCT	1. Dobson Road 2. Country Club Drive	-	-	-	-	-	-	10	20
NEW ^A	Guadalupe Road	-	-	-	-	-	-	30	30
		-	-	-	-	-	-	15	30
NEW ^A	Ray Road	-	-	30	30	30	30	30	30
		-	-	-	-	15	30	15	30
NEW ^A	Warner Road	-	-	-	-	-	-	30	30
		-	-	-	-	-	-	15	30
NEW	Queen Creek Road	-	-	-	-	-	-	30	30
NEW	Chandler Circulator	-	-	-	-	30	30	15	30
NEW	Pecos Road	-	-	-	-	-	-	30	30
Mesa Main Street Link	Mesa Main Street	15	30	0	0	0	0	0	0
Arizona Avenue/Country Club Link	Arizona Avenue	30	30	0	0	0	0	0	0

Bold text indicates enhanced frequency compared to existing service

^AImproved frequency for route segment

Source: Valley Metro, 2016

3.5 HIGH-CAPACITY TRANSIT SCENARIOS

Along with the implementation of new local bus routes, the development of a BRT and/or LRT transit service will be analyzed along the two alignment scenarios for the long-term time period. The Transit Master Plans along with input from the Project Management Team, serve as the base alternative for evaluating potential high-capacity transit in the FDCTCS corridor. This base alternative will be used with both the base and enhanced land use projections within the framework of the MAG regional travel demand model to assess the ridership potential of high-capacity transit alternatives.

3.5.1 MODELING ASSUMPTIONS

The project team will use the base land use data set, which is defined as the MAG POPTAC approved land use within the study area, the 2040 enhanced land use scenarios, combined with highway improvements and transit capacity improvements identified in MAG's adopted 2035 regional transportation plan, and enhanced transit network outputs to determine if a HCT system is optimal in the future. Table 6 provides assumptions of route characteristics including route length, number of stops and station locations, park-and-ride locations as identified in the Arizona Avenue HCT Study, number of vehicles and frequency for proposed BRT and LRT along the two scenarios using base land use information for the long-term time period.

With consideration of enhanced bus service and the enhanced land use data in accordance with this study, proposed BRT or LRT service is recommended for the long-term time frame. The long-term model run will examine LRT transit scenarios consistent with the long-term SEVTSS transit investments, with an additional two model runs that will incorporate an enhanced land use data set. Options for interlining LRT with the Central Phoenix/East Valley (CP/EV) system will be evaluated in Task 6.0. Assumptions of route characteristics including route length, number of stop and station locations, number of vehicles and frequency for proposed BRT and LRT along the two scenarios are shown in Table 6.

TABLE 6 LONG-TERM HIGH-CAPACITY TRANSIT SCENARIOS

Description	Enhanced Land use with BRT		Enhanced Land use with LRT	
	Dobson Road	Country Club Drive/Arizona Avenue	Dobson Road	Country Club Drive/Arizona Avenue
Route Length	10.5	8.5	10.5	8.5
Fleet Quantity	8	6	19	14
Stops/Stations	12	10	12	10
# of Park-and-Rides	2	2	2	2
Park-and-Ride Space	1,000	1,000	1,000	1,000
Headway (Minutes)	10 / 20	10 / 20	10 / 20	10 / 20
Operating Span (Hours)	22	22	22	22

*Headway is shown in peak/off-peak service

Park-and-Ride space is the number of spaces for each park-and-ride lot.

Fleet quantity includes 20% spare ratio.

Source: Valley Metro, 2016

3.6 CONCEPTUAL CROSS SECTIONS

The conceptual cross sections presented in this section demonstrate the existing ROW and conceptual roadway designs for long-term, exclusive guideway HCT transit scenarios at representative locations along Dobson Road, Southern Avenue and Arizona Avenue/Country Club Drive. Dimensions for bike lanes, travel lanes, left/right turn lanes and sidewalk length are subject to change and will be further analyzed in Task 6.0. Table 7 consists of assumed cross section dimensions and should not be considered the final dimensions.

TABLE 7 ASSUMED CROSS SECTION DIMENSIONS

Estimated Widths	Dobson Road	Southern Avenue	Arizona Avenue	Downtown Chandler
BRT/LRT Station (ft.)	17	17	17	None
Track-way (ft.)**	40	40	40	26
Travel Lane (ft.)	11	11 – 12	11– 16	11 – 12
Left Turn Lane (ft.)	10	10	10	None
Bus Bay	None	None	11	None
Bike Lane (ft.)	6	None	6	6
Streetscape (ft.)	14	9 – 14	12	8
Existing ROW (ft.)	110	110	138	100
Proposed ROW (ft.)	142	129 – 134	None	None

**Track-way includes bi-directional tracks and station.

Measurements are in feet.

Valley Metro, 2016

Figure 7 through Figure 14 show conceptual cross sections of proposed LRT and BRT operating in a designated right-of-way, as well as potential station locations. These cross sections are not intended to portray a final design for the areas indicated, but provide a conceptual foundation for further analysis.

FIGURE 7 DOBSON ROAD ALIGNMENT

Dobson South of Broadway Looking North

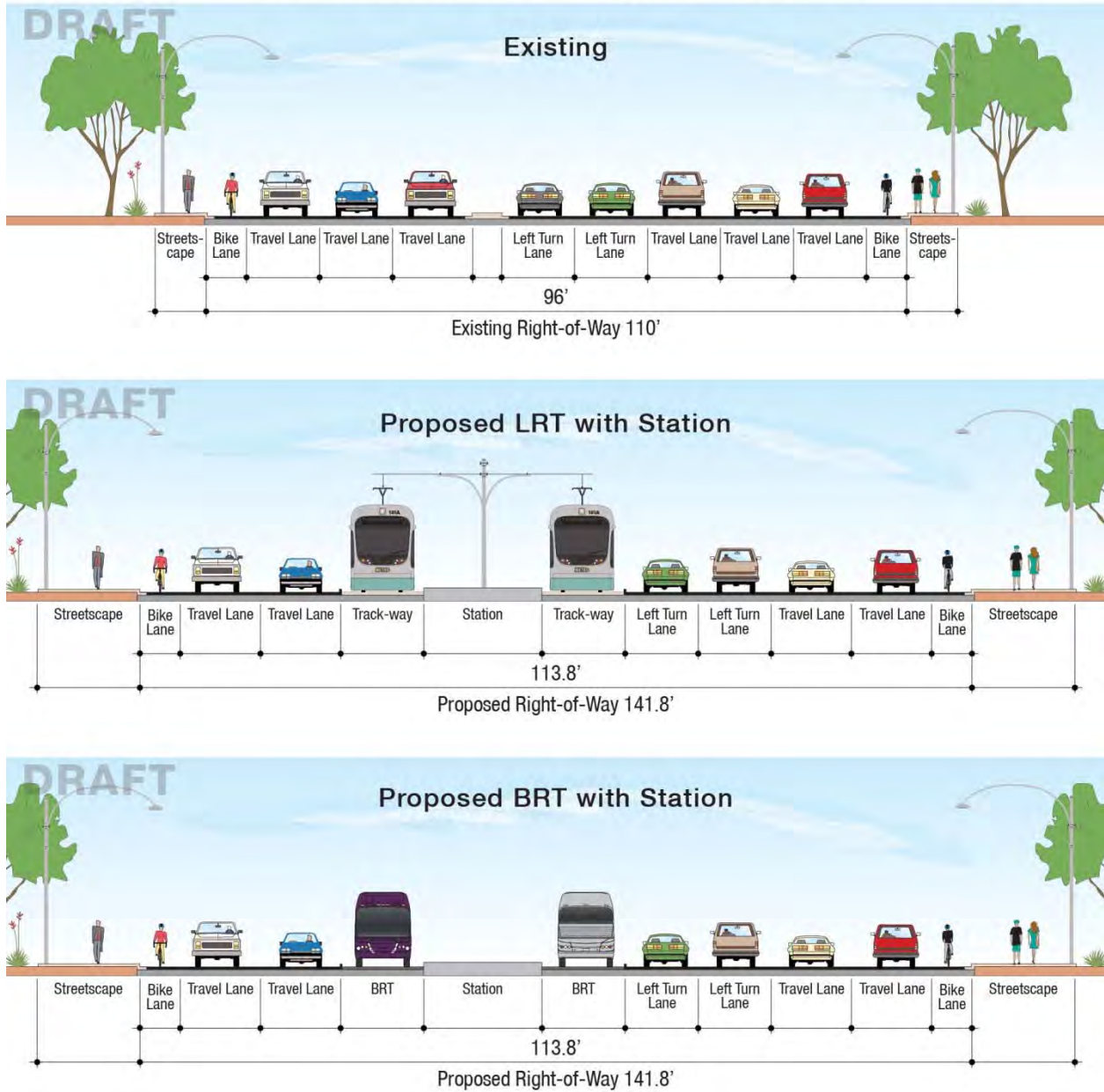


FIGURE 8 SOUTHERN AVENUE ALIGNMENT OPTION 1

Southern East of Dobson Looking East

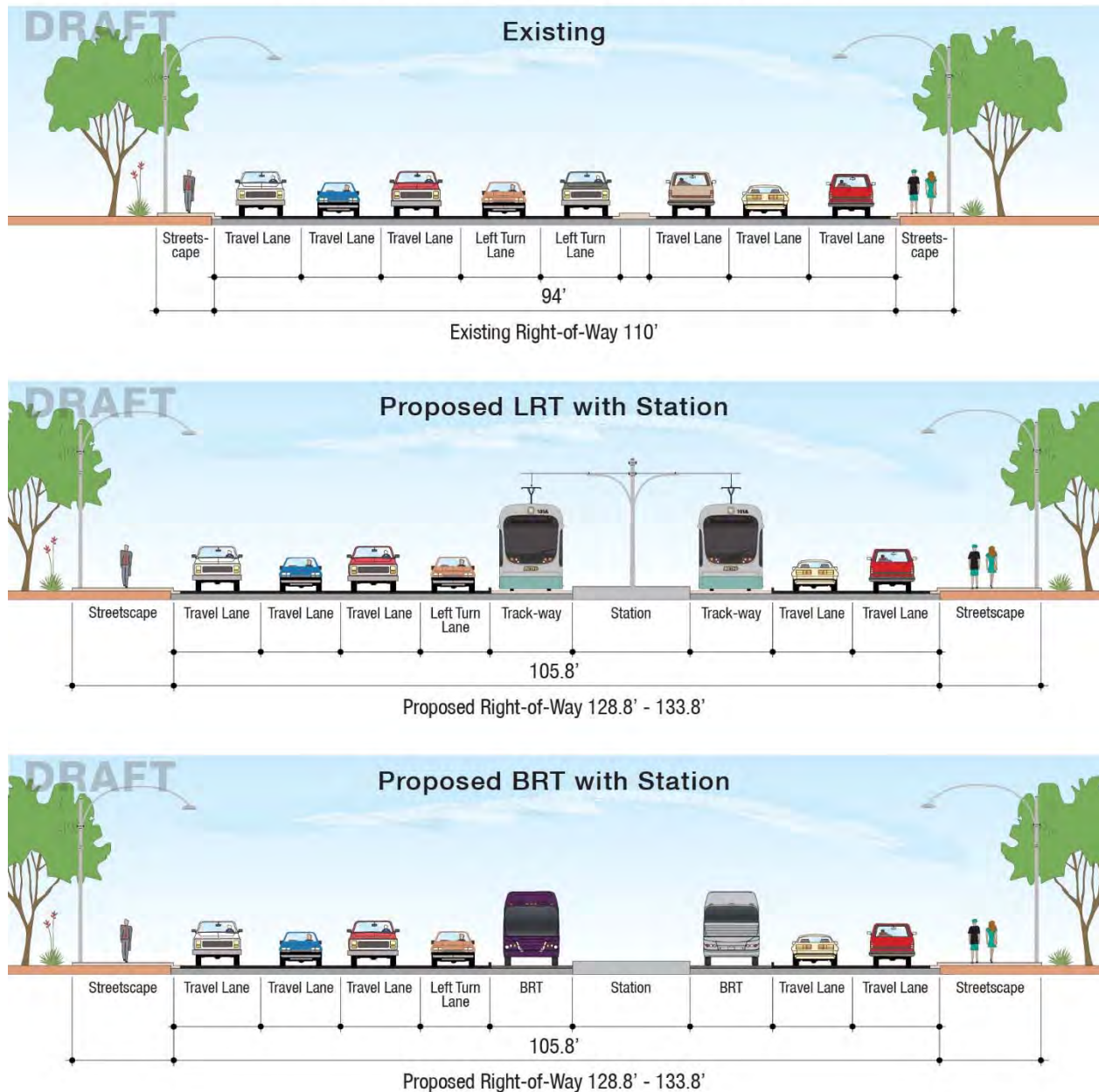


FIGURE 9 SOUTHERN AVENUE ALIGNMENT OPTION 2

Southern East of Dobson Looking East

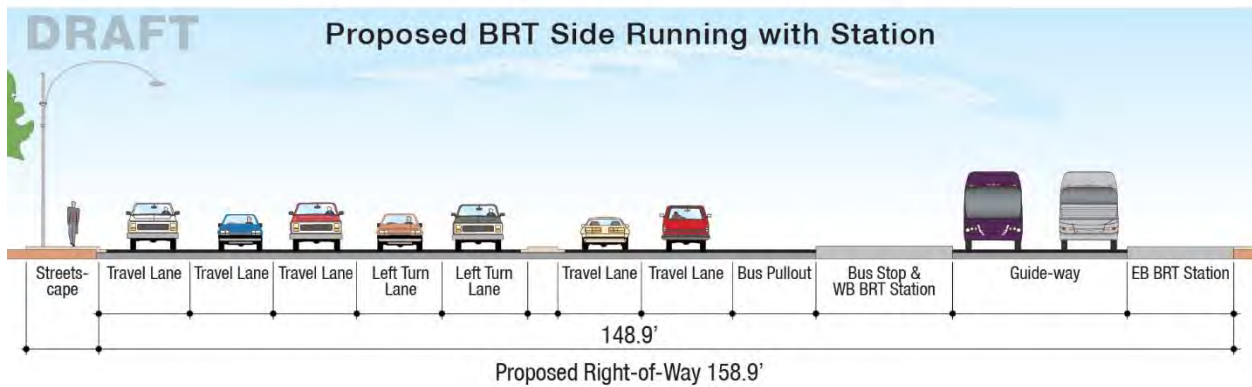
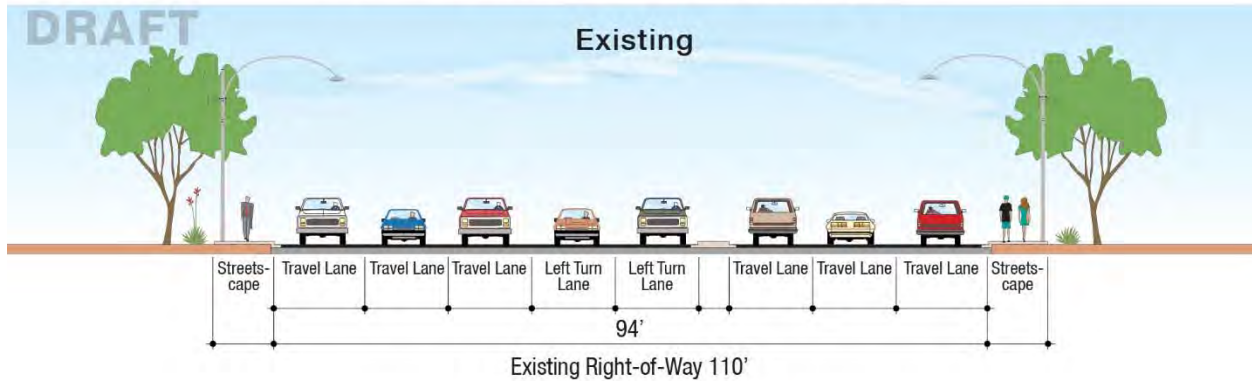


FIGURE 10 SOUTHERN AVENUE ALIGNMENT OPTION 1 (CONTINUED)

Southern Avenue West of Longmore Looking East

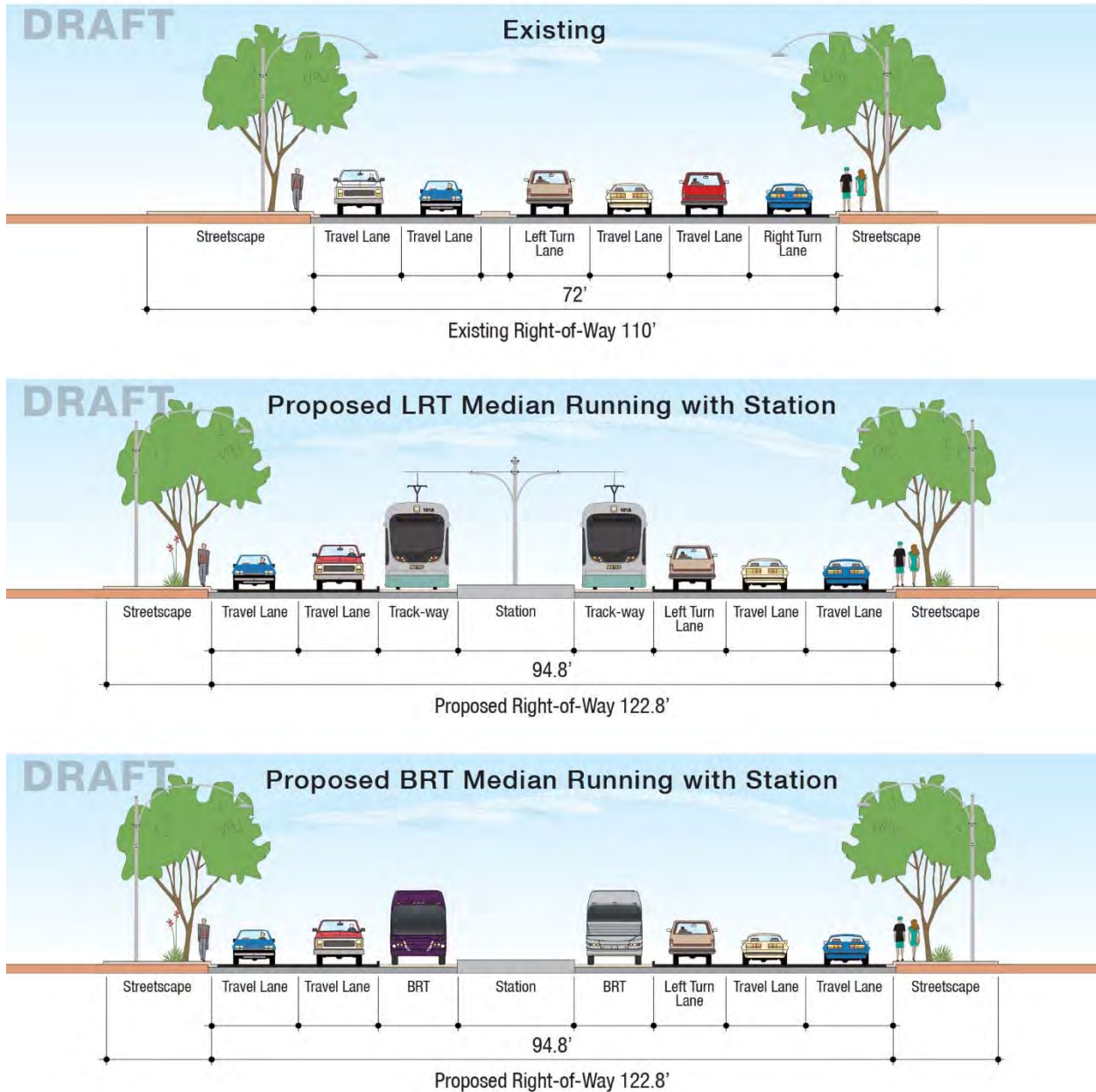


FIGURE 11 SOUTHERN AVENUE ALIGNMENT OPTION 2 (CONTINUED)

Southern Avenue West of Longmore Looking East

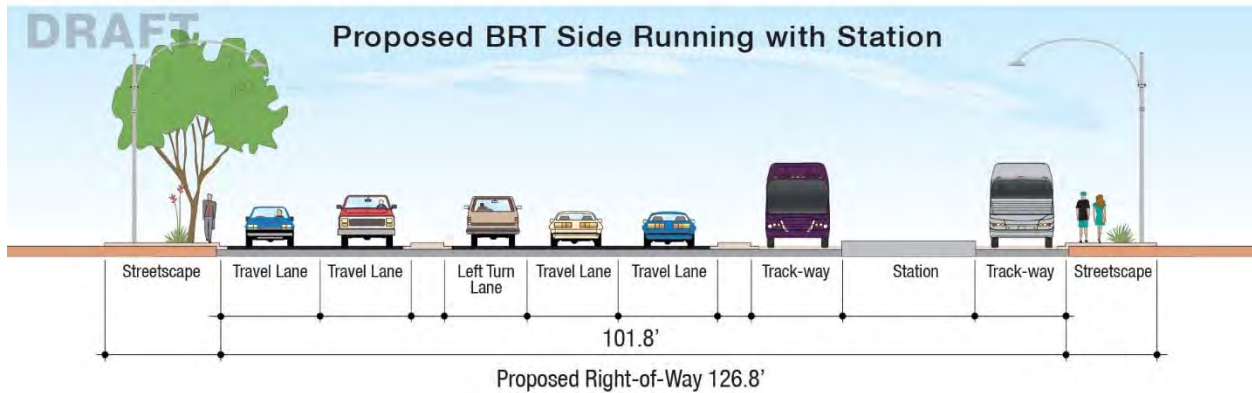
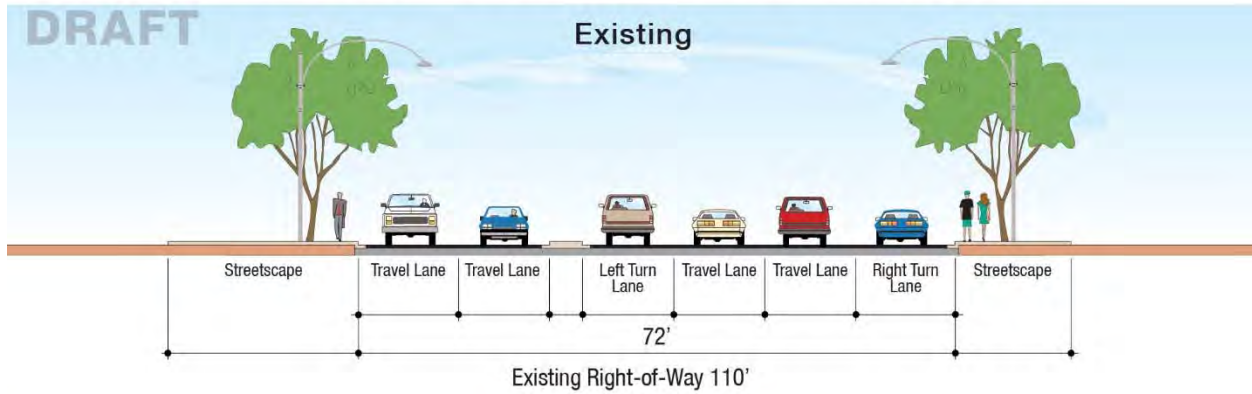


FIGURE 12 ARIZONA AVENUE ALIGNMENT

Arizona Ave South of Chandler Blvd Looking North

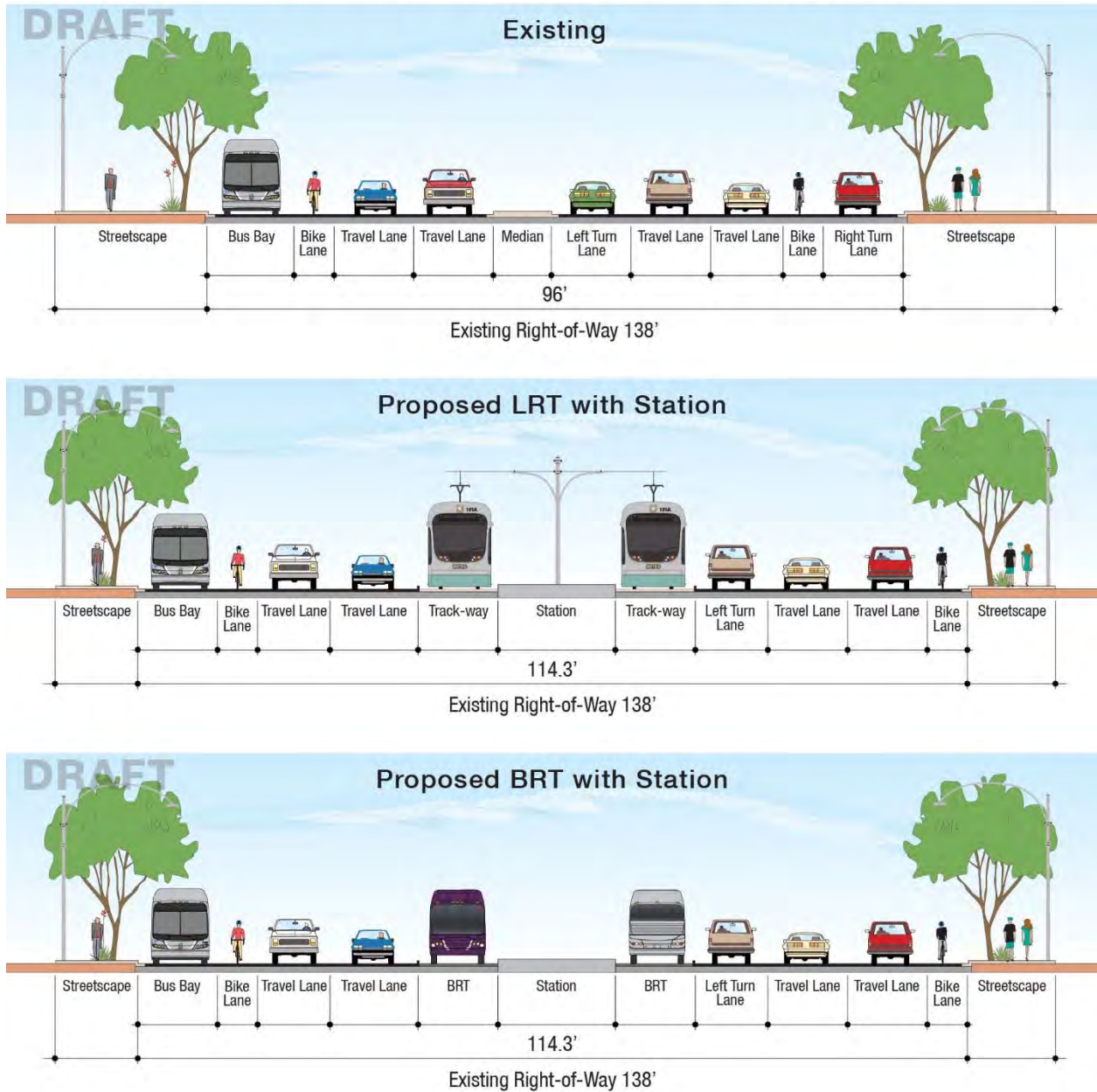


FIGURE 13 DR. A.J. CHANDLER PARK OPTION 1

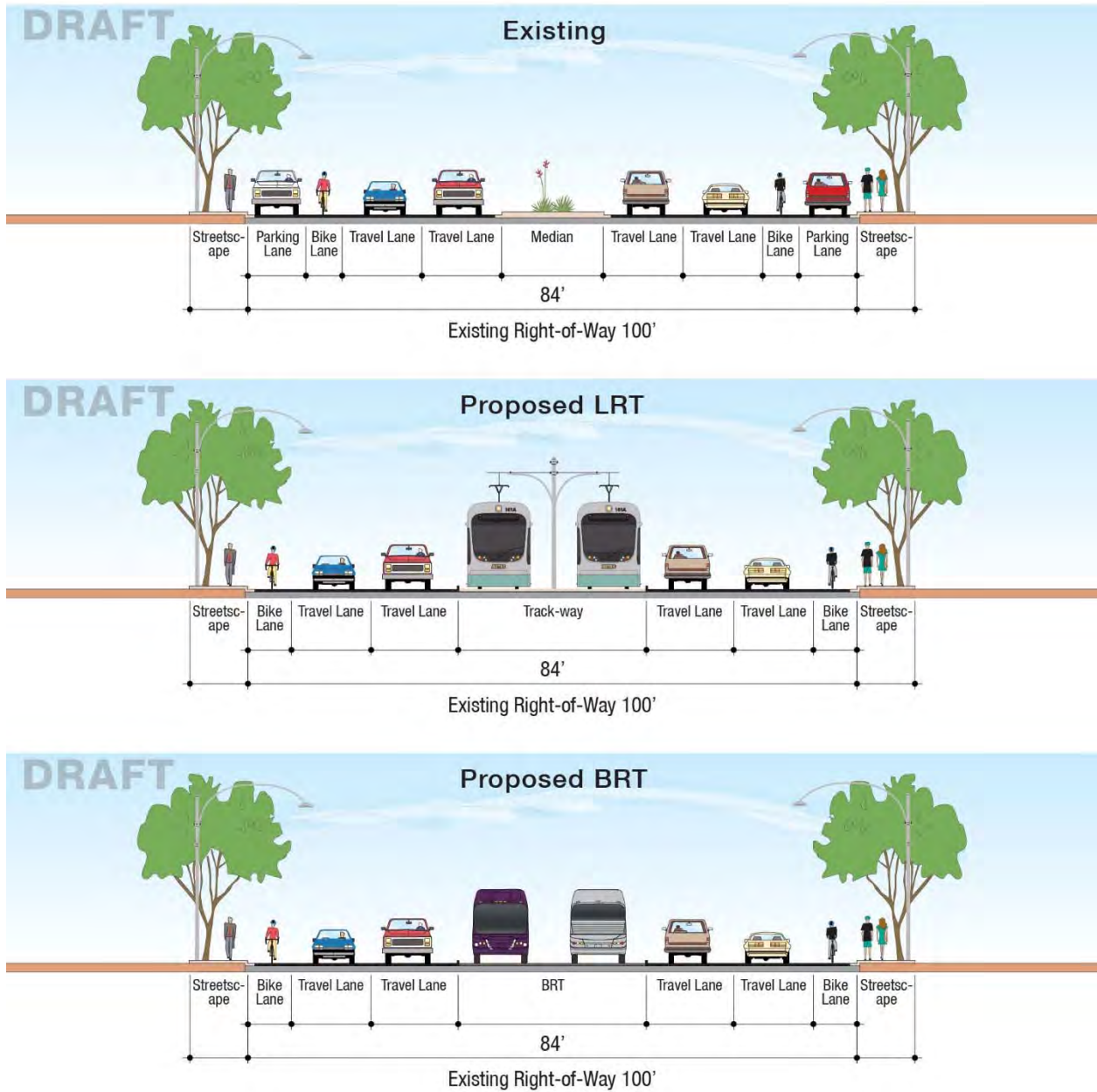
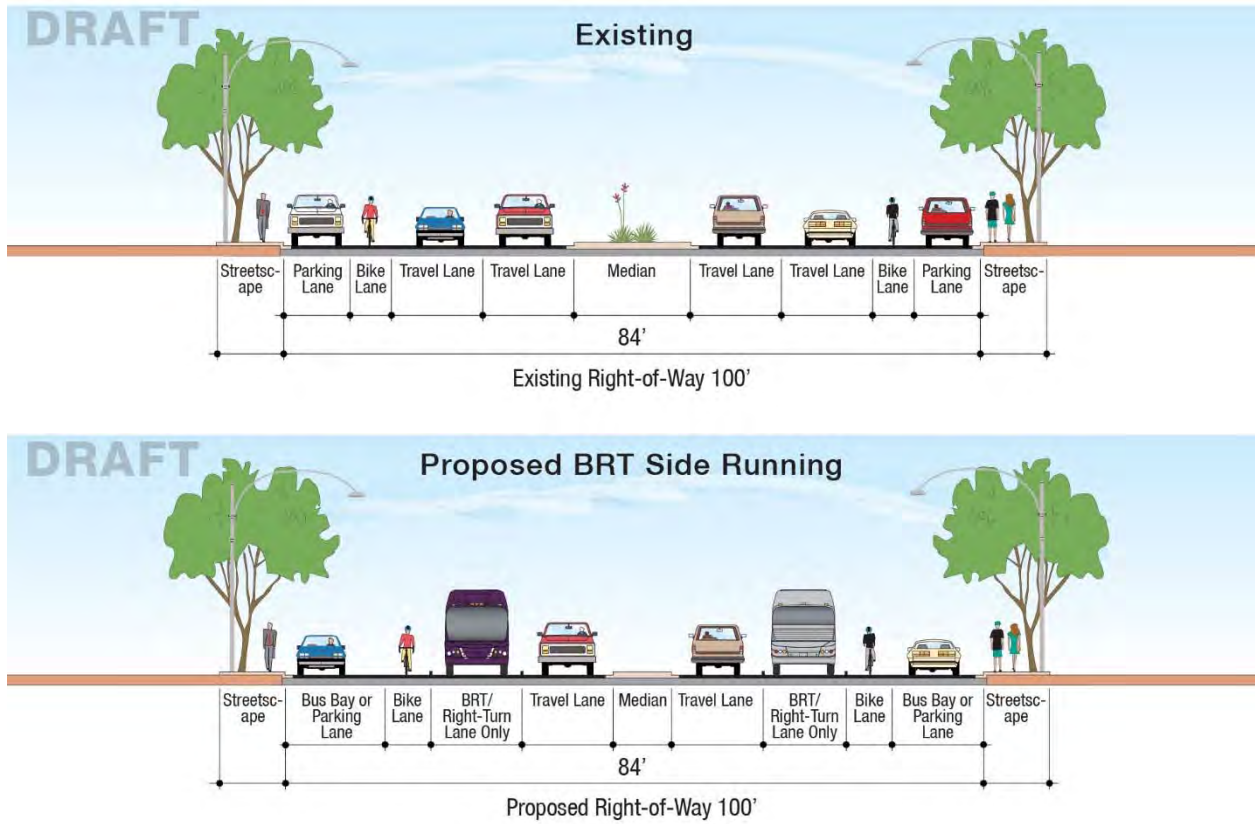


FIGURE 14 DR. A.J. CHANDLER PARK OPTION 2



4.0 COSTS

The implementation of recommended concepts identified in Section 3.0 is dependent on future funding decisions either regionally or locally within the context of Chandler, Gilbert and Mesa municipal budgets. Each community's contributions to Valley Metro's operating budget is predominately derived from their respective allocation of the regional Public Transportation Fund (PTF); however, local general funds and transit fares collected within city limits contribute toward covering capital and operating costs of the transit system.

4.1 CAPITAL COSTS

Costs were estimated for improvements to bus service and to provide HCT service on the two alignment scenarios as defined in Section 3.0. The estimated costs to implement HCT were calculated for individual expense categories based on the US Department of Transportation Federal Transit Administration Standard Cost Categories. Unit costs for each category were developed based on local data such as recent comparable Valley Metro projects. Valley Metro utilizes industry standard and local unit costs to anticipate and forecast future transit expenditures. This method produces "order of magnitude" cost estimates to provide a general framework for review and planning purposes. These capital costs should not be considered a formal estimate of costs and are not for programming purposes.

4.1.2 Enhanced Bus Service Capital Costs

The total estimated capital costs to support the long-term enhanced bus service, which includes the implementation of all recommended service changes, is \$164,360,000. Table 8 shows the itemized cost elements of implementing the enhanced bus service. The needs and costs shown represent the total needs required for the enhanced bus service needed by the 2040 horizon year to support HCT in the study corridor. Fleet and bus stop needs were calculated for each recommended bus enhancement. Fleet requirements for each route were calculated using the industry standard cycle-time formula: $\text{Peak Vehicles} = (\text{Two-way Run Time} + \text{Recovery Time}) / \text{Headway}$. An additional industry standard of 20% for spare vehicles is included in all fleet calculations. A formula of four sheltered stops and four basic stops per linear mile is used for local service on arterial roadways. This formula assumes a bus stop every one-quarter mile with sheltered stops located at major arterial roadway intersections only.

TABLE 8 ENHANCED BUS SERVICE CAPITAL COST ESTIMATE

Cost Element	Unit Cost¹	Total Needs	Total Cost²
Standard Bus (40ft) ³	\$550	269	\$147.84
Circulator Bus (20ft) ³	\$150	10	\$1.44
Basic Bus Stops	\$2	290	\$0.58
Bus Shelters	\$50	290	\$14.50
Total²		\$164.36	

¹Unit costs shown in thousands of 2016 dollars

²Total costs in millions of 2016 dollars.

³Include 20% ratio for spare vehicles.

Source: Valley Metro, 2016.

4.1.3 HCT Capital Costs

Table 9 summarizes the costs estimated for LRT along the two alignment scenarios in the long-term horizon. Similarly, Table 10 summarizes the costs estimated for a BRT mode. Costs were calculated in both tables based on the unit costs for each cost category in current year, 2016 dollars, enabling a comparison of costs across modes and alternative routes. HCT fleet needs were estimated similarly to the calculation for buses used above, which factors the service's headway, dwell time and average travel speed along the corridor. The estimation also includes spare vehicles. Since these costs are based on order of magnitude unit costs, they only represent illustrative examples of a typical LRT or BRT corridor. These costs are provided only for planning and review and not for programming purposes.

TABLE 9 LRT CAPITAL COST ESTIMATE

Cost Category	Alignment Scenario 1 Dobson	Alignment Scenario 2 Country Club
Construction*	\$460	\$369
Right-of-Way ¹	\$129	\$120
Vehicles (19 for Scenario 1, 14 for Scenario 2)	\$111	\$82
Professional Services ²	\$136	\$115
Contingency ³	\$238	\$202
Total	\$1,074	\$888

Total costs in millions of 2016 dollars. Doesn't include finance costs.

*Fare collection systems, park-and-ride, sitework, transit signal priority, operation and maintenance center, LRT stops and guideway are included in the LRT "Construction" cost estimate category.

¹ Based on per mile estimate.

² Approximately 30% of construction cost.

³ Applied approximately 30% at conceptual stage.

Source: Valley Metro, 2016

TABLE 10 BRT CAPITAL COST ESTIMATE

Cost Category	Alignment Scenario 1 Dobson	Alignment Scenario 2 Country Club
Construction*	\$26	\$22
Right-of-Way ¹	\$129	\$120
Vehicles (8 for Scenario 1, 6 for Scenario 2)	\$8	\$6
Professional Services ²	\$8	\$7
Contingency ³	\$51	\$46
Total	\$222	\$201

Total costs in millions of 2016 dollars. Doesn't include finance costs.

*Fare collection systems, park-and-ride, sitework, transit signal priority, operation and maintenance center, BRT stops and guideway are included in the BRT "Construction" cost estimate category.

¹ Based on per mile estimate.

² Approximately 30% of construction cost.

³ Applied approximately 30% at conceptual stage.

Source: Valley Metro, 2016

4.2 OPERATING COSTS

The operating costs for the enhanced bus service scenario and two HCT alternatives with LRT and BRT are presented in this section of the technical memo. The cost for each scenario was calculated by estimating the total revenue miles and then multiplying by a gross-cost per-mile factor. Similar to the capital costs, costs were projected for the short-, mid-, and long-term time periods using a three percent inflation rate. A 15% farebox recovery ratio was applied to the final number for the buses and BRT options and 20% for LRT. Note that the total estimated annual operating costs for the enhanced bus service scenario are conservative estimates and include neither preventive maintenance credits nor alternative fuel tax credits. The total revenue miles for the BRT and LRT concepts were found directly using geospatial analysis of the current proposed alignments from Main Street to Pecos Road. For the enhanced bus service, the existing service as of December 2015 was used as a base to calculate the projected revenue miles in the different time scenarios. It should be noted that the operating costs given in the tables below are an “order-of-magnitude” estimate of the actual cost and may not reflect the actual operating costs in the given time frames.

4.2.1 Enhanced Bus Service Characteristics and Operating Costs

Table 11 below summarizes the annual operating costs for the enhanced local bus scenarios. The operating costs provide an order-of-magnitude estimate for long-term planning purposes only and the operating costs need to be reevaluated if these potential changes are to be implemented in the future. Furthermore, the operating costs do not account for inflation; therefore, actual costs in the future may vary. The annual operating costs are divided into three columns to show the cost of the base service, long-term service and the difference between the two. October 2015 is used as the base service period for all routes except for Route 40 and Route 112, since these local routes will be consolidated with the LINK services in October 2016. The base service period serves as a starting point from which the cost estimates of the different enhancements are calculated. The costs in all time ranges are based on a gross operating cost per revenue mile of \$6.30 for local routes in 2016. A farebox recovery ratio of 15% was assumed for all local services and 0% for all circulator services. The operating costs have been rounded up to the nearest thousand dollars.

TABLE 11 ENHANCED BUS SERVICE TOTAL OPERATING COSTS

Service Type	Annual Operating Costs (Estimates)		
	Base Service ¹	Long-Term Service ²	Difference ³
Weekday	\$27,185,000	\$48,080,000	+\$20,895,000
Weekend	\$6,218,000	\$12,381,000	+\$6,163,000
Total	\$33,403,000	\$60,461,000	+\$27,058,000

Costs are rounded up to the nearest \$1000 2016 dollars.

The reported costs are the total cost for all routes in the study area, which includes costs from jurisdictions outside of the study area.

¹Base service is from October 2015, except for Routes 40, 112, and the LINKs which is from October 2016

²Long-term operating costs are the total annual operating cost for all routes in the study area in the long-term time frame.

³Difference in annual operating costs is the long-term operating cost minus the base service operating cost.

Source: Valley Metro, 2016

The operating costs reported above are the sum of the total route cost for all routes within the study area; therefore, the costs incorporate any portions of a route that may also operate outside of the study area boundary. This method was used to be consistent with the travel demand model, which is run with enhanced bus service characteristics for the entire route. Of all the routes that cross the study area, Mesa, Chandler and Gilbert fund 67% of the base service operating costs using multiple funding sources (e.g. Prop. 400 and general funds). In the long-term the cities would be funding 74%. Of all the proposed enhancements from the base scenario to the long-term, 83% of them are within Mesa Chandler and Gilbert. Appendix A, which includes a summary of the proposed enhanced bus services and operating costs by route in the long-term, serves as a complementary resource to Table 11.

4.2.2 HCT Alternatives Characteristics and Operating Costs

Table 12 summarizes the operating characteristics and costs for LRT. The costs are based on a gross operating cost per revenue mile of \$10.49 in fiscal year 2015 based on the adjusted FY15 Transit Performance Report. A farebox recovery ratio of 20% was assumed.

TABLE 12 LRT OPERATING CHARACTERISTICS AND COSTS

Characteristics	Long-Term	
	Dobson Road	Country Club Drive
Corridor Miles	10.5	8.5
Headway (peak/off-peak mins)	10 / 20	10 / 20
Weekday Span (hrs)	22	22
Trips/Hour (per direction)	6 / 3	6 / 3
Net Daily Trips	198 / 132	198 / 132
Net Annual Revenue Miles ¹	1,358,280	1,099,560
Total Estimated Net Annual Operating Cost ²	\$11.39	\$9.22

Costs are rounded up to the nearest \$1000 2016 dollars.

Includes service Monday through Sunday.

¹ Assumes 2-vehicle consists.

² Assumes a 20% farebox recovery. Total net operating annual operating costs in millions.

Source: Valley Metro, 2016

Similarly, Table 13 summarizes the operating characteristics and costs for BRT. The costs are based on a gross operating cost per revenue mile of \$6.30 in fiscal year 2015 based on the adjusted FY15 Transit Performance Report. A farebox recovery ratio of 20% was assumed.

TABLE 13 BRT OPERATING CHARACTERISTICS AND COSTS

Characteristics	Long-Term (YOE 2040)	
	Dobson Road	Country Club Drive
Corridor Miles	10.5	8.5
Headway (mins)	10 / 20	10 / 20
Weekday Span (hrs)	22	22
Trips/Hour (per direction)	6 / 3	6 / 3
Net Daily Trips	198 / 132	198 / 132
Net Annual Revenue Miles	1,358,280	1,099,560
Total Estimated Annual Operating Cost ¹	\$6.85	\$5.54

Costs are rounded up to the nearest \$1000 2016 dollars.

Includes service Monday through Sunday.

¹Total net operating annual operating costs in millions.

Source: Valley Metro, 2016

5.0 SUMMARY AND NEXT STEPS

In general, transportation improvements within the study area revolve around the enhancements to well-performing local and key local bus routes to meet the operation standards identified in the TSPM. As noted in the SEVTSS, routes exemplifying high ridership and demand are recommended to have increased service frequency in the short-term (2020). Increased frequency, expanded service and the implementation of new local bus routes are proposed for the mid- (2030) and long-term (2040) time periods.

Two potential HCT alignment scenarios have been identified for the long-term timeframe; (1) along the Fiesta alignment from the existing Central Phoenix/East Valley (CP/EV) light rail corridor south along Dobson Road, east along Southern Avenue with a connection to Arizona Avenue, to Pecos Road south of downtown Chandler; and (2) the Arizona Avenue/Country Club Drive alignment south from CP/EV at Country Club/Arizona Avenue to Downtown Chandler and Pecos Road south of downtown Chandler. A comparison of the estimated capital and operating costs for the proposed BRT and LRT concepts was conducted as part of this phase of the study and documented in this technical memorandum.

The next steps in the study process will include conducting a detailed evaluation of the long-term scenario summarized herein. The evaluation will be conducted as part of Task 6.0 (Evaluation of Transit Alignment/Routing Alternatives), and will include a comparison of potential benefits such as transit ridership and cost effectiveness.

APPENDIX A PROPOSED LONG-TERM ENHANCED BUS SERVICE CONCEPTS BY ROUTE

Route No.	Description	Service Type	Frequency (minutes)	Duration	From ¹	To ²	Along ³	Differences between Long-Term Service and Existing Base Service			
								Rev. Miles	Gross Cost ⁴	Farebox ⁴	Operating Cost ⁴
30	University Local Route	Weekday	30	All Day	South Mtn Com College	Sycamore / Main St	32nd St / Univ	223,000	\$1,392,000	-\$207,000	\$1,185,000
			15	All Day	Sycamore / Main St	Gilbert Rd	University Dr				
			30	All Day	Gilbert Rd	Sossaman Rd	University Dr				
		Saturday	30	All Day	South Mtn Com College	Sossaman Rd	32nd St / University Dr				
		Sunday									
40	Apache / Main St Local Route	Weekday	30	All Day	Price Rd	Mesa Dr	Main St	0	\$0	\$0	\$0
			15	All Day	Mesa Dr	Superstition Springs TC	Main St				
		Saturday	30	All Day	Price Rd	Superstition Springs TC	Main St				
		Sunday					Main St				
45	Broadway Local Route	Weekday	15	All Day	19th Ave	Superstition Springs TC	Broadway Rd	523,000	\$3,281,000	-\$489,000	\$2,792,000
		Saturday	30	All Day	19th Ave	Superstition Springs TC	Broadway Rd				
		Sunday									
61	Southern Local Route	Weekday	15	All Day	43rd Ave	Superstition Springs TC	Southern Ave	285,000	\$1,794,000	-\$268,000	\$1,526,000
		Saturday	30	All Day	43rd Ave	Superstition Springs TC	Southern Ave				
		Sunday									
77	Baseline Local Route	Weekday	15	All Day	75th Ave	Gilbert Rd	Baseline Rd	814,000	\$5,096,000	-\$759,000	\$4,337,000
			30	All Day	Gilbert Rd	Power Rd	Baseline Rd				
		Saturday	30	All Day	75th Ave	Power Rd	Baseline Rd				
		Sunday									
96	Dobson Local Route	Weekday	15	All Day	Mesa Riverview	Baseline Rd	Dobson Rd	78,000	\$485,000	-\$71,000	\$414,000
			30	All Day	Baseline Rd	Fulton Ranch Blvd & Basha Rd	Dobson Rd / Other				
		Saturday	30	All Day	Mesa Riverview	Pecos Rd	Dobson Rd				
		Sunday									
104	Alma School Local Route	Weekday	15	All Day	Mesa Riverview	Elliot Rd	Alma School Rd	154,000	\$942,000	-\$136,000	\$806,000
			30	All Day	Elliot Rd	Chandler Blvd	Alma School Rd				
		Saturday	30	All Day	Mesa Riverview	Chandler Blvd	Alma School Rd				
		Sunday									

⁴ Dollar values reported based on 2016 cost per mile rates and do not account for inflation

(Table Continued on the Next Page)

Route No.	Description	Service Type	Frequency (minutes)	Duration	From ¹	To ²	Along ³	Differences between Long-Term Service and Existing Base Service			
								Rev. Miles	Gross Cost ⁴	Farebox ⁴	Operating Cost ⁴
108	Elliot / 48th St Local Route	Weekday	15/30	Peak / Off Peak	Chandler Blvd	Power Rd	48th St/ Elliot Rd	173,000	\$1,062,000	-\$154,000	\$908,000
		Saturday	30	All Day	Chandler Blvd	Power Rd	48th St/ Elliot Rd				
		Sunday									
112	Country Club / Arizona Ave Local Route	Weekday	20	All Day	McKellips Rd	Ocotillo Rd	Country Club Dr / Arizona Ave	71,000	\$439,000	-\$64,000	\$375,000
		Saturday	30	All Day	McKellips Rd	Chandler PNR	Country Club Dr / Arizona Ave				
		Sunday									
120	Mesa Dr / McQueen Local Route	Weekday	15/30	Peak / Off Peak	Brown Rd	Baseline Rd	Mesa Dr	193,000	\$1,177,000	-\$170,000	\$1,007,000
			30	All Day	Baseline Rd	Chandler Blvd	McQueen Rd				
		Saturday	30	All Day	Brown Rd	Chandler Blvd	Mesa Dr / McQueen Rd				
		Sunday									
128	Stapley / Cooper Local Route	Weekday	15/30	Peak / Off Peak	McKellips Rd	Baseline Rd	Stapley Dr	95,000	\$574,000	-\$83,000	\$491,000
		Saturday	30	All Day	McKellips Rd	Baseline Rd	Stapley Dr				
		Sunday									
136	Gilbert Rd Local Route	Weekday	30	All Day	Gilbert Rd / McDowell PNR	Main St	Gilbert Rd	136,000	\$837,000	-\$124,000	\$713,000
			15/30	Peak / Off Peak	Main St	Elliot Rd	Gilbert Rd				
			30	All Day	Elliot Rd	Germann Rd	Gilbert Rd				
		Saturday	30	All Day	Gilbert Rd / McDowell PNR	Germann Rd	Gilbert Rd				
		Sunday									
156	Chandler Blvd / Williams Field Local Route	Weekday	15	All Day	48th St	Val Vista Dr	Chandler Blvd	252,000	\$1,568,000	-\$233,000	\$1,335,000
			30	All Day	Val Vista Dr	ASU Polytechnic	Chandler Blvd				
		Saturday	30	All Day	48th St	ASU Polytechnic	Chandler Blvd				
		Sunday									
204	Ray Rd Local Route	Weekday	15/30	Peak / Off Peak	48th St	Gilbert Rd	Ray Rd	453,000	\$2,834,000	-\$421,000	\$2,413,000
			30	All Day	Gilbert Rd	Power Rd	Ray Rd				
		Saturday	30	All Day	48th St	Power Rd	Ray Rd				
		Sunday									

⁴ Dollar values reported based on 2016 cost per mile rates and do not account for inflation

(Table Continued on the Next Page)

Route No.	Description	Service Type	Frequency (minutes)	Duration	From ¹	To ²	Along ³	Differences between Long-Term Service and Existing Base Service			
								Rev. Miles	Gross Cost ⁴	Farebox ⁴	Operating Cost ⁴
New	Chandler Circulator	Weekday	15/30	Peak / Off Peak	Chandler Fashion Center TC	McQueen Rd	Frye Rd	85,000	\$475,000	\$0	\$475,000
New	Guadalupe Rd Local Route	Weekday	15/30	Peak / Off Peak	Price Rd	Gilbert Rd	Guadalupe Rd	348,000	\$2,183,000	-\$325,000	\$1,858,000
			30	All Day	Gilbert Rd	Power Rd	Guadalupe Rd				
		Saturday Sunday	30	All Day	Price Rd	Power Rd	Guadalupe Rd				
New	Warner Rd Local Route	Weekday	15/30	Peak / Off Peak	Price Rd	Gilbert Rd	Warner Rd	265,000	\$1,654,000	-\$245,000	\$1,409,000
			30	All Day	56th St	Price Rd	Warner Rd				
		Saturday Sunday	30	All Day	56th St	Gilbert Rd	Warner Rd				
New	Queen Creek Rd Local Route	Weekday	30	All Day	Price Rd	Gilbert Rd	Queen Creek Rd	123,000	\$763,000	-\$113,000	\$650,000
		Saturday									
		Sunday									
New	Pecos Rd Local Route	Weekday	30	All Day	Ellis Rd	Gilbert Rd	Pecos Rd	316,000	\$1,984,000	-\$296,000	\$1,688,000
		Saturday									
		Sunday									
Notes: Numbers are rounded up to the nearest 1000 ¹ From is where the route begins from either the north or west direction ² To is where the route ends from either the south or east direction ³ Along is the road where the route operate along ⁴ Dollar values reported based on 2016 cost per mile rates and do not account for inflation ⁵ 10% Contingency buffers the costs of deviations / service areas and loss of revenue miles.							10% Contingency ⁵	503,000	\$3,133,000	-\$457,000	\$2,676,000
							Total	5,090,000	\$31,673,000	-\$4,615,000	\$27,058,000



APPENDIX C

ECONOMIC DEVELOPMENT BROCHURE

Union at Roosevelt

Roosevelt St and 1st Ave, Phoenix



Land Use:	Mixed use
Stories:	5
Parcel Size:	50,465 sq. ft (1.16 acres)
Dwelling Units:	60
DU/Ac:	52
Usable sq. ft.:	141,223
FAR:	2.80

Alta Steelyard

Frye Rd and Washington St, Chandler



Land Use:	Multi-family Housing
Stories:	4
Parcel Size:	279,132 sq. ft. (6.41 acres)
Dwelling Units:	301
DU/Ac:	47
Usable sq. ft.:	396,885
FAR:	1.42

The Motley

Apache Blvd and Dorsey Ln, Tempe



Land Use:	Mixed use
Stories:	5
Parcel Size:	291,182 sq. ft. (6.68 acres)
Dwelling Units:	399
DU/Ac:	60
Usable sq. ft.:	333,230
FAR:	1.14

The Muse

McDowell Rd and Central Ave, Phoenix



Land Use:	Mixed use
Stories:	5
Parcel Size:	245,310 sq. ft. (5.61 acres)
Dwelling Units:	367
DU/Ac:	65
Usable sq. ft.:	328,154
FAR:	1.34

iLuminate Apartments

Roosevelt St and 3rd St, Phoenix



Land Use:	Multi-family Housing
Stories:	5
Parcel Size:	41,160 sq. ft. (0.95 acres)
Dwelling Units:	111
DU/Ac:	117
Usable sq. ft.:	166,703
FAR:	4.05

Linear Apartments

Roosevelt St and 3rd St, Phoenix



Land Use:	Multi-family Housing
Stories:	5
Parcel Size:	41,880 sq. ft. (0.96 acres)
Dwelling Units:	104
DU/Ac:	108
Usable sq. ft.:	175,356
FAR:	4.19

Phoenix Police Forensics Lab

Washington St and 7th Ave, Phoenix



Land Use:	Office/Public
Stories:	3
Parcel Size:	86,931 sq. ft. (1.99 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	104,000
FAR:	1.20

Tempe Gateway

Mill Ave and 3rd St



Land Use:	Mixed use
Stories:	8
Parcel Size:	154,267 sq. ft. (3.54 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	259,365
FAR:	1.68

Papago Gateway Center (First Solar)

Washington St and Mill Ave, Tempe



Land Use:	Office
Stories:	6
Parcel Size:	218,299 sq. ft. (5.01 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	267,000
FAR:	1.22

Broadway 101 Commerce Park

Broadway Rd and Dobson Rd, Mesa



Land Use:	Light Industrial
Stories:	1
Parcel Size:	2,967,042 sq. ft. (68 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	1,021,364
FAR:	0.34

College Ave Commons

College Ave and 7th St, Tempe



Land Use:	Education
Stories:	7
Parcel Size:	93,656 sq. ft. (2.15 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	175,175
FAR:	1.87

Walter Cronkite Building

Central Ave and Taylor St, Phoenix



Land Use:	Education
Stories:	7
Parcel Size:	101,386 sq. ft. (2.33 acres)
Dwelling Units:	0
DU/Ac:	0
Usable sq. ft.:	130,500
FAR:	1.29

APPENDIX D
TECHNICAL MEMORANDUM 3



Technical Memorandum No. 3 Scenario Evaluation

Fiesta-Downtown Chandler Transit Corridor Study

December 2016





TABLE OF CONTENTS

1.0	PROJECT PURPOSE	1
1.1	Project Development Process.....	1
1.2	Definition of Alternatives	3
2.0	TIER 1 EVALUATION	6
2.1	Study Area Characteristics	7
2.2	Consistency with Existing Plans.....	14
2.3	Environmental Considerations	23
3.0	TIER 2 EVALUATION	25
3.1	Travel Forecasting	25
3.2	Evaluation Criteria	30
3.3	Capital Costs Evaluation.....	32
4.0	CONCLUSION	34



LIST OF FIGURES

Figure 1	HCT Transit Scenarios (2040)	2
Figure 2	2015 Population per Square Mile	7
Figure 3	2040 Population per Square Mile	8
Figure 4	2015 Employment per Square Mile	10
Figure 5	2040 Employment per Square Mile	11
Figure 6	Population with Zero and One Car-Households	13
Figure 7	Mesa 2040 General Plan – Character Areas	15
Figure 8	Short-term Transit Enhancements	16
Figure 9	Mid-term Transit Enhancements Option 1	17
Figure 10	Mid-term Transit Enhancements Option 2	18
Figure 11	Long-term Transit Enhancements Option 1	19
Figure 12	Long-term Transit Enhancements Option 2	20
Figure 13	Alternative Transportation Modes Map	21
Figure 14	City of Chandler Circulation Map	22
Figure 15	City of Chandler Long-term Transit Improvements	23
Figure 16	Long-term Transit Scenarios	26

LIST OF TABLES

Table 1	Downtown Chandler Alignment Alternatives	5
Table 2	Population Growth	6
Table 3	Employment Growth	9
Table 4	Transit-Dependent Population	12
Table 5	Potential Section 4(f) Properties	24
Table 6	Inputs Used in STOPS	28
Table 7	Population and Employment	29
Table 8	Population and Employment Percent Change (2015 - 2014)	29
Table 9	Additional Parameters Used in STOPS	30
Table 10	Tier 2 Evaluation Criteria for HCT	30
Table 11	2040 Ridership Projections	31
Table 12	Capital Cost Estimates (2016)	33
Table 13	Light Rail Scenario Evaluation	34

1.0 PROJECT PURPOSE

The purpose of this technical memorandum is to select one of two scenarios shown in Figure 1, based on qualitative and quantitative analysis to move forward as the preferred high-capacity transit (HCT) corridor for further evaluation. This document will present the Tier 1 and Tier 2 evaluation of the transit scenarios defined for HCT in the Fiesta-Downtown Chandler Corridor study. The memorandum also includes general design concepts within the corridor for future decision-making consideration.

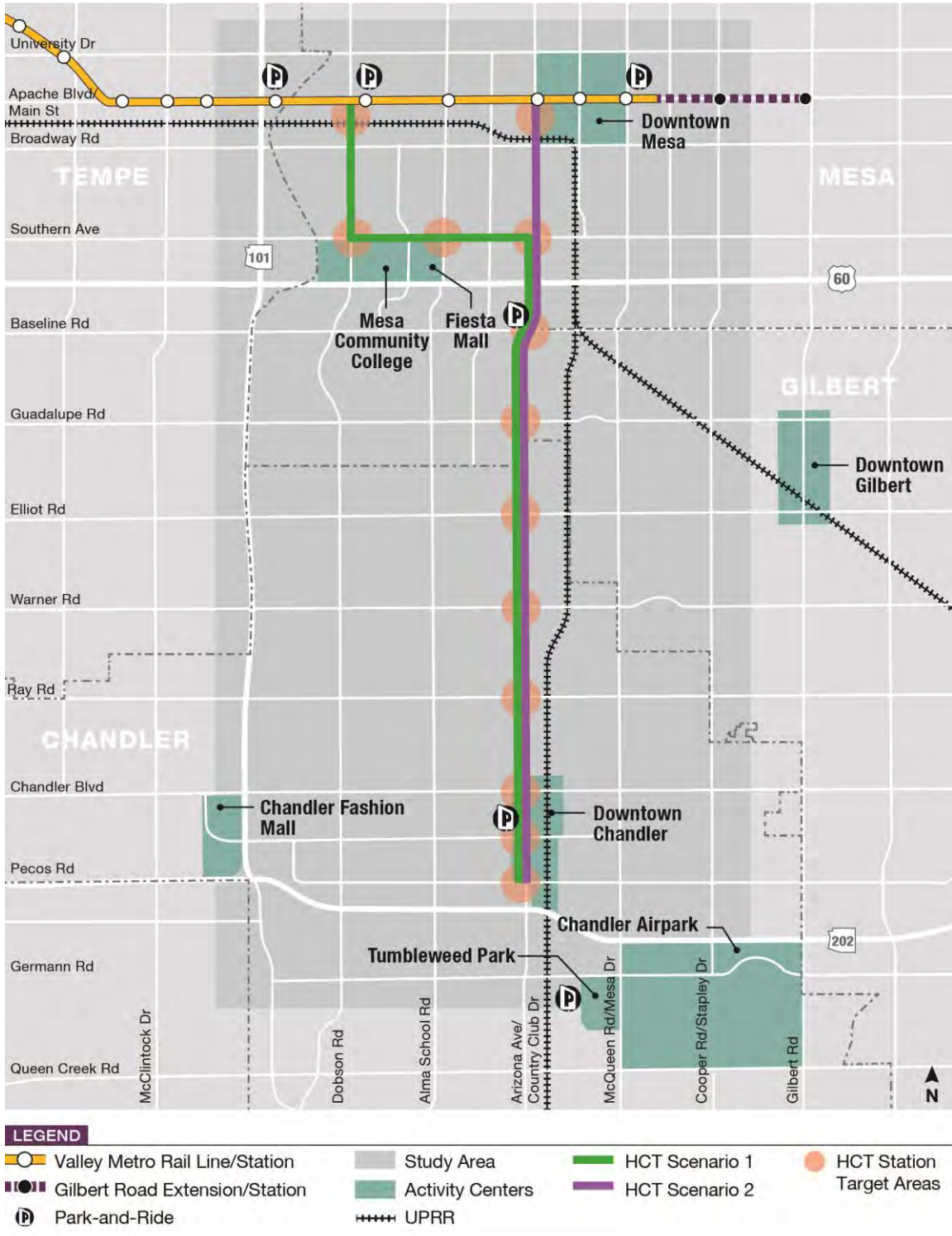
A formal Alternatives Analysis and Environmental Analysis will be required at a later date to determine the transit technology, alignment, station, and park-and-ride locations if a project is advanced in the future. A preliminary evaluation of federal funding competitiveness will be completed as part of the final screening process that will include steps that the member agencies and the region can take to make the corridor more competitive. Opportunities for phasing the project will be identified for developing HCT in an incremental approach to meet passenger demand and funding availability.

1.1 PROJECT DEVELOPMENT PROCESS

A two-tiered alternatives development process is being used to evaluate the conceptual alternatives for the Fiesta-Downtown Chandler Study area. The purpose of the initial screening (Tier 1) is to determine which of the scenarios will be most feasible using qualitative measures, thus narrowing down the range of options to be considered for future analysis. Conceptual assessment that evaluates the long list of transit scenarios using qualitative criteria includes consistency with existing plans, employment and activity centers, Project Management Team (PMT) input (enhanced land use workshop), operational considerations to the (CP/EV) light rail (LRT) Starter Line and environmental considerations.

The final screening (Tier 2) is intended to quantify each HCT transit scenario, expanding on assumptions identified in Task 4.0 and ridership projections. A detailed assessment that evaluates the short list of transit scenarios using quantitative criteria includes existing and projected ridership and capital costs. Using this approach for the development process will ultimately result in a better performing HCT alternative that will move forward for further analysis.

FIGURE 1 HCT TRANSIT SCENARIOS (2040)



Source: Valley Metro, 2016

1.2 DEFINITION OF ALTERNATIVES

The following provides a detailed description of the two HCT Scenarios identified in Figure 1; including alignment options, connections to activity centers, potential station locations and roadway configuration. Note, HCT Scenario 1 and HCT Scenario 2 share the same alignment options and station locations along Country Club Drive/Arizona Avenue between Southern Avenue and Pecos Road. Therefore, HCT Scenario 1 describes alignment options between Main Street and Baseline Road, and HCT Scenario 2 describes alignment options along Country Club Drive/Arizona Avenue from Baseline Road to Pecos Road (these options are the same for both scenarios). There are five alignment options proposed for downtown Chandler along Arizona Avenue between Chandler Boulevard and Pecos Road as described below.

1.2.1 HCT Scenario 1 – Dobson Rd./Southern Ave./Country Club Dr./Arizona Ave.

The Dobson Road alignment is 10.5 miles in length beginning at Main Street and Dobson Road traveling south to connect to Southern Avenue and travelling two-miles east to Country Club Drive, where it turns south to an end-of-line (EOL) station at Pecos Road in downtown Chandler. Along Dobson Road between Main Street and Southern Avenue, the roadway will be converted from three to two through lanes in each direction and will maintain the existing bike lanes. The trackway is median running and will be grade separated with an elevated trackway at the Union Pacific Railroad (UPRR) crossing. Southern Avenue will maintain two through lanes in each direction, as well as existing bike lanes. The trackway is median running with center stations, which follow the original light rail line Central Phoenix/East Valley (CP/EV) design standards. As the HCT scenario turns south on Country Club Drive from Southern Avenue, the roadway maintains three through lanes and bike lanes with the trackway median running from Southern Avenue to Baseline Road. The bridge over the US 60 will maintain all through lanes and turn lanes.

Station Descriptions

Twelve potential station locations are identified along HCT Scenario 1, four of which serve the Fiesta District and are not shared with the HCT Scenario 2 station options. The first proposed station is on Dobson Road immediately south of Main Street near 1st Avenue. The second station proposed is along the Southern Avenue corridor, located at the southeast corner of Dobson Road and Southern Avenue just north of Mesa Community College (MCC). This station will also serve as a bus connection for Local Route 61 that operates along Southern Avenue and is one of the highest performing local bus routes in the cities of Tempe and Mesa. Another station under consideration for HCT Scenario 1 is located at Alma School Road, which will provide access to Fiesta Mall and MCC. The following station location is near the Southern Avenue and Country Club Drive

intersection, directing the trackway to turn south along Country Club Drive with the station positioned on Country Club Drive. Descriptions of alignment scenarios and proposed station locations for the remainder of the corridor along Country Club Drive/Arizona Avenue, from Baseline Road to Chandler Boulevard are included under HCT Scenario 2 and from Chandler Boulevard to Pecos Road for the Downtown Chandler alternatives.

1.2.2 HCT Scenario 2

The Country Club Drive/Arizona Avenue alignment is 8.5 miles in length, beginning at Main Street and travels south to an EOL station at Pecos Road in downtown Chandler. The roadway will maintain three through lanes in each direction and the existing bike lanes between Main Street and Baseline Road. The trackway is median running and will be grade separated at the UPRR crossing. All through lanes and left and right-turn lanes will be maintained at the US 60 bridge. From Baseline Road to Chandler Boulevard, the roadway will be reduced from three through lanes to two through lanes in each direction in order to accommodate a median-running HCT line and preserve the existing bike lanes.

Station Descriptions

There are ten potential station locations identified along the Country Club Drive/Arizona Avenue corridor, which provide access to downtown Mesa and Chandler. Eight out of the ten stations will be center running following the CP/EV design standards between Main Street and Chandler Boulevard. The first proposed station is located immediately south of Main Street near 1st Avenue, followed by another station approximately 1.5 miles south of Main Street at the intersection of Southern Avenue and Country Club Drive. Six station locations spaced every one mile are proposed at major arterial streets including Baseline Road, Guadalupe Road, Elliot Road, Warner Road, Ray Road and Chandler Boulevard.

1.2.3 Downtown Chandler

There are five alignment alternatives proposed for the downtown Chandler corridor along Arizona Avenue between Chandler Boulevard and Pecos Road. In downtown, the roadway will maintain two through lanes in each direction between Chandler Boulevard and the EOL station at Pecos Road; however, on-street parking will be removed in order to maintain the existing bike lanes where possible with a median-running HCT line. Table 1 provides an overview of criteria associated with each alternative which includes the number of through lanes, location of left-turn lanes based on station location, preservation of bike lanes, number of building impacts and the installation of additional traffic signalization.



Alternatives 1 and 3 consist of a left-turn lane adjacent to the trackway, which is consistent with Valley Metro’s Design Standards. In addition, Alternative 1 will require five building takes west of Arizona Avenue just south of Chicago Street, while Alternative 3 will result in zero building takes. Alternative 3, however, does include a lane reduction in order to maintain bike lanes along Arizona Avenue.

Alternatives 2, 4 and 5 include an additional traffic signal near slip ramps adjacent to the station to allow automobiles left-turn access to businesses and retail developments east of Arizona Avenue. The left-turn lane for Alternative 2 will be located between the northbound/southbound trackway and in line with the station, which requires three building takes near Chicago Street. Alternatives 4 and 5 will require a designated left-turn lane adjacent to the station, which will result in the left-turn lane crossing the trackway.

Alternatives 4 and 5 include a southbound and northbound alignment along Arizona Avenue. These options result in the least number of building takes, with Alternative 4 resulting in two building takes and Alternative 5 with zero. Alternative 4 preserves existing bike lanes along Arizona Avenue, however, Alternative 5 will relocate the bike paths to the adjacent streets outside of the Arizona Avenue corridor in order to avoid additional building impacts. The southbound bike path will travel west along Chicago Street to Orange Street, where it will continue south to Frye Road and travel west to connect back to Arizona Avenue. The northbound bike path will travel east on Frye Road connecting to Washington Street and continue traveling north to Chicago Street where it will travel west to connect to Arizona Avenue. Wayfinding signs will be installed and included in overall construction costs.

TABLE 1 DOWNTOWN CHANDLER ALIGNMENT ALTERNATIVES

Criteria	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
2 Travel Lanes	Yes	Yes	1 Travel Lane	Yes	Yes
Left-Turn Lanes	Adjacent to trackway (CP/EV Standard)	Between trackway/in line with station	Adjacent to trackway (CP/EV Standard)	Cross trackway to access left-turn lane	Cross trackway to access left-turn lane
Bike Lanes	Yes	Yes	Yes	Yes	Yes (Separate bikeway/paths)
Building Takes	5	3	No	2	No
Additional Traffic Signalization	No	At slip ramp	No	At slip ramp	At slip ramp

Source: Valley Metro, 2016

2.0 TIER 1 EVALUATION

The following section provides a summary of the qualitative Tier 1 evaluation including study area characteristics, consistency with existing plans and environmental considerations for the two HCT scenarios identified in Figure 1.

2.1 STUDY AREA CHARACTERISTICS

This section provides a summary of population and employment densities and socioeconomic data for transit-dependent populations within one-half mile of the proposed HCT scenarios.

2.1.1 Population

The 2015 MAG TAZ data shown in Table 2 shows the population within one-half mile of the proposed corridor along HCT Scenario 1 was approximately 71,589 and is expected to increase roughly 21% to nearly 86,854 people by 2040. Comparatively, the population along HCT Scenario 2 showed a population total of 55,635 and is expected to increase by 22% to approximately 68,080 people by 2040. Although the percent of population growth for Scenario 2 is greater than Scenario 1, HCT Scenario 1 currently serves a larger population and is expected to have 22% higher population in 2040 compared to HCT Scenario 2.

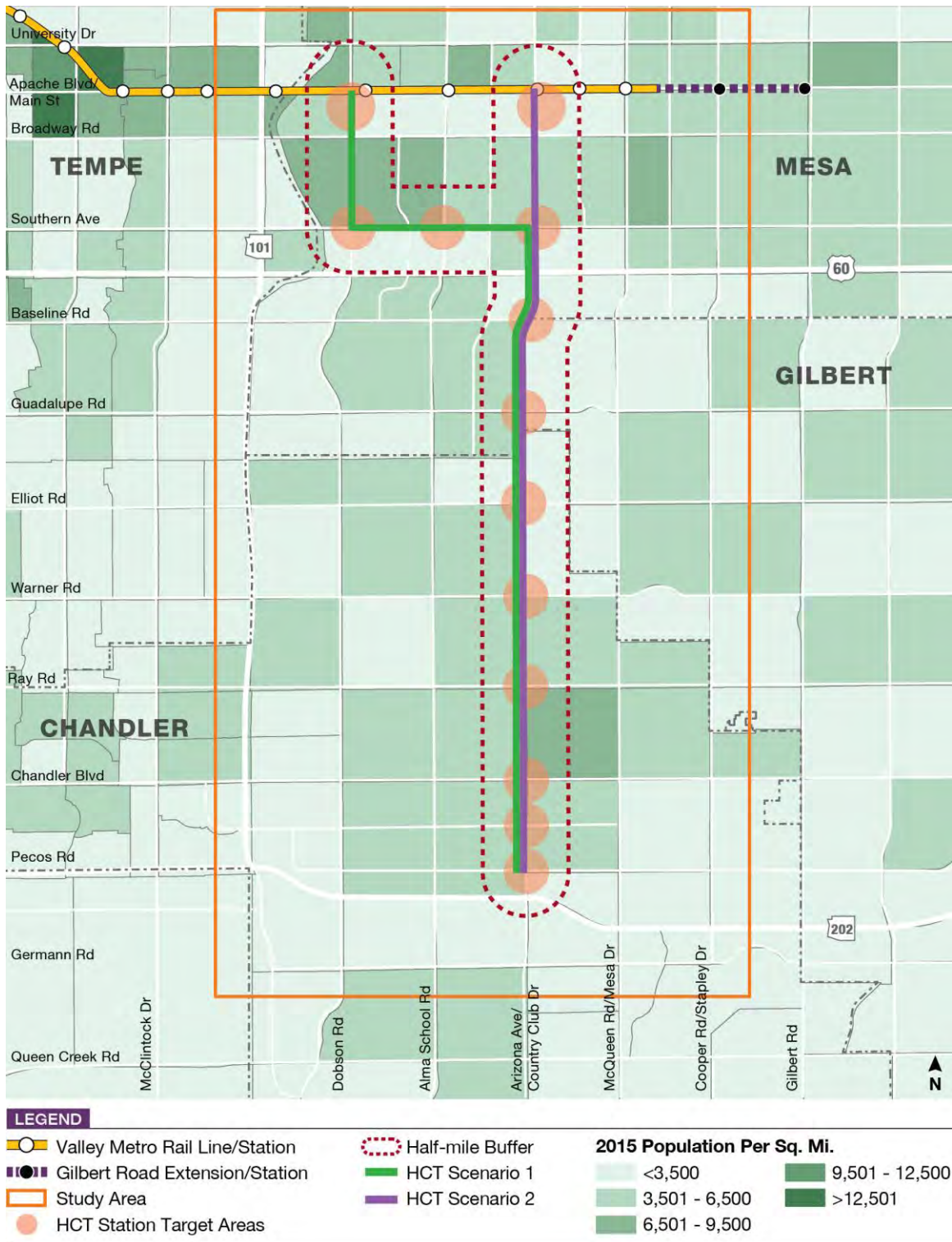
TABLE 2 POPULATION GROWTH

Area	MAG 2015	MAG 2040 Projections	Percent Change 2015-2040
HCT Scenario 1	71,589	86,854	21%
HCT Scenario 2	55,635	68,080	22%

Source: MAG TAZ, 2015

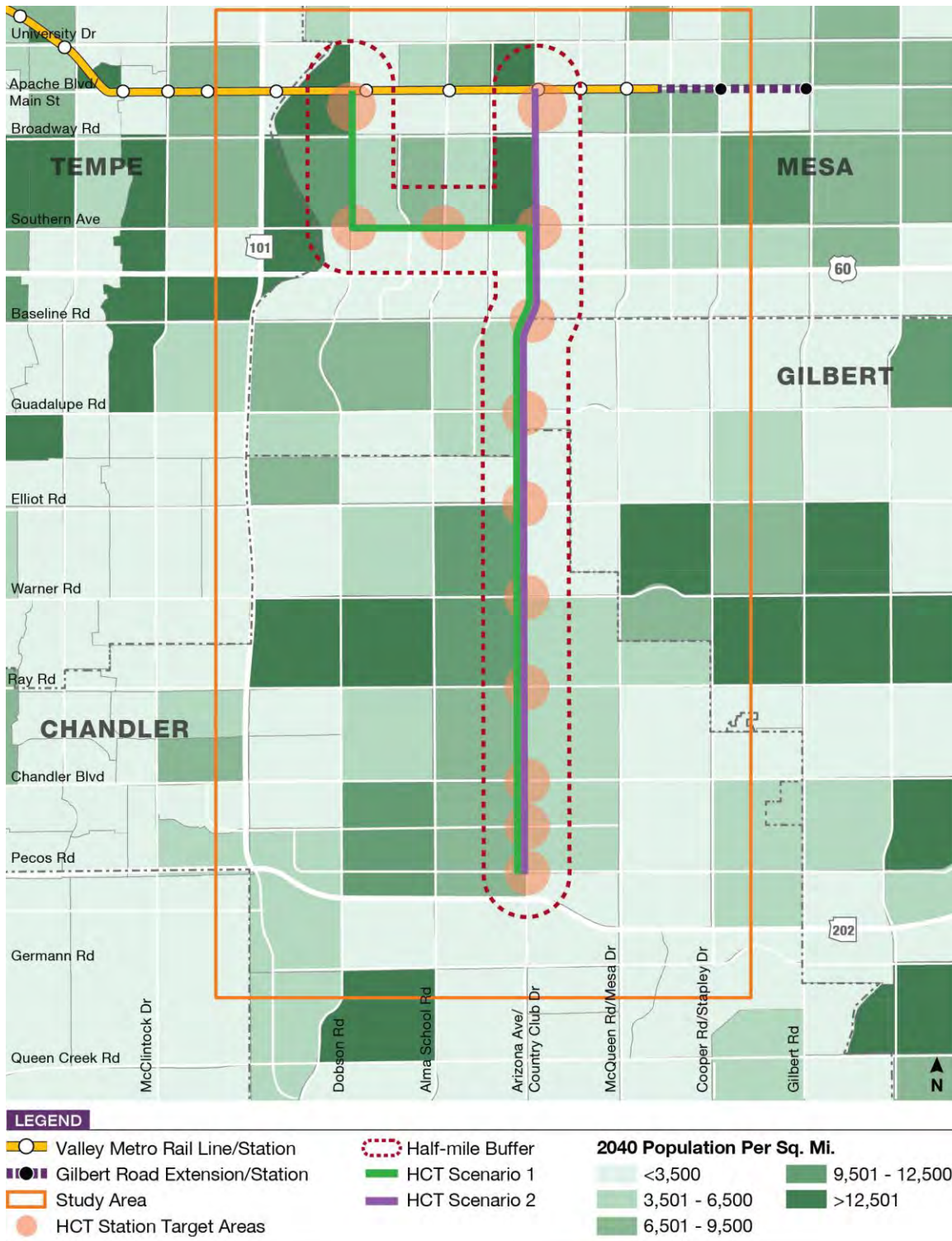
As shown in Figure 2, the most populated portions of the study area are located around the Fiesta District in Mesa and in downtown Chandler. Generally, population is densest between Broadway Road and Southern Avenue, specifically along Dobson Road and Southern Avenue in Mesa. Figure 3 illustrates the MAG projected population density in 2040. Compared to the study area as a whole, the distribution of population is expected to grow most notably around the Fiesta District and downtown Chandler between Elliot Road and Pecos Road.

FIGURE 2 2015 POPULATION PER SQUARE MILE



Source: MAG TAZ, 2015

FIGURE 3 2040 POPULATION PER SQUARE MILE



Source: MAG TAZ, 2015

2.1.2 Employment

As shown in Table 3, the MAG TAZ 2015 data employment within one-half mile of the proposed alignment along HCT Scenario 1 totaled over 36,000 jobs. Based on MAG projections, total employment is expected to increase by 20% and is forecasted to eclipse 43,000 jobs by 2040. In comparison, total employment along HCT Scenario 2 is expected to increase by 18% from 29,000 to 34,000 jobs by 2040. Similarly, to population growth along each corridor, HCT Scenario 1 is expected to have 20% higher employment numbers by 2040 compared to HCT Scenario 2.

TABLE 3 EMPLOYMENT GROWTH

Area	MAG 2015	MAG 2040 Projections	Percent Change
HCT Scenario 1	36,157	43,410	20%
HCT Scenario 2	29,570	34,831	18%

Source: MAG TAZ, 2015

Figure 4 illustrates 2015 employment density within a one-half mile buffer of the proposed corridors for each HCT scenario. Similar to population growth, the corridors with the densest employment throughout the study area are located in the Fiesta District in Mesa along Southern Avenue and in downtown Chandler. As shown in Figure 5, key areas predicted for future employment growth in the study area include downtown Mesa, specifically along Dobson Road and Southern Avenue, and along the Arizona Avenue corridor between Elliot Road and Pecos Road in downtown Chandler.

FIGURE 4 2015 EMPLOYMENT PER SQUARE MILE

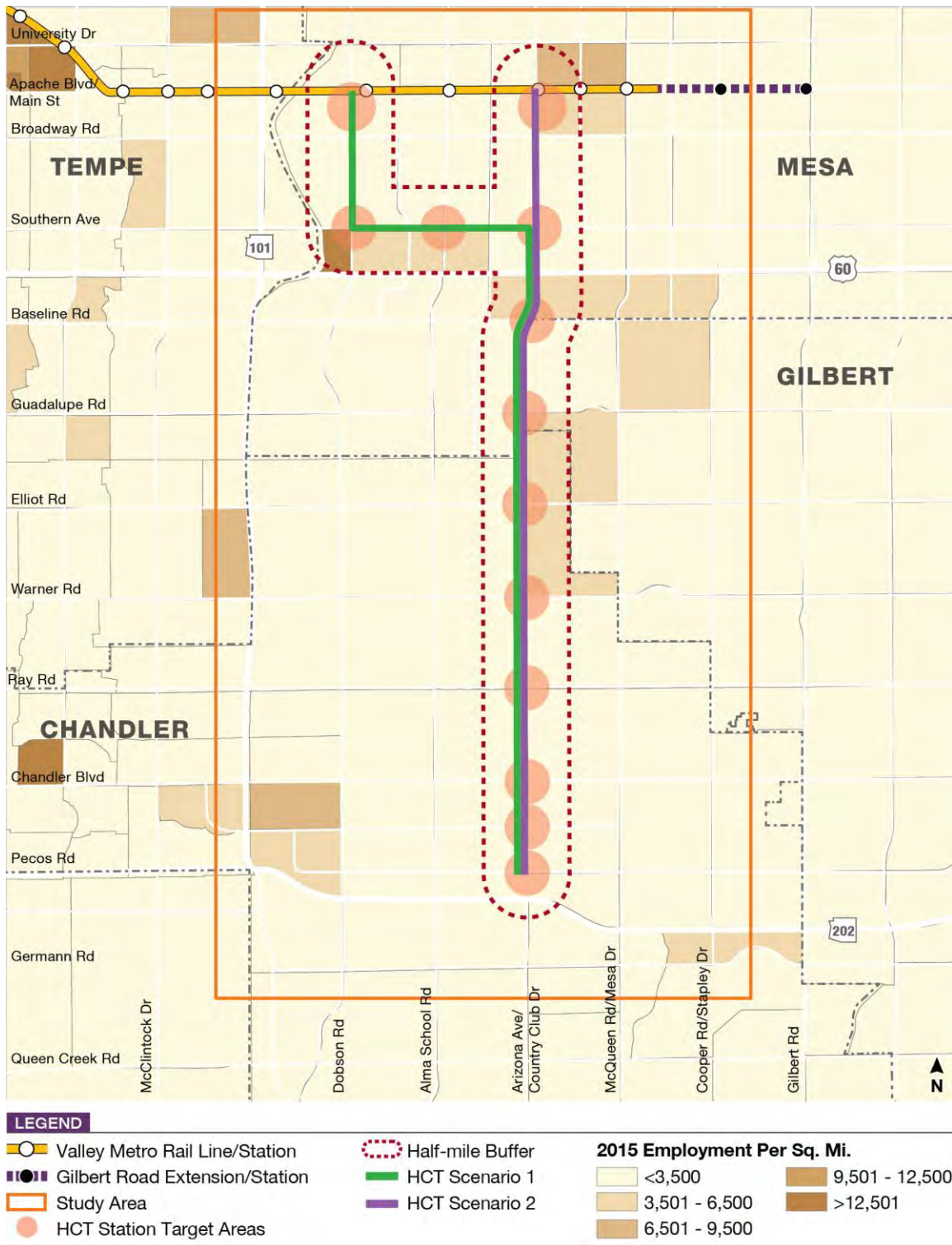
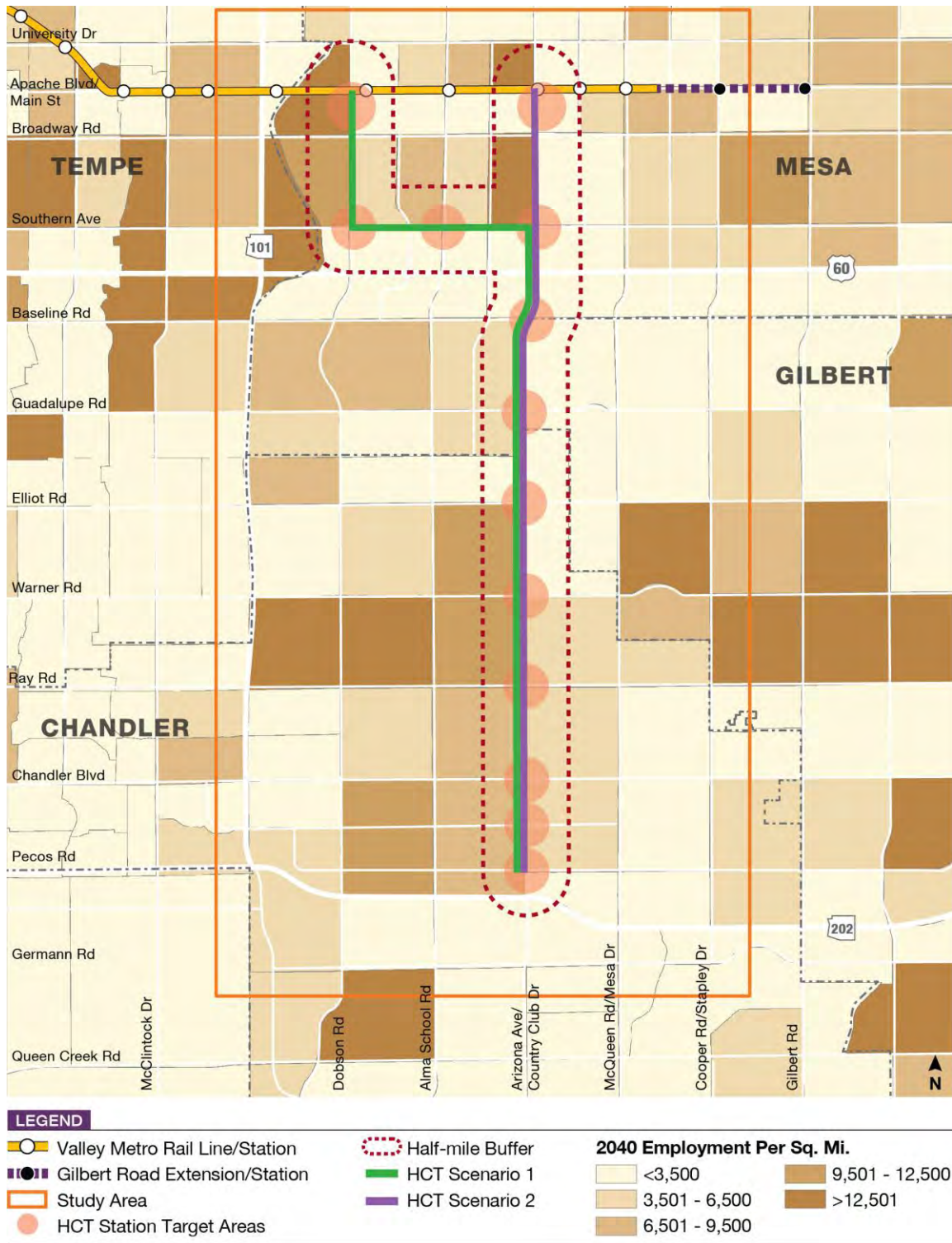


FIGURE 5 2040 EMPLOYMENT PER SQUARE MILE



Source: MAG TAZ, 2015

2.1.3 Transit-Dependent Populations

Transit dependency refers to sections of the population that rely on transit service to increase their overall mobility. The FDCTC study area population is diverse and includes population groups with a propensity to use transit. Such groups include households with zero and one-cars, lower household incomes and seniors, and workers age 16 and over who use public transit for their commute to work. For this portion of the study, we are only including populations with zero and one-car households to gain a better understanding of public transit dependency within the study area. To see the other population groups listed above, please refer to Technical Memorandum 1.

Data was collected from the U.S. Census Bureau for the year 2014, which is the latest data available. Note, that data used to determine existing and future population and employment numbers described in sections 2.1.1 and 2.1.2 are derived from MAG TAZ data in order to show growth or decline over a period of time, whereas, data derived from the U.S. Census Bureau is used to show existing transit-dependent populations. The transit-dependent characteristics evaluated for the study area are identified in Table 4.

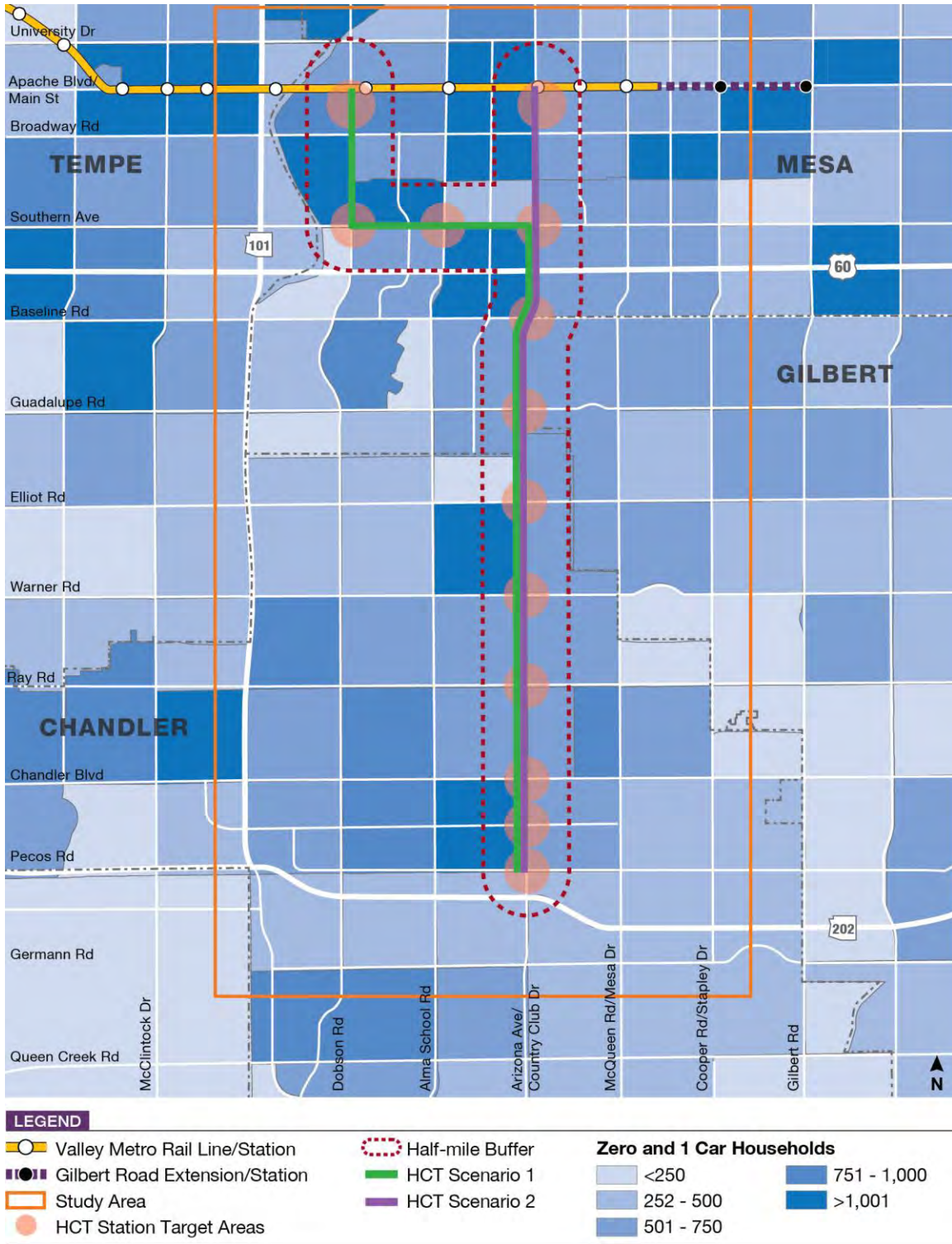
TABLE 4 TRANSIT-DEPENDENT POPULATION

Criteria	Transit Dependent Population		
	HCT Scenario 1	HCT Scenario 2	% Difference
Zero and One Car Households	27,658	20,202	27%

Source: U.S. Census Bureau, 2014

Figure 6 illustrates the concentrations of populations with zero and one-car households throughout the FDCTC study area. As shown in Table 4, the total percentage of the populations with zero and one-car households is 27% greater along HCT Scenario 1 compared to HCT Scenario 2. The areas with the densest populations are within the Fiesta District along Dobson Road and Southern Avenue and downtown Chandler between Elliot Road and Pecos Road.

FIGURE 6 POPULATIONS WITH ZERO AND ONE-CAR HOUSEHOLDS



Source: ACS, 2014

2.2 CONSISTENCY WITH EXISTING PLANS

This section provides information on future planning efforts for an HCT corridor recognized in the City of Mesa *2040 General Plan and Master Transportation Plan*, the Town of Gilbert *2012 General Plan* and the City of Chandler *2016 General Plan*. To review the full list of summaries of Regional and Local general plans, transportation plans and related studies regarding the FDCTCS area, please refer to Technical Memorandum 1.

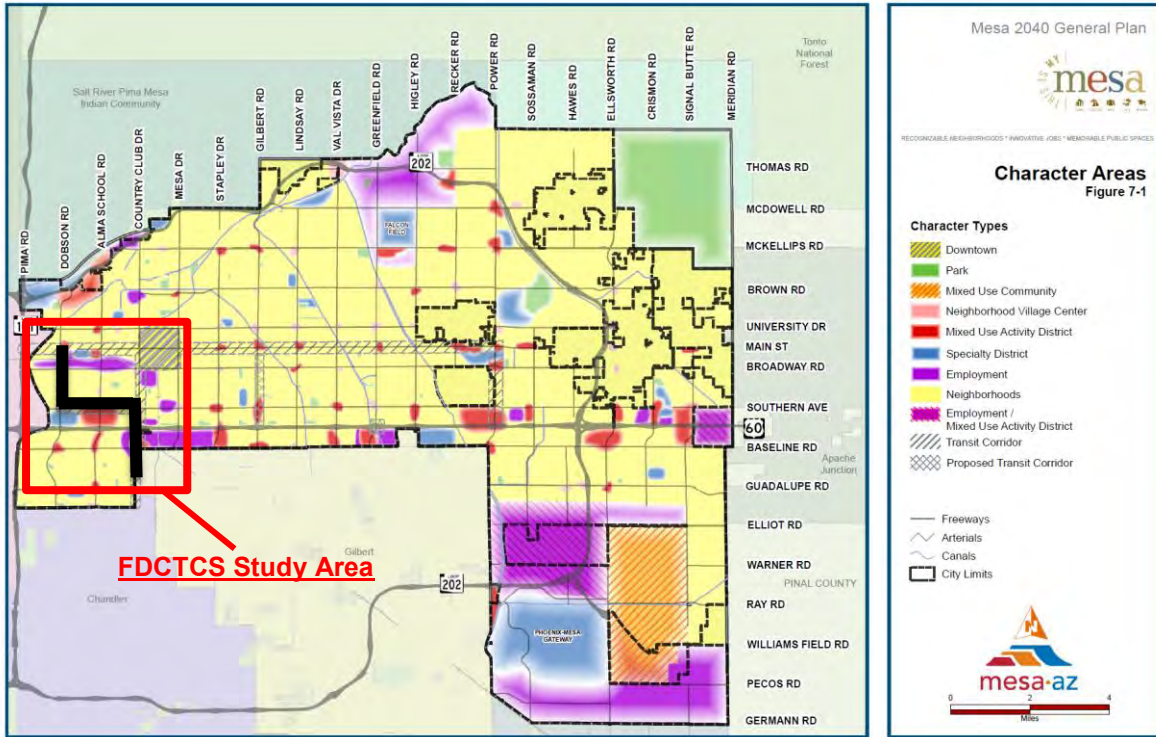
2.2.1 Support Local and Community Planning Efforts

Transit supportive policies and development standards are not only important to the success of HCT service, they are also part of the current Federal Transit Association (FTA) New Starts evaluation criteria. A summary level review was conducted of applicable local planning efforts to determine the compatibility and/or preparedness for HCT in the FDCTC area.

City of Mesa

According to City of Mesa *General Plan 2040*, the City of Mesa will be expanding light rail by adding five more miles to the existing CP/EV line. Figure 7 shows the Characteristic Areas including land use, existing transit corridors and proposed transit corridors for the City of Mesa. Areas designated as transit corridors that are specific to this study are shown in a black line within the red geographical boundary line.

FIGURE 7 MESA 2040 GENERAL PLAN – CHARACTER AREAS



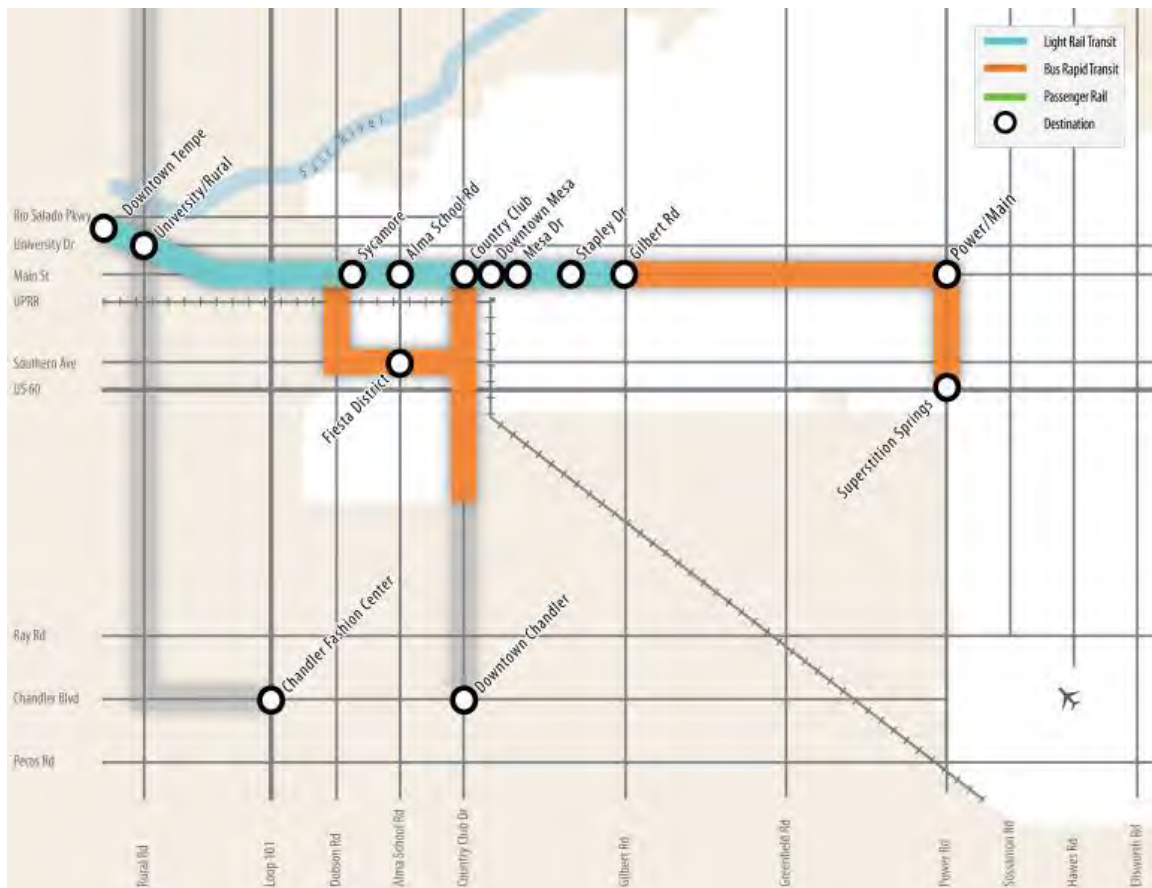
Source: City of Mesa 2040 General Plan

The City of Mesa *Master Transportation Plan 2040* identifies transit services, facilities, and features needed to support a multi-modal transportation system in the City of Mesa for the short-, mid-, and long-term time periods.

Short-term (2018)

As shown in Figure 8, the transit alternatives for the short-term are listed as Bus Rapid Transit (BRT) routes serving the Fiesta District and Country Club Avenue beginning in the year 2018. This also corresponds with the opening year of Valley Metro’s Gilbert Road Light Rail Extension. Short-term plans also include an extension of BRT service along Main Street from the new EOL station at Gilbert Road to Power Road serving the Superstition Springs Transit Center, which is currently being served by Local Route 40. This assumes BRT service will replace Local Route 40 as early as 2018.

FIGURE 8 SHORT-TERM TRANSIT ENHANCEMENTS

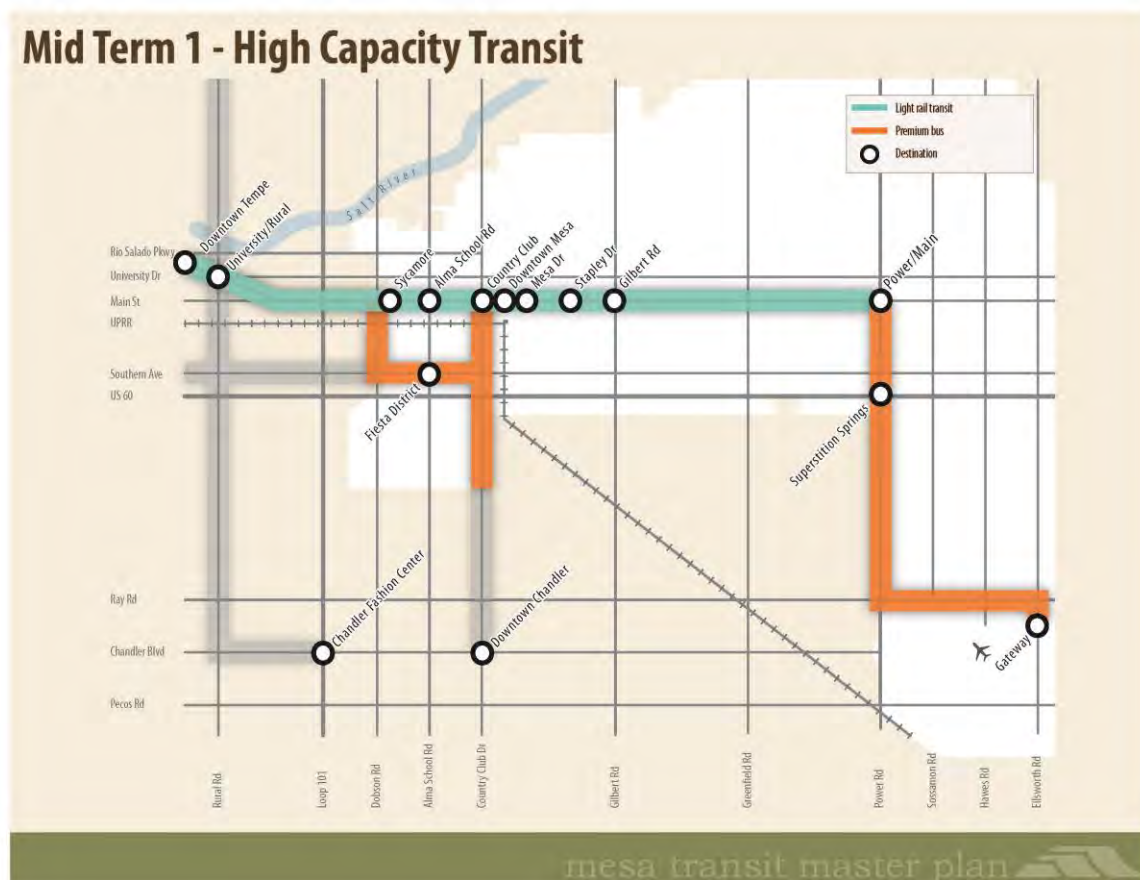


Source: City of Mesa Transit Master Plan 2040

Mid-term (2030)

Transit enhancements for the mid-term time period include two options for implementing and expanding HCT service within the City of Mesa. Figure 9 shows light rail service extending to Power Road along Main Street, and a BRT corridor traveling south along Power Road to connect to Gateway Airport on Ray Road. HCT Scenario 1 along Dobson Road, Southern Avenue and Country Club Drive, and HCT Scenario 2 along Country Club Drive/Arizona Avenue assume premium bus service by 2030, and are the two corridors being evaluated for HCT service.

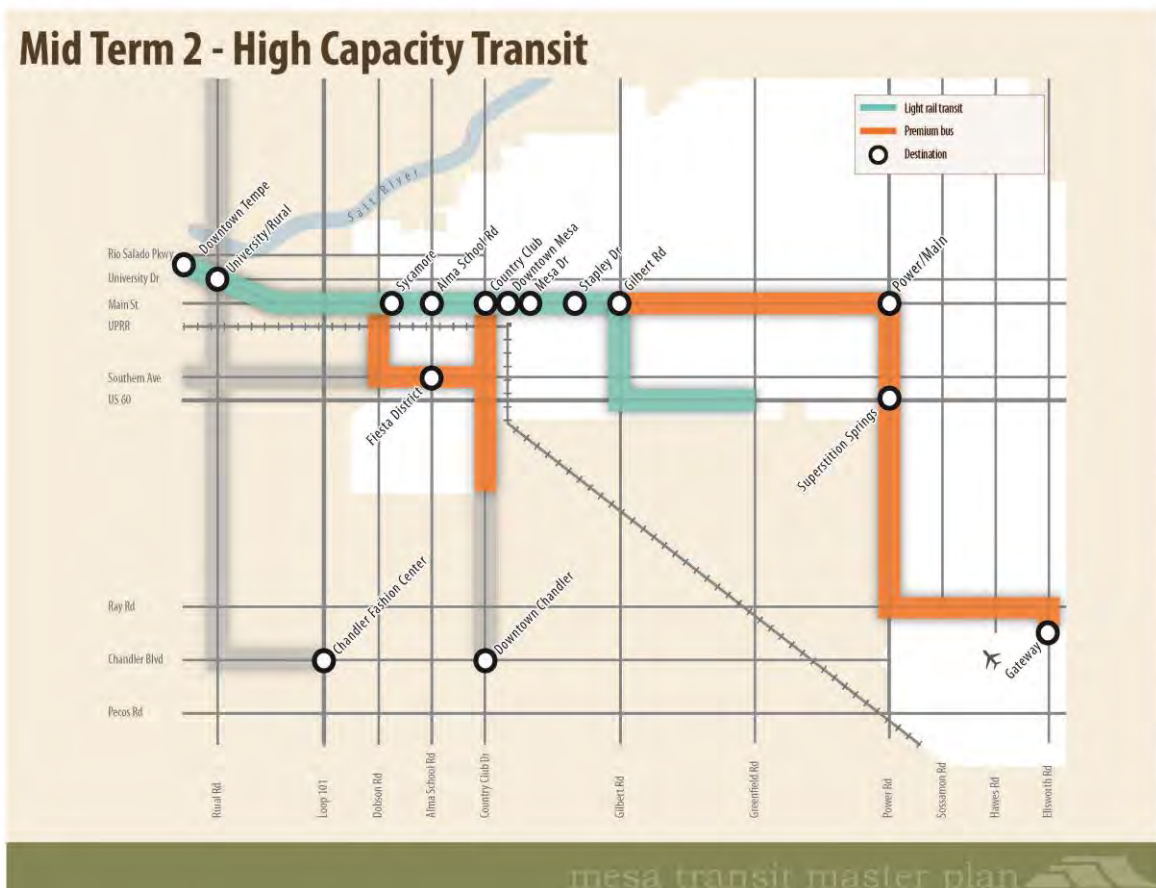
FIGURE 9 MID-TERM TRANSIT ENHANCEMENTS OPTION 1



Source: City of Mesa Transit Master Plan 2040

The second option of transit enhancements for the mid-term shown in Figure 10 assumes the light rail line traveling south along Gilbert Road to the US 60 and traveling east ending at Greenfield Road. It also shows BRT service extending from the current light rail EOL located at Gilbert Road, traveling east to Power Road and diverting south along Power Road to connect to the Phoenix-Mesa Gateway Airport. HCT Scenario 1 and HCT Scenario 2 assume premium bus service along each corridor and are the two corridors being evaluated for HCT service for this study.

FIGURE 10 MID-TERM TRANSIT ENHANCEMENTS OPTION 2

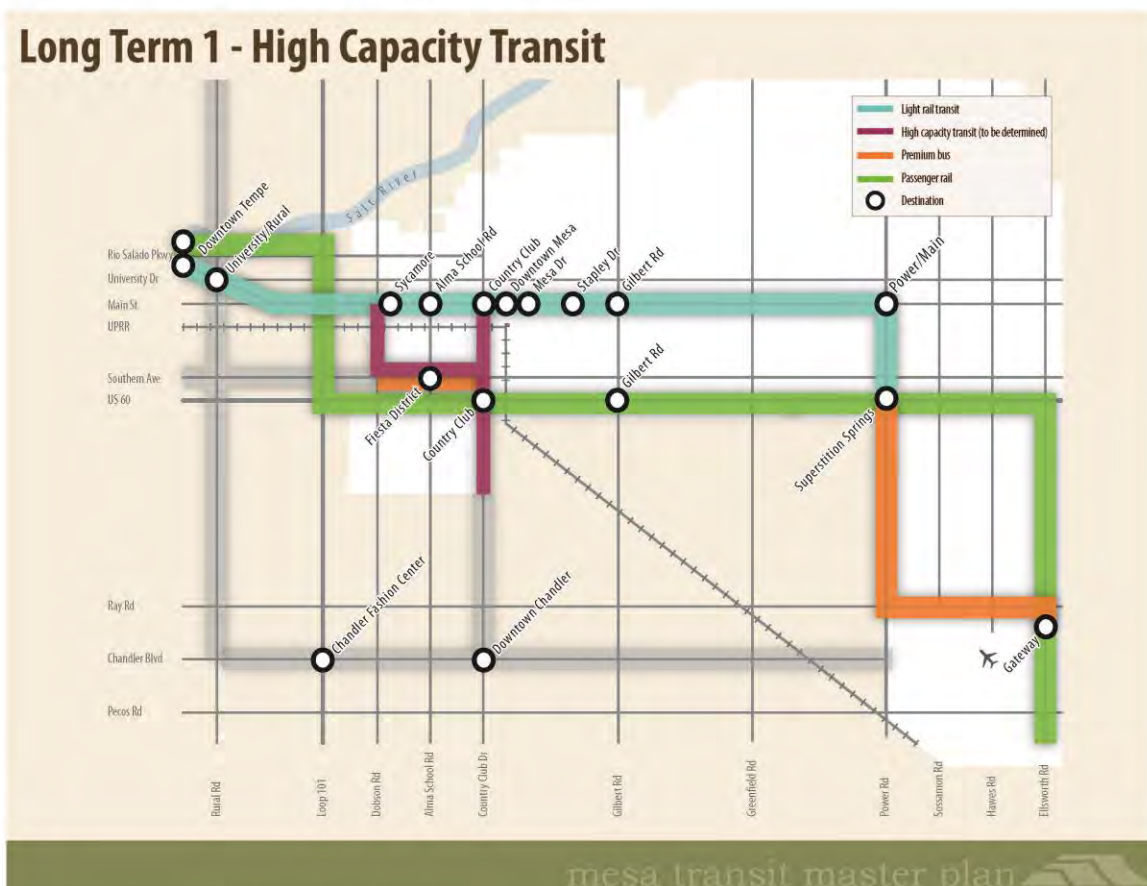


Source: City of Mesa Transit Master Plan 2040

Long-term (2040)

Similar to the mid-term transit options, there are two long-term scenarios for transit enhancements that include the expansion of light rail service and high-speed commuter rail service. The first set of alternatives shown in Figure 11 display the extension of light rail service along Main Street to Power Road and south to connect to the Superstition Springs Transit Center. From there, a BRT service is assumed to connect to the light rail EOL and travel south along Power Road, then east on Ray Road to serve Phoenix-Mesa Gateway Airport. The implementation of a high-speed passenger rail connects downtown Tempe at Rio Salado Parkway and travels east to the Loop-101 Freeway, where it travels south along the Loop-101 to US 60 and east to connect to Phoenix-Mesa Gateway Airport. Three stops are identified along the US 60 at Country Club Drive, Gilbert Road, and Superstition Springs. In addition to BRT and LRT service, HCT Scenario 1 and HCT Scenario 2 corridors are defined in the long-term high-capacity transit plan to be further evaluated for HCT service.

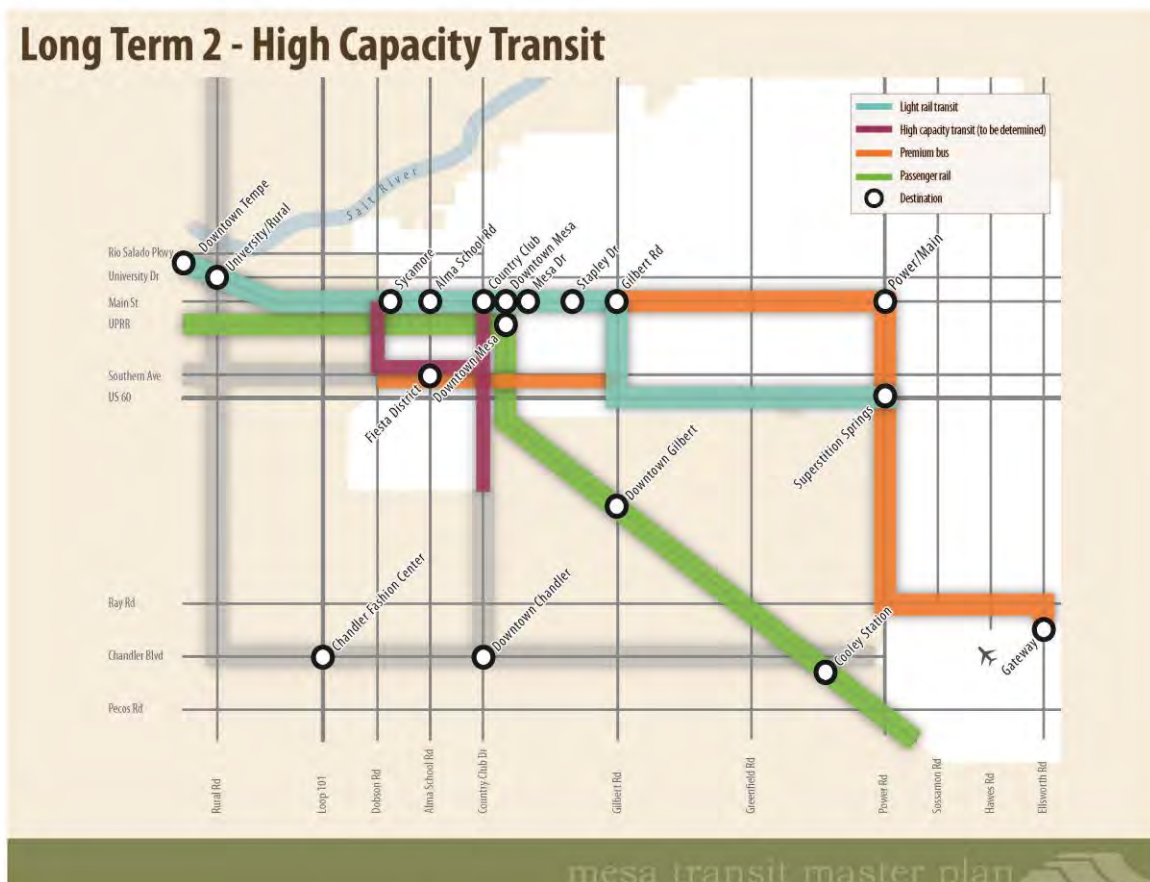
FIGURE 11 LONG-TERM TRANSIT ENHANCEMENTS OPTION 1



Note: Passenger Rail corridor was approved by City of Mesa, this does not include ADOT and MAG approval.
 Source: City of Mesa Transit Master Plan 2040

The second set of alternatives shown in Figure 12 show an extension of BRT service along Southern Avenue between Country Club Drive and Gilbert Road. Light rail service will extend east from Greenfield Road to Superstition Springs Transit Center. HCT service is also assumed along the two HCT Scenarios being evaluated for this study, which include Dobson Road/Southern Avenue/Country Club Drive and Country Club Drive/Arizona Avenue. The implementation of a high-speed passenger rail connects downtown Tempe following the UPRR corridor and travels south just past the US 60 where it travels southeast continuing along the UPRR corridor ending at Cooley Station.

FIGURE 12 LONG-TERM TRANSIT ENHANCEMENTS OPTION 2



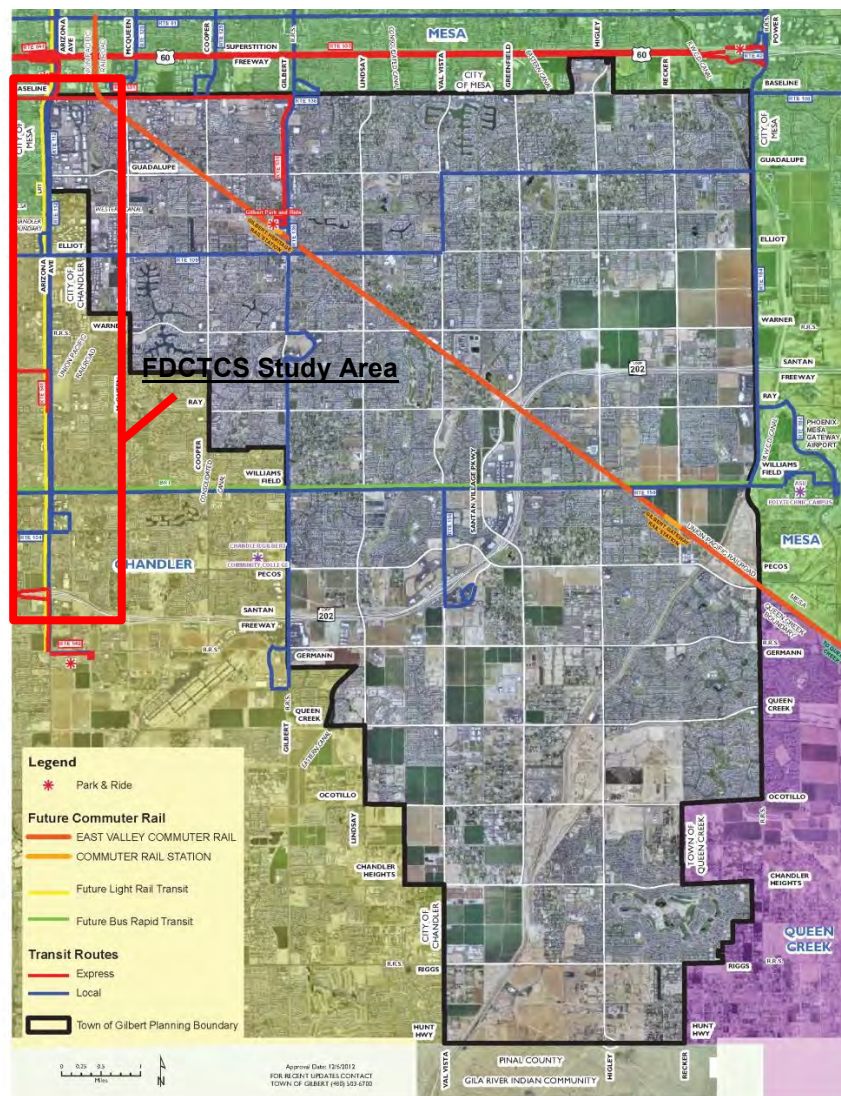
Note: Passenger Rail corridor was approved by City of Mesa, this does not include ADOT and MAG approval.
Source: City of Mesa Transit Master Plan 2040

In summary, HCT service in the Fiesta District along Dobson Road and Southern Avenue and along the Country Club Drive corridor has been identified in the short-, mid- and long-term time periods. Therefore, the two HCT Scenarios being evaluated are consistent with the City of Mesa’s local and community plans to support future transit service.

Town of Gilbert

The 2012 *Town of Gilbert General Plan* outlined alternative modes, as shown in Figure 13, and identifies the section of Arizona Avenue that borders the town boundary line as a future light rail transit corridor. The corridor is consistent with both scenarios addressed in this technical memorandum. The plan recognizes the proposed section along Arizona Avenue in Chandler as a LRT line; however, the City of Chandler has since removed that assumed LRT line from their 2016 General Plan.

FIGURE 13 ALTERNATIVE TRANSPORTATION MODES MAP



ALTERNATIVE TRANSPORTATION MODES MAP



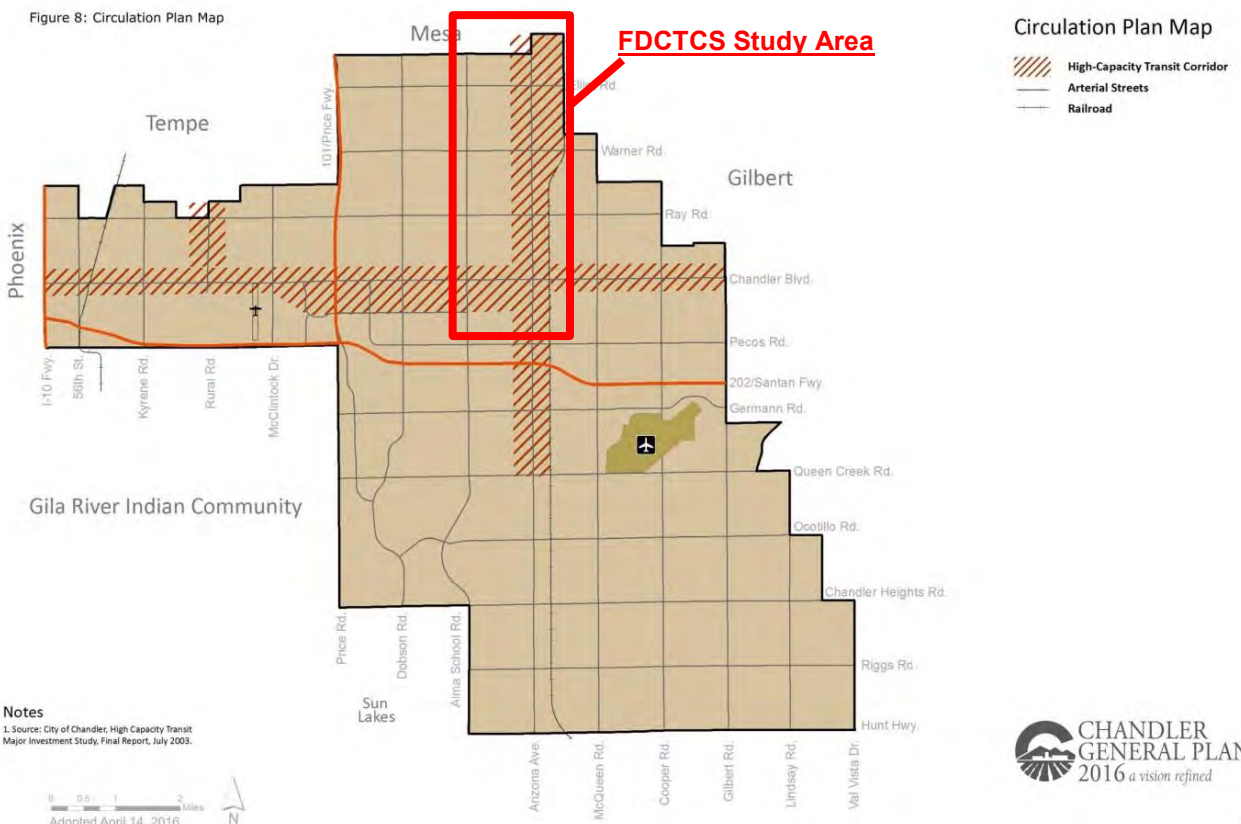
Source: Town of Gilbert General Plan 2012

City of Chandler

The City of Chandler’s General Plan, recently adopted in August 2016, identifies three HCT corridors along Rural Road, Arizona Avenue and Chandler Boulevard, as shown in Figure 14. The General Plan also defines these corridors as locations for high-intensity and mixed-use land use development.

Previous studies such as, *Chandler’s High Capacity Transit Major Investment Study* completed in July 2003, identified the same three HCT corridors as either light rail investment corridors or bus rapid transit corridors. In the most recent *2012 Arizona Avenue High Capacity Long-Range Study*, the study also focused on the feasibility of light rail along Arizona Avenue. In summary, both HCT Scenarios 1 and 2 along Arizona Avenue are consistent with the area identified as one of the three HCT corridors.

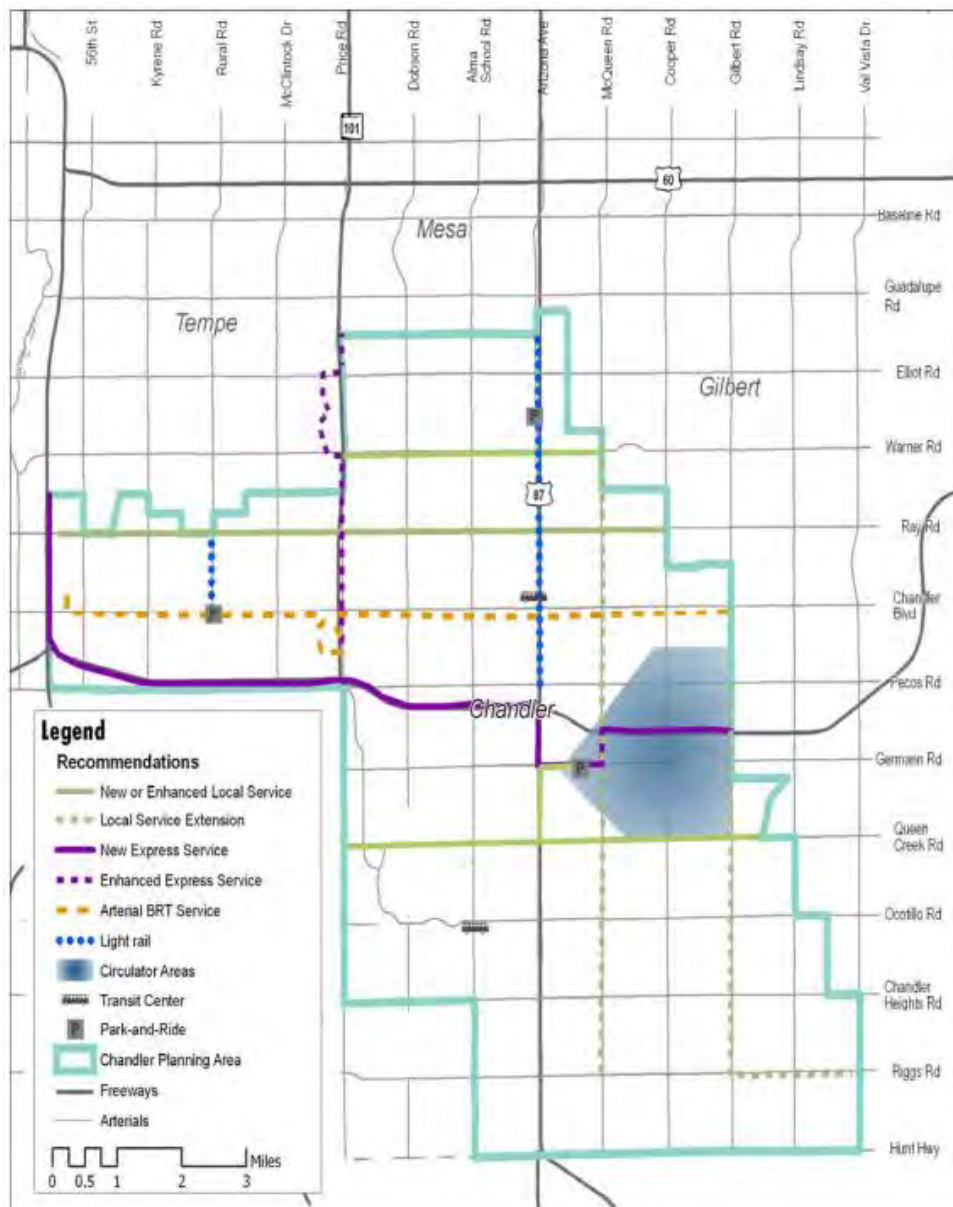
FIGURE 14 CITY OF CHANDLER CIRCULATION PLAN MAP



Source: City of Chandler General Plan 2040

Two light rail corridors were identified in Chandler's *2010 Transportation Master Plan Update* which include 1) along Rural Road and terminating at Chandler Boulevard (FY2025), and 2) along Arizona Avenue terminating at Pecos Road (FY2030). The report noted the City will consider implementation of these two corridor options for LRT service in long-term. Figure 15 outlines the two LRT corridor options for long-term transit improvements, including LRT service along Arizona Avenue which is consistent with the corridors being evaluated in the FDCTCS.

FIGURE 15 CITY OF CHANDLER LONG-TERM TRANSIT IMPROVEMENTS



Source: City of Chandler Transportation Master Plan Update 2010

2.3 ENVIRONMENTAL CONSIDERATIONS

This section provides a qualitative assessment of impacts that Tier 1 alternatives could have on sensitive environmental issues and conditions within the FDCTCS area.

2.3.1 Section 4(f) Properties

Section 4(f) refers to the original section within the U.S. Department of Transportation Act of 1966, which established the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges and historic sites in transportation project development. The law, now codified in 49 U.S.C. §303 and 23 U.S.C. §138, is implemented by the Federal Highway Administration (FHWA) through the regulation 23 CFR 774. Section 4(f) properties include publicly owned public parks, recreation areas and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places. Table 5 provides a list of potential Section 4(f) properties along each transit scenario within one-quarter mile of the corridor, which is the distance at which noise travels and has an impact on surrounding properties.

TABLE 5 POTENTIAL SECTION 4(f) PROPERTIES

Section 4(f) Properties		
Alignment	Name	Distance (Miles)
HCT Scenario 1 (Dobson Rd, Southern Ave)	Powell Estates Subdivision Mini Park	0.25
	Mesa Community College	0
HCT Scenario 2 (Country Club Dr/AZ Ave)	Guerrero Rotary Park	0.21
Shared Properties* (Along AZ Ave. between Broadway Rd to Pecos Rd)	Navarette Park	0.25
	Gazelle Meadows Park	0.25
	Manors Park	0.25
	Chandler High School	0
	Dr. A.J. Chandler Park	0
	Elgin Park	0.12
	Winn Park	0.08
Silk Stocking Neighborhood	0	

Distance is ¼-mile from roadway centerline.

*Shared Properties consist of Section 4(f) properties shared by both HCT scenarios.

Source: Valley Metro, 2016

3.0 TIER 2 EVALUATION

The following section provides a summary of the Tier 2 quantitative evaluation including FTA's travel forecast results, engineering considerations and capital costs for the two HCT scenarios identified in Figure 1.

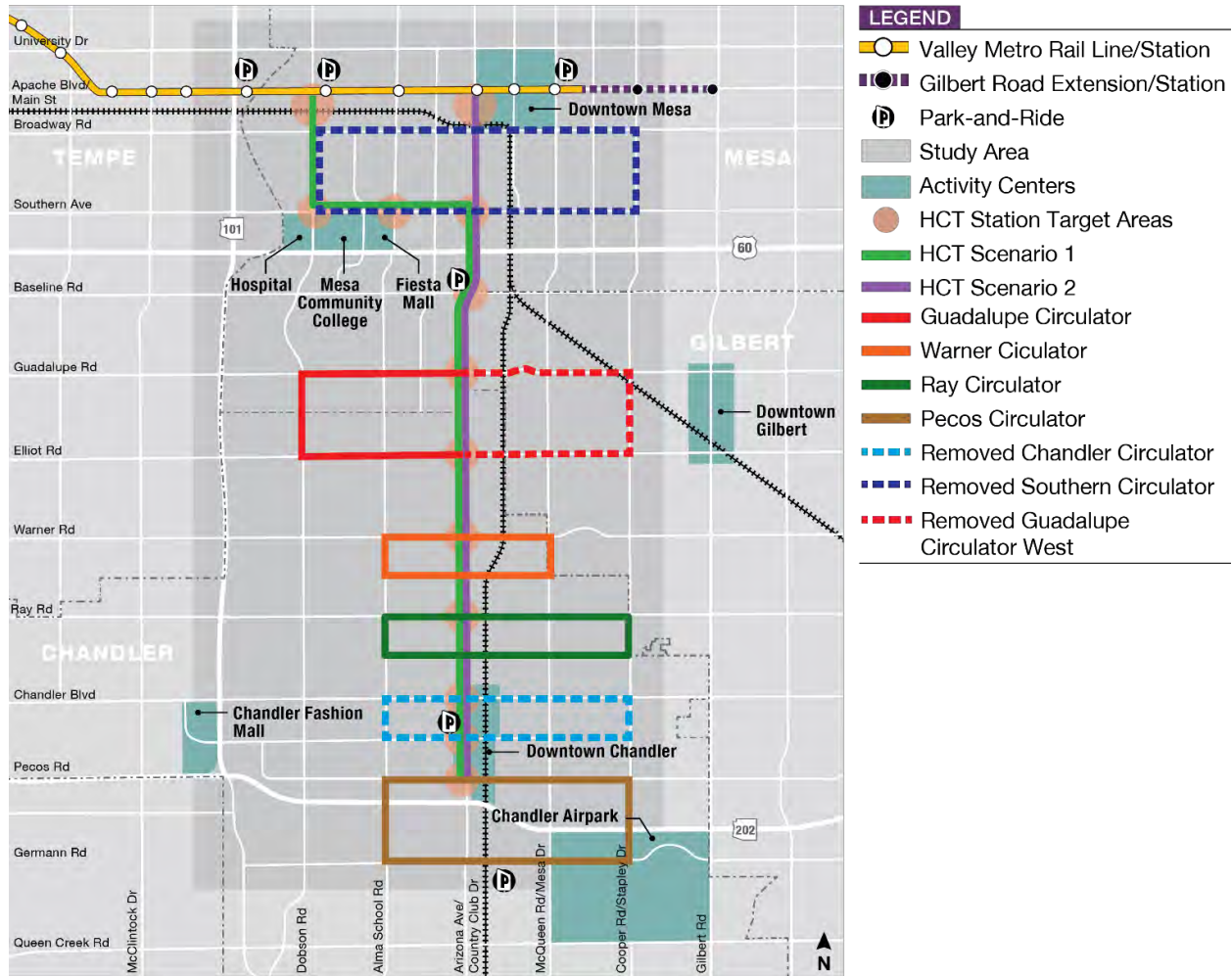
3.1 TRAVEL FORECASTING

The HCT scenarios include (1) the Dobson Road alignment from the existing (CP/EV) light rail corridor south along Dobson Road, east along Southern Avenue with a connection to Country Club Drive/Arizona Avenue to Pecos Road south of downtown Chandler; and (2) the Country Club Drive/Arizona Avenue alignment south from CP/EV at Country Club/Arizona Avenue to Downtown Chandler and Pecos Road south of downtown Chandler. Local bus service enhancements include east and west circulator routes operating on top of existing local bus service, and future planned bus service identified in MAG's 2035 Regional Transit Plan. The HCT transit scenarios and bus service enhancements being evaluated in the long-term (2040) are shown in Figure 16.

Optimized Local Bus Service vs. Circulator Routes

The optimized local bus service enhancements analyzed in Technical Memorandum 2 was comprised of transit improvements identified in the 2015 Southeast Valley Transit System Study, as well as additional transit improvements identified with the cities of Mesa and Chandler, and the Town of Gilbert. The additional improvements were identified to better accommodate possible HCT in the study area. When analyzed through the MAG regional travel demand model, the optimized local bus service resulted in less trips in the Country Club Drive/Arizona Avenue HCT corridor than the MAG 2035 base transit network. A circulator proof of concept (i.e. five bidirectional circulators extending approximately one mile on each side of the Country Club Drive/Arizona Avenue HCT corridor) was also analyzed as a next step in the study process. The modeling results showed that the circulator routes added more riders directly to the Country Club Drive/Arizona Avenue HCT corridor scenarios. A mix of transit modes, for example, the circulator proof of concept and local routes from the 2015 Southeast Valley Transit System Study could potentially maximize ridership in the HCT corridor and provide additional mobility in the Southeast Valley.

FIGURE 16 LONG-TERM TRANSIT SCENARIOS



Source: Valley Metro, 2016

Light Rail Configuration

There were three light rail configurations used for modeling assumptions. In the existing (calibration) scenario, the light rail operates between 19th Avenue/Montebello Avenue and Main Street/Sycamore. The No-Build scenario consists of light rail operating between 19th Avenue/Dunlap Avenue and Main Street/Gilbert Road. In the Build scenario, the Fiesta-Downtown Chandler alignment operates between Dobson Road/Main Street and Arizona Avenue/Pecos Road (HCT Scenario 1). The Dobson Road alignment was chosen as the Build Scenario because it serves more activity and employment centers along its route, which could represent higher ridership potential for FTA’s New Starts rating.

Methodology

The ridership forecast for the FDCTCS was estimated using a travel modeling software called STOPS (Simplified Trips-on-Project Software). The STOPS model is a stand-alone ridership forecasting software package developed by the Federal Transit Administration (FTA). The software applies a set of travel models to predict detailed travel patterns on fixed-guideway systems. STOPS was specifically developed to support New Starts and Small Starts projects.

STOPS utilizes a modified four-step (trip generation, trip distribution, mode choice and trip assignment) model structure to quantify total transit ridership by trip type, mode of access and auto ownership. It also computes the change in person miles travelled (PMT) that is attributable to the proposed transit project. The component sub-models in STOPS have been calibrated with local adjustments and compared to rider-survey datasets from locations within six metropolitan areas (with a total of 10 lines), and validated against stop-specific counts of trips in nine other metropolitan areas (with a total of 14 lines), resulting in 24 total fixed-guideway systems.

The current STOPS version available on the Federal Transit Administration website is STOPS 1.50; however, a pre-release version of STOPS 2.0 was available from FTA dated February 6, 2016, and this version was used for estimating ridership for this study.

3.1.1 STOPS Inputs

Following the installation of STOPS, several inputs were required to successfully complete the model run. This section will provide detailed information on the following inputs:

- Census Data/On-Board Survey
- LRT/Bus Boarding Data
- Population and Employment Data
- Highway Skims
- Transit Agency Data
- Additional Inputs

Table 6 identifies the inputs that were used in STOPS for the Fiesta-Downtown Chandler Feasibility Study.

TABLE 6 INPUTS USED IN STOPS

Inputs Used	Source	Source Year
GTFS Files	Valley Metro	2015 (April)
On-Board Survey Data	Valley Metro	2015 (April)
LRT Boarding Data	Valley Metro	2015 (April)
Bus Boarding Data	Valley Metro	2015 (April)
Population/Employment Data	MAG	2015, 2040
AM Peak Highway Skims	MAG	2015, 2035

Source: Valley Metro, 2015; MAG, 2015

Transit Agency Data

General Transit Feed Specification (GTFS) is a standardized format for public transportation schedules used by transit agencies throughout the world. GTFS is a collection of text files that, together, provide data necessary for trip planners, schedules and mobile phone applications. STOPS utilizes GTFS for estimating ridership in the existing, no-build, and build scenarios. GTFS files from April 2015 were provided by Valley Metro to be used as inputs into STOPS. These files were used for calibration and as a foundation for the no-build and build scenarios. In addition, highway skims included data acquired from MAG for the years 2015 and 2035 for estimated peak highway travel times.

Census Data

STOPS has the ability to calibrate to year 2000 Journey-to-Work (JTW) trip flow data, year 2010 American Community Survey (ACS) trip flow data, or a recent on-board transit survey. In April 2015, Valley Metro completed an on-board survey and the transit trips from this survey (by trip purpose and household auto occupancy) were used as an input for calibration. Light rail and bus boarding data were provided from Valley Metro for April 2015.

Population and Employment Data

Total population and employment estimates for years 2015 and 2040 were acquired from MAG. The study team developed a second 2040 population and employment scenario that identified transit-oriented development opportunities in the study corridor. Table 7 identifies the 2015 and 2040 population and employment growth for rail and non-rail districts for both the MAG and transit-enhanced land use. Table 8 shows the percent change in population and employment growth from 2015 to 2014.

TABLE 7 POPULATION AND EMPLOYMENT

TAZs	Population			Employment		
	MAG 2015	MAG 2040	2040 Enhanced	MAG 2015	MAG 2040	2040 Enhanced
All Other	4,113,212	6,520,582	6,520,582	1,468,502	2,594,646	2,594,646
Existing + No Build LRT	162,441	315,074	315,074	190,082	277,811	277,811
Build Scenario	124,199	147,726	195,818	64,666	78,097	117,492
Total	4,399,852	6,983,382	7,031,474	1,723,250	2,950,554	2,989,949

Source: MAG, 2015; Valley Metro, 2016

TABLE 8 POPULATION AND EMPLOYMENT PERCENT CHANGE (2015 – 2040)

TAZs	Population		Employment	
	MAG 2040	2040 Enhanced	MAG 2040	2040 Enhanced
All Other	59%	59%	77%	77%
Existing + No Build LRT	94%	94%	46%	46%
Build Scenario	19%	58%	21%	82%
Total	59%	60%	71%	74%

Source: MAG, 2015; Valley Metro, 2016

Additional Inputs

There are several inputs that are optional in STOPS which were also applied for the FDCTCS. These include the following:

- Weekday Unlinked Transit Trips
- Weekday Home-Based Work (HBW) Linked Transit Trips
- Ratio of Home-Based Other (HBO) to HBW trips by Auto Occupancy
- Ratio of Non-Home-Based NHB to HBW trips by Auto Occupancy

Table 9 shows the additional parameters used in STOPS for the Fiesta Downtown Chandler Feasibility Study.

TABLE 9 ADDITIONAL PARAMETERS USED IN STOPS

Linked Transit Trip Goal			
	HBW	HBO	NHB
0-Car HH	34,534	45,619	12,820
1-Car HH	18,970	20,217	4,899
2-Car HH	12,821	17,683	3,545
All-Car HH	66,325	83,520	21,867
Weekday Unlinked Transit Trips			
242,000			
Weekday Linked HBW Transit Trips			
66,325			

HH refers to Household
Source: Valley Metro, 2016

3.2 EVALUATION CRITERIA

The study team developed a set of evaluation criteria by which to assess each HCT scenario. The criteria included both qualitative and quantitative factors, as shown in Table 10. An evaluation matrix was prepared to provide both qualitative and quantitative assessments and ratings of how well each HCT corridor met each of the eight criteria.

TABLE 10 TIER 2 EVALUATION CRITERIA FOR HCT

Category of Criterion	Tier 2 Evaluation Criteria
Engineering	• Operational considerations/tie into existing CP/EV line
Mobility	• Projected daily station boardings (2040) • Proximity to regional east-west arterials • Proximity to existing or planned bicycle/pedestrian routes
Costs	• Capital costs

Source: Valley Metro, 2016

3.2.1 Operating Characteristics

Both HCT Scenario 1 and HCT Scenario 2 are considered stand-alone rail lines, meaning they will not interline with the existing CP/EV line. An analysis to determine the possibility and functionality of an interlined option may be completed in the future, but shall be completed outside of this study. This modelling effort assumed riders will transfer to and from the Sycamore/Main Street LRT station to the Main Street/Dobson Road station for HCT Scenario 1. LRT service along the Dobson Road alignment will maintain 12-minute headways, which allows for a 6-minute transfer window to the main CP/EV line.

HCT Scenario 2 will operate at 12-minute headways and this modelling effort assumed passengers would have to transfer from the Main Street/Country Club Drive to the proposed station at Country Club Drive/First Avenue Station. Similar to HCT Scenario 1, there will be a 6-minute window to allow passengers to transfer to the main CP/EV line.

3.2.2 Mobility

The results of the STOPS model run conclude in 2040, HCT Scenario 1 has averages 960 boardings per station area, and HCT Scenario 2 averages 1,013 boardings per station area. Although there are less boardings per station area for the Dobson Road alignment, there is a greater number of total boardings along the entire corridor compared to the Country Club Drive/Arizona Avenue corridor. Table 11 shows STOPS forecasts based on the transit-enhanced 2040 population and employment projections. The table breaks down boardings by jurisdiction to show where ridership is highest along each corridor.

TABLE 11 2040 RIDERSHIP PROJECTIONS

Parameter	Enhanced Transit and City Land Use	
	Dobson Road Scenario	Arizona Avenue Scenario
Stations (Length)	12 (10.5 miles)	10 (8.5 miles)
Scenario boardings	10,084	8,612
Mesa	5,506	3,522
Gilbert	1,168	1,178
Chandler	3,410	3,912
Scenario boardings/Mile	960	1,013
Mesa	1,224	1,409
Gilbert	1,168	1,178
Chandler	682	782

Source: Valley Metro, 2016

Proximity to East/West Routes

There are a total of four existing east/west local bus routes that connect to both HCT Scenarios. Those routes include Local Route 45 (Broadway Road), Local Route 61 (Southern Avenue), Local Route 108 (Guadalupe Road), and Local Route 156 (Chandler Boulevard). With the addition of the circulator routes used in the STOPS analysis, there are a total of four additional routes that will provide connections to the Arizona Avenue corridor. These circulator routes serve Guadalupe Road and Elliot Road, Warner Road, Ray Road, and Pecos Road to Germann Road. The proposed circulator routes will operate on top of existing local bus service at 10-minute frequency.

Bike and Pedestrian Connectivity

The bike and pedestrian connectivity evaluation focused on bike lanes and sidewalks proximity to the proposed station locations. The evaluation found that every potential station area for each HCT scenario has intersecting sidewalks that provide a pedestrian connection, as well as maintain existing bike lanes along each corridor.

3.3 CAPITAL COSTS EVALUATION

Costs were estimated for the development of an HCT service on the two alignment scenarios as defined in Section 1.0. The estimated costs to implement HCT were calculated for individual expense categories based on the US Department of Transportation Federal Transit Administration Standard Cost Categories. Unit costs for each category were developed based on local data such as recent comparable Valley Metro projects. Valley Metro utilizes industry standard and local unit costs to anticipate and forecast future transit expenditures. This method produces “order of magnitude” cost estimates to provide a general framework for review and planning purposes. These capital costs should not be considered a formal estimate of costs and are not for programming purposes.

Table 12 summarizes the costs estimated for LRT along the two alignment scenarios in the long-term horizon. Costs were calculated based on the unit costs for each category in current year, 2016 dollars, enabling a comparison of costs across each corridor alternative. The estimation also includes spare vehicles. Costs are based on order of magnitude unit costs, which is used for illustrative examples of a typical LRT corridor. These costs are provided only for planning and review and not for programming purposes.



TABLE 12 CAPITAL COST ESTIMATES (2016)

Cost Category	Alignment Scenario 1 Dobson	Alignment Scenario 2 Country Club
Construction*	\$465	\$376
Right-of-Way ¹	\$129	\$120
Vehicles (19 for Scenario 1, 17 for Scenario 2)	\$110	\$99
Professional Services ²	\$137	\$116
Contingency ³	\$239	\$210
Total⁴	\$1,080	\$921
Total Cost Per Mile	\$103	\$108

Total costs in millions of 2016 dollars. Doesn't include finance costs.

*Fare collection systems, park-and-ride, sitework, transit signal priority, operation and maintenance center, LRT stops and guideway are included in the LRT "Construction" cost estimate category.

¹ Based on per mile estimate.

² Approximately 30% of construction cost.

³ Applied approximately 30% at conceptual stage.

⁴ Assumes 12-minute headway while cost estimated in Technical Memo #2 assumed 10-minute headway.

Source: Valley Metro, 2016

4.0 CONCLUSION

In conclusion, both HCT scenario alternatives demonstrate an increase in population and employment growth; however, HCT Scenario 1 (Dobson Road/Southern Avenue) has greater potential of serving a larger population and connecting riders to activity centers, specifically located in the Fiesta District. In comparison, HCT Scenario 2 (Country Club Drive/Arizona Avenue) does have lower capital costs, but this is due to the reduced length of the corridor, which is 2-miles less than the Dobson Road/Southern Avenue alignment. Table 13 summarizes the qualitative and quantitative criteria used in the evaluation of alternatives for both HCT scenarios that helped determined which scenario should move forward for further analysis.

TABLE 13 LIGHT RAIL SCENARIO EVALUATION

Criteria	Dobson Road (10.5 miles)			Arizona Avenue (8.5 miles)		
	MAG 2015	MAG 2040	% Change	MAG 2015	MAG 2040	% Change
Population	71,589 (6,390 sq. mi)	86,854 (7,750 sq. mi)	21%	55,635 (5,950 sq. mi)	68,080 (7,280 sq. mi)	22%
Employment	36,157 (3,230 sq. mi)	43,410 (3,870 sq. mi)	20%	29,570 (3,160 sq. mi)	34,831 (3,730 sq. mi)	18%
Zero Auto Households	13% (2015)			10% (2015)		
Unique Activity Centers	Banner Desert Medical Center, Fiesta Mall, Mesa Community College			Downtown Mesa		
LRT Ridership*	10,084			8,612		
Capital Costs (Millions)	\$1,080			\$921		

Population/Employment – Reported at one-half mile buffer along individual corridors

*Ridership: Total boardings using FTA STOPS model 2040 forecast

Total costs in millions of 2016 dollars. Doesn't include finance costs.

Source: MAG, 2015

As shown in Table 13, population and employment, percent of zero and one-car households, connection to activity centers and overall ridership are greater for the Dobson Road alignment compared to the Country Club Drive/Arizona Avenue corridor. The corridor is also consistent with The City of Mesa's General Plan and Master Transportation Plan which is identified as an HCT corridor. Therefore, HCT Scenario 1 is the preferred corridor that will move forward into a more detailed analysis that will include a high-level traffic analysis and determine potential phasing options for future development.



APPENDIX E

TRAFFIC SEGMENT ANALYSIS MEMORANDUM



MEMO



To: Fiesta-Downtown Chandler Transit Corridor Study Project File

From: Fiesta/Downtown Chandler TCS Project Team

Date: February 27, 2017

Re: Fiesta-Downtown Chandler Traffic Segment Analysis

INTRODUCTION

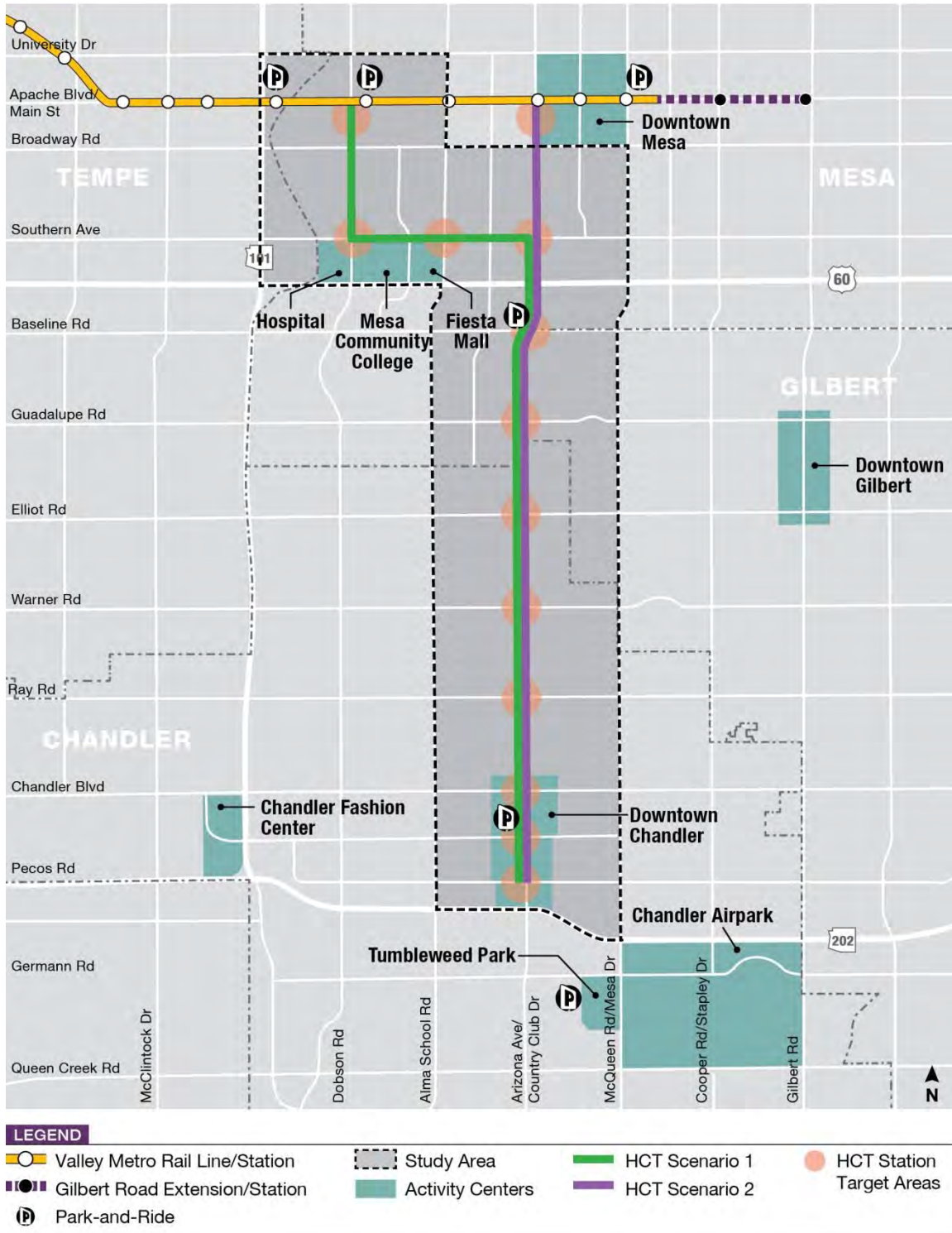
As part of the Fiesta-Downtown Chandler Transit Corridor Study (FDCTCS), a high-level traffic analysis was completed to determine the traffic impacts of introducing high-capacity transit (HCT) in the Arizona Avenue corridor, a primarily north-south corridor that exists within the cities of west Mesa, Gilbert, and Chandler. The traffic analysis included looking at historical data from the Mesa, Chandler, Gilbert, Arizona Department of Transportation (ADOT) and the Maricopa Association of Governments (MAG). Along with this data, the analysis used the MAG Transportation Demand Model (TDM) to model volumes changes associated with introducing HCT and reducing lane capacity. The model results were then converted to a level of service (LOS) segment analysis to interpret the data.

PROPOSED HCT ROUTE

Technical Memorandum Number 3: Scenario Evaluation for the FDCTCS recommends that the proposed HCT alignment connect to the existing light rail system near the Main Street and Dobson Road intersection in Mesa. The proposed alignment would then travel south on Dobson Road. At Southern Avenue, the alignment would turn east for two miles until Country Club Drive. At Country Club Drive, the alignment would turn south and continue past US 60. At Elliot Road, the northern border of the cities of Chandler and Mesa, Country Club Drive becomes Arizona Avenue. The alignment would continue south into Chandler via Arizona Avenue until it reaches its terminus at Pecos Road.

The proposed HCT route is shown in Figure 1 as HCT 1. From Technical Memorandum 3, HCT 1 was suggested as the recommended alternative because it has greater potential to serve a larger population and connect riders to more activity centers than HCT 2, the other alternative evaluated in the FDCTCS. Additionally, Figure 1 shows the study area for the segment analysis which follows the proposed HCT 1 route.

FIGURE 1: HCT TRANSIT SCENARIOS (2040) AND TRAFFIC STUDY AREA



ASSUMPTIONS AND METHODOLOGY

The analysis looked at the approximately mile-long segment average daily traffic (ADT) in three different scenarios (2015 existing conditions, 2040 No-Build Alternative and the 2040 Build Alternative) within the study area shown in Figure 1. These years are consistent with previous analyses done for the FDCTCS including socioeconomic conditions and travel forecasting. MAG TDM model runs were completed for all three scenarios.

In order to accommodate HCT in the study corridor, it is assumed that travel lane reduction would occur in the Build Alternative. The number of travel lanes in the No-Build Alternative is assumed to be the same as the 2015 Existing scenario. There were no other major changes made to the Build Alternative when compared to the No-Build Alternative. The number of travel lanes, not including turn lanes, on the alignment segments in the 2015 existing/2040 No-Build and 2040 Build Alternatives can be found in Table 1. Seven of 13 segments along the proposed alignment have lane drops. The number of travel lanes on all segments in the study area can be found in Figure 2 for the 2015 existing/2040 No-Build Alternative and Figure 3 for the 2040 Build Alternative.

TABLE 1: TRAVEL LANES FOR HCT ALIGNMENT SEGMENTS BY SCENARIO

Street	Segment	Number of Travel Lanes			
		2015 Existing 2040 No-Build		2040 Build	
		NB or EB	SB or WB	NB or EB	SB or WB
Dobson Rd	Apache/Main St to Broadway Rd	3	3	2	2
	Broadway Rd to Southern Ave	3	3	2	2
Southern Ave	Dobson Rd to Alma School Rd	2	2	2	2
	Alma School to Arizona Ave/Country Club Dr	3	3	2	2
Arizona Ave/Country Club Dr	Southern Ave to US 60	3	3	3	3
	US 60 to Baseline Rd	3	3	3	3
	Baseline Rd to Guadalupe Rd	3	3	2	2
	Guadalupe Rd to Elliot Rd	3	3	2	2
	Elliot Rd to Warner Rd	3	3	2	2
	Warner Rd to Ray Rd	3	3	2	2
	Ray Rd to Chandler Blvd	2	2	2	2
	Chandler Blvd to Frye Rd	2	2	2	2
Frye Rd to Pecos Rd	2	2	2	2	

Note: Red signifies lane(s) have been removed in the Build Alternative.

To ensure accurate model results, historical ADT counts along the corridor from 2011 to 2015 were gathered (if available) from the City of Mesa, the City of Chandler, the Town of Gilbert, MAG, and ADOT. The most recent ADT prior to 2016 at mile or half mile arterial segments in the study area was recorded and shown in Figure 4.

FIGURE 2: 2015 EXISTING/2040 NO-BUILD NUMBER OF TRAVEL LANES

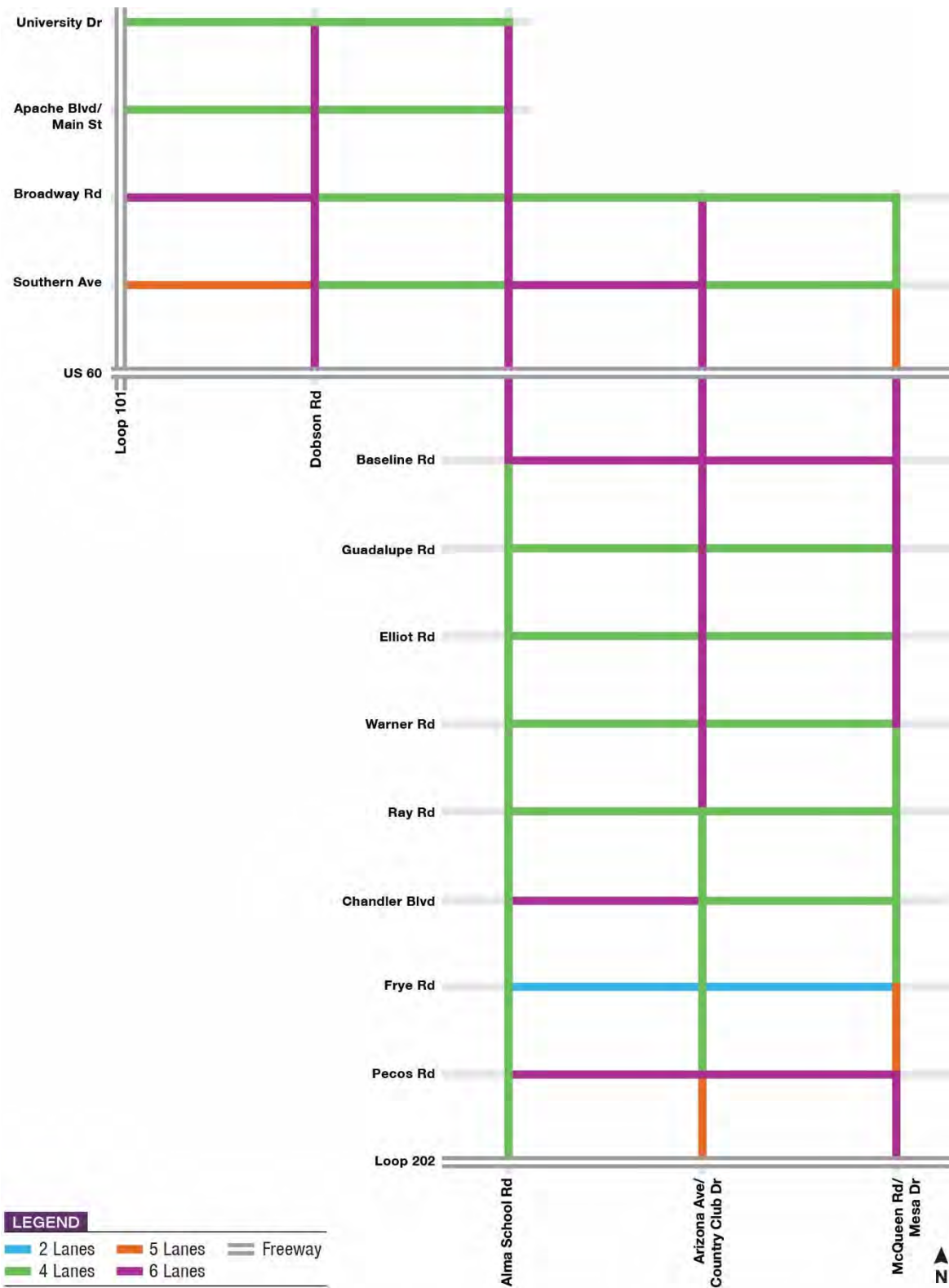


FIGURE 3: 2040 BUILD NUMBER OF TRAVEL LANES

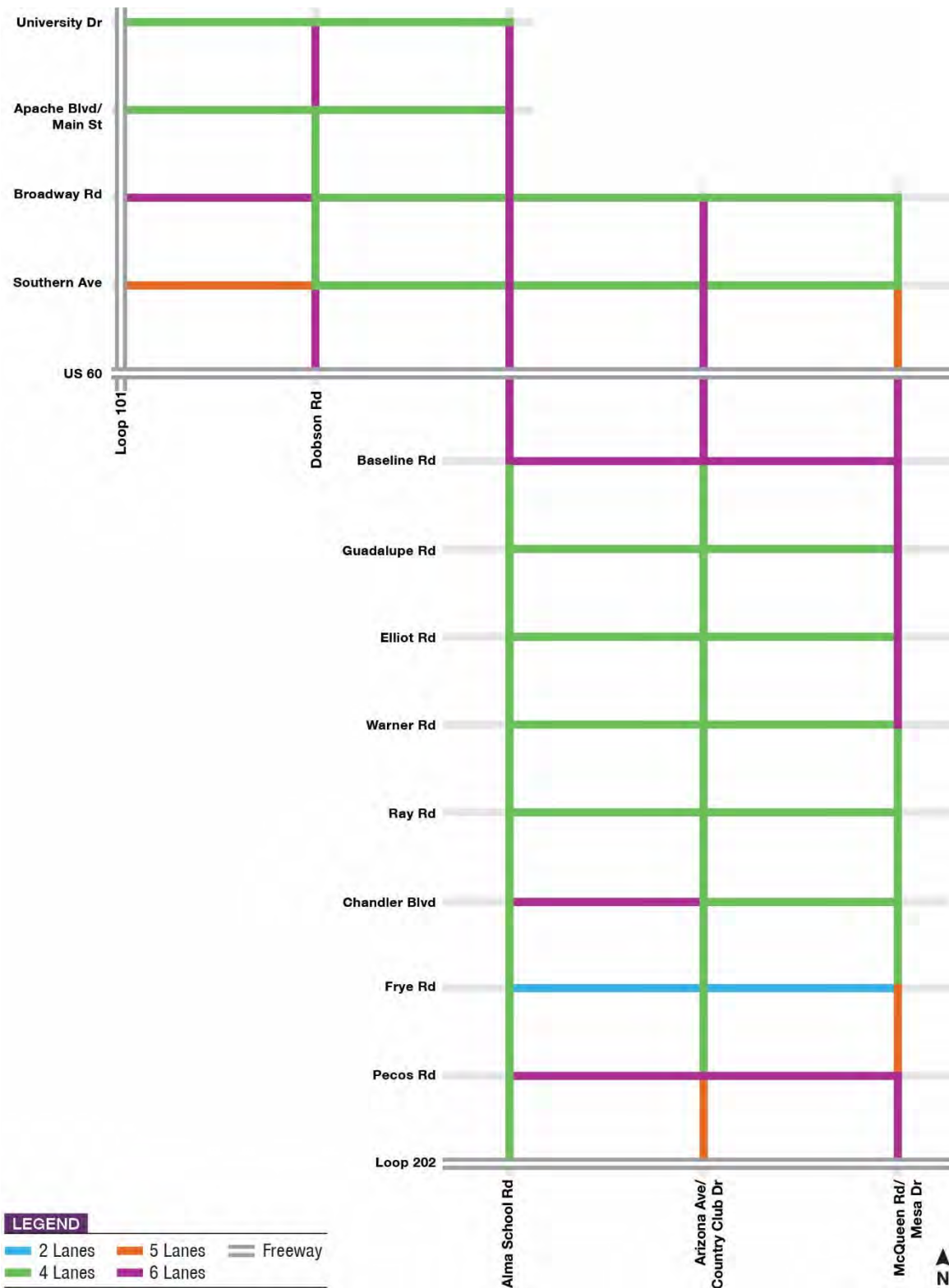
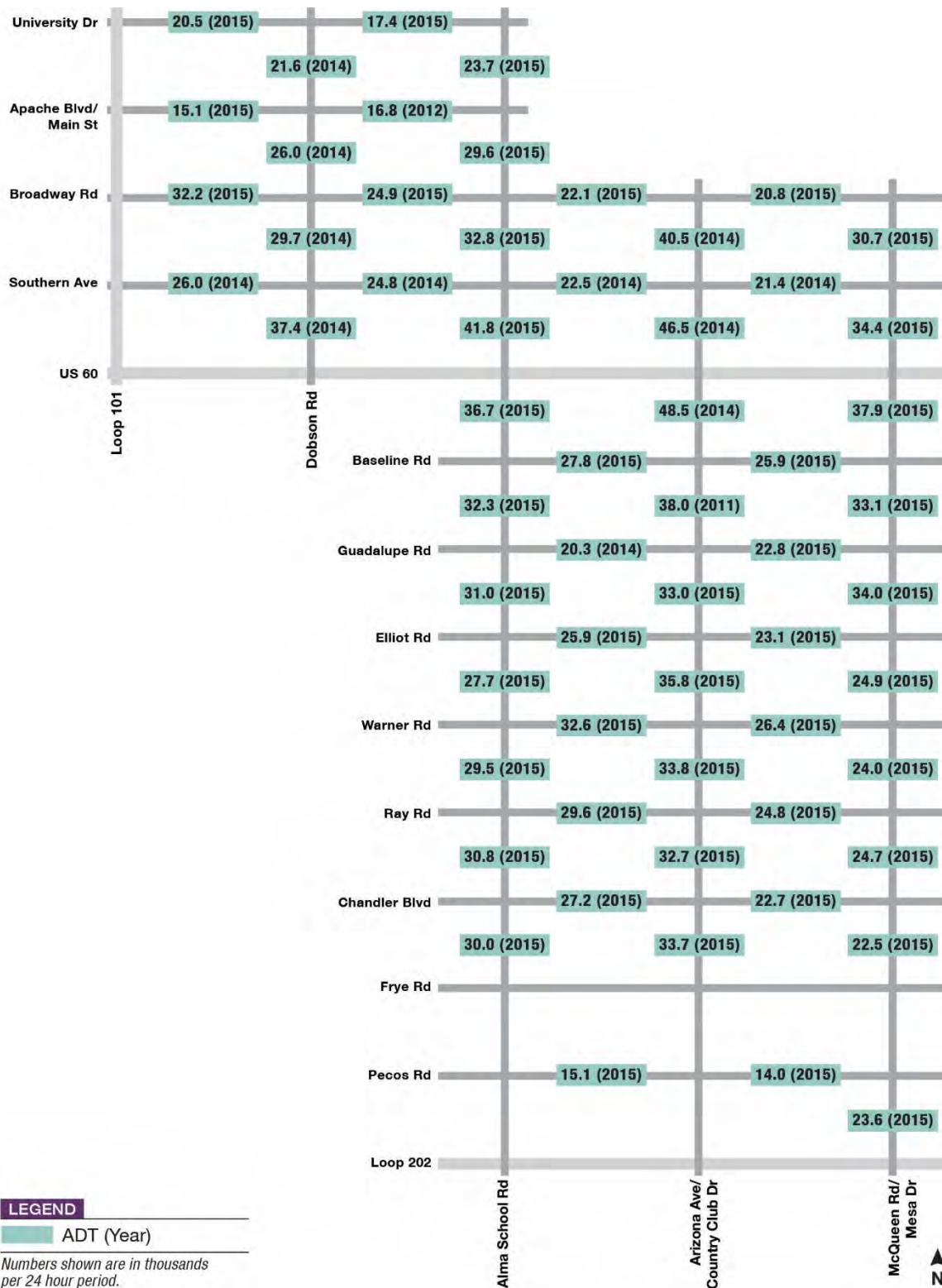


FIGURE 4: EXISTING ADT BY SEGMENT



The ADT was adjusted to 2015 values using compounded annual growth rates, unique to each segment, derived from the segments' most recent two years' ADT. For segments that did not have two or more recent ADT values after 2010, or where recent ADT appeared to have an outlying trend, assumptions were made for either the ADT, growth rate, or both based on ADT from neighboring segments. The segments with estimated values are:

- Dobson Road – Southern Avenue to US 60 (Estimated Growth Rate Only)
- Arizona Avenue/Country Club Drive – Baseline Road to Guadalupe Road (Estimated Growth Rate Only)
- Arizona Avenue/Country Club Drive – Frye Road to Pecos Rd
- Arizona Avenue/Country Club Drive – Pecos Road to Loop 202
- Alma School Road – Frye Road to Pecos Road
- Alma School Road – Frye Road to Loop 202
- Mesa Drive/McQueen Road – Frye Road to Pecos Road

Two methods were used to determine the segment ADT in the 2040 No-Build and Build Alternatives from the MAG TDM models: a growth factor and a difference method. The growth factor method compared each segment of the 2040 No-Build or Build MAG models to the 2015 MAG model and derived a growth rate for each alternative unique to the segments. The growth rates were then applied to the adjusted 2015 ADT to develop the respective 2040 No-Build and Build Alternatives. The difference method took the 2040 No-Build and Build MAG models when compared to the 2015 MAG model and directly applied the traffic volume differences to the adjusted 2015 ADT to develop the 2040 No-Build and Build Alternatives. The segment 2040 No-Build and Build ADTs are based on an average of the results from these two methods.

The Highway Capacity Manual (HCM) 2010 was employed to determine the LOS from the adjusted 2015, 2040 No-Build and 2040 Build ADT. Exhibit 16-14 from the HCM provides generalized daily service volumes for urban street facilities and the associated LOS in two-, four-, and six-lane streets using given K- and D-Factors. The K- and D-Factors were acquired from the ADOT permanent count station (ID: 100971) located on Arizona Avenue/Country Club Drive between Guadalupe Road and Elliot Road. The thresholds for LOS in two-, four- and six-lane streets from Exhibit 16-14 of the HCM 2010 are shown in Table 2. According to the HCM 2010, Exhibit 16-14 is meant to be used as a tool for general planning purposes; final design decisions should not be made based on its results.

To be conservative, arterial segments in the study area with five-lanes (see Figure 2 and Figure 3) were analyzed as four-lane streets.

TABLE 2: GENERALIZED DAILY SERVICE VOLUMES FOR URBAN STREET FACILITIES – EXHIBIT 16-14, HCM 2010

LOS	Number of Total Through Lanes		
	2	4	6
B	NA	NA	NA
C	9,300	19,300	28,700
D	16,800	33,500	48,600
E	17,900	34,100	48,900

NA = Not applicable.

Note: Thresholds applicable for posted speed of 45 mi/hr, K-Factor of 0.10, D-Factor of 0.55. Other assumptions found in Exhibit 16-14 of HCM 2010.

RESULTS

2015 Existing

Figure 5 summarizes the adjusted 2015 ADT and corresponding LOS. Based on the LOS criteria shown in Exhibit 16-14 of the HCM 2010, there are six segments in the study area that have an LOS worse than C in the 2015 Existing scenario. These segments are:

- Arizona Avenue/Country Club Drive from US 60 to Baseline Road (LOS E)
- Arizona Avenue/Country Club Drive from Chandler Boulevard to Frye Road (LOS D)
- Arizona Avenue/Country Club Drive from Frye Road to Pecos Road (LOS D)
- Arizona Avenue/Country Club Drive from Pecos Road to Loop 202 (LOS E)
- Alma School Road from Pecos Road to Loop 202 (LOS E)
- Mesa Drive/McQueen Road from Southern Avenue to US 60 (LOS E)

2040 No-Build

Figure 6 summarizes the 2040 No-Build ADT and corresponding LOS. In the 2040 No-Build Alternative, there are 18 segments that have an LOS worse than C. These segments are:

- Arizona Avenue/Country Club Drive from Southern Avenue to US 60 (LOS E)
- Arizona Avenue/Country Club Drive from US 60 to Baseline Road (LOS E)
- Arizona Avenue/Country Club Drive from Ray Road to Chandler Boulevard (LOS E)
- Arizona Avenue/Country Club Drive from Chandler Boulevard to Frye Road (LOS E)
- Arizona Avenue/Country Club Drive from Frye Road to Pecos Road (LOS E)
- Arizona Avenue/Country Club Drive from Pecos Road to Loop 202 (LOS E)

- Alma School Road from Southern Avenue to US 60 (LOS E)
- Alma School Road from Baseline Road to Guadalupe Road (LOS E)
- Alma School Road from Ray Road to Chandler Boulevard (LOS E)
- Alma School Road from Frye Road to Pecos Road (LOS E)
- Alma School Road from Pecos Road to Loop 202 (LOS E)
- Mesa Drive/McQueen Road from Broadway Road to Southern Avenue (LOS E)
- Mesa Drive/McQueen Road from Southern Avenue to US 60 (LOS E)
- Mesa Drive/McQueen Road from Warner Road to Ray Road (LOS E)
- Mesa Drive/McQueen Road from Ray Road to Chandler Boulevard (LOS E)
- Mesa Drive/McQueen Road from Frye Road to Pecos Road (LOS E)
- Warner Road from Alma School to Arizona Avenue/Country Club Drive (LOS E)
- Ray Road from Alma School to Arizona Avenue/Country Club Drive (LOS D)

2040 Build

Figure 7 summarizes the 2040 Build ADT and corresponding LOS. In the 2040 Build Alternative, there are 20 segments that have an LOS worse than C. These segments are:

- Arizona Avenue/Country Club Drive from Southern Avenue to US 60 (LOS E)
- Arizona Avenue/Country Club Drive from US 60 to Baseline Road (LOS E)
- Arizona Avenue/Country Club Drive from Baseline Road to Guadalupe Road (LOS E)
- Arizona Avenue/Country Club Drive from Ray Road to Chandler Boulevard (LOS E)
- Arizona Avenue/Country Club Drive from Chandler Boulevard to Frye Road (LOS E)
- Arizona Avenue/Country Club Drive from Frye Road to Pecos Road (LOS E)
- Arizona Avenue/Country Club Drive from Pecos Road to Loop 202 (LOS E)
- Alma School Road from Southern Avenue to US 60 (LOS E)
- Alma School Road from Baseline Road to Guadalupe Road (LOS E)
- Alma School Road from Guadalupe Road to Elliot Road (LOS E)
- Alma School Road from Ray Road to Chandler Boulevard (LOS E)
- Alma School Road from Frye Road to Pecos Road (LOS E)
- Alma School Road from Pecos Road to Loop 202 (LOS E)
- Mesa Drive/McQueen Road from Broadway Road to Southern Avenue (LOS E)
- Mesa Drive/McQueen Road from Southern Avenue to US 60 (LOS E)
- Mesa Drive/McQueen Road from Warner Road to Ray Road (LOS E)
- Mesa Drive/McQueen Road from Ray Road to Chandler Boulevard (LOS E)
- Mesa Drive/McQueen Road from Frye Road to Pecos Road (LOS E)
- Warner Road from Alma School to Arizona Avenue/Country Club Drive (LOS E)
- Ray Road from Alma School to Arizona Avenue/Country Club Drive (LOS D)

FIGURE 5: 2015 ADT AND LOS

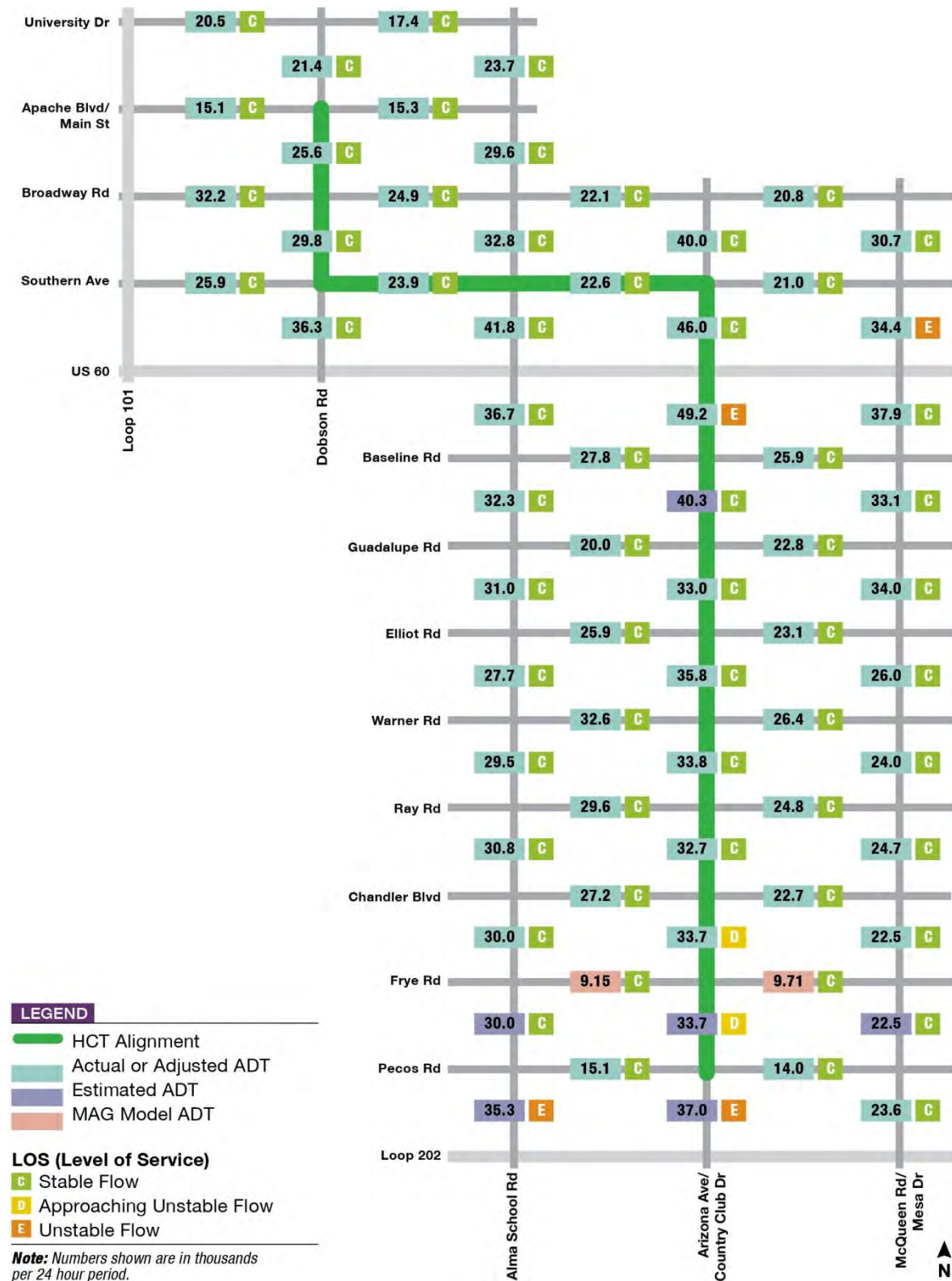


FIGURE 6: 2040 NO-BUILD ADT AND LOS

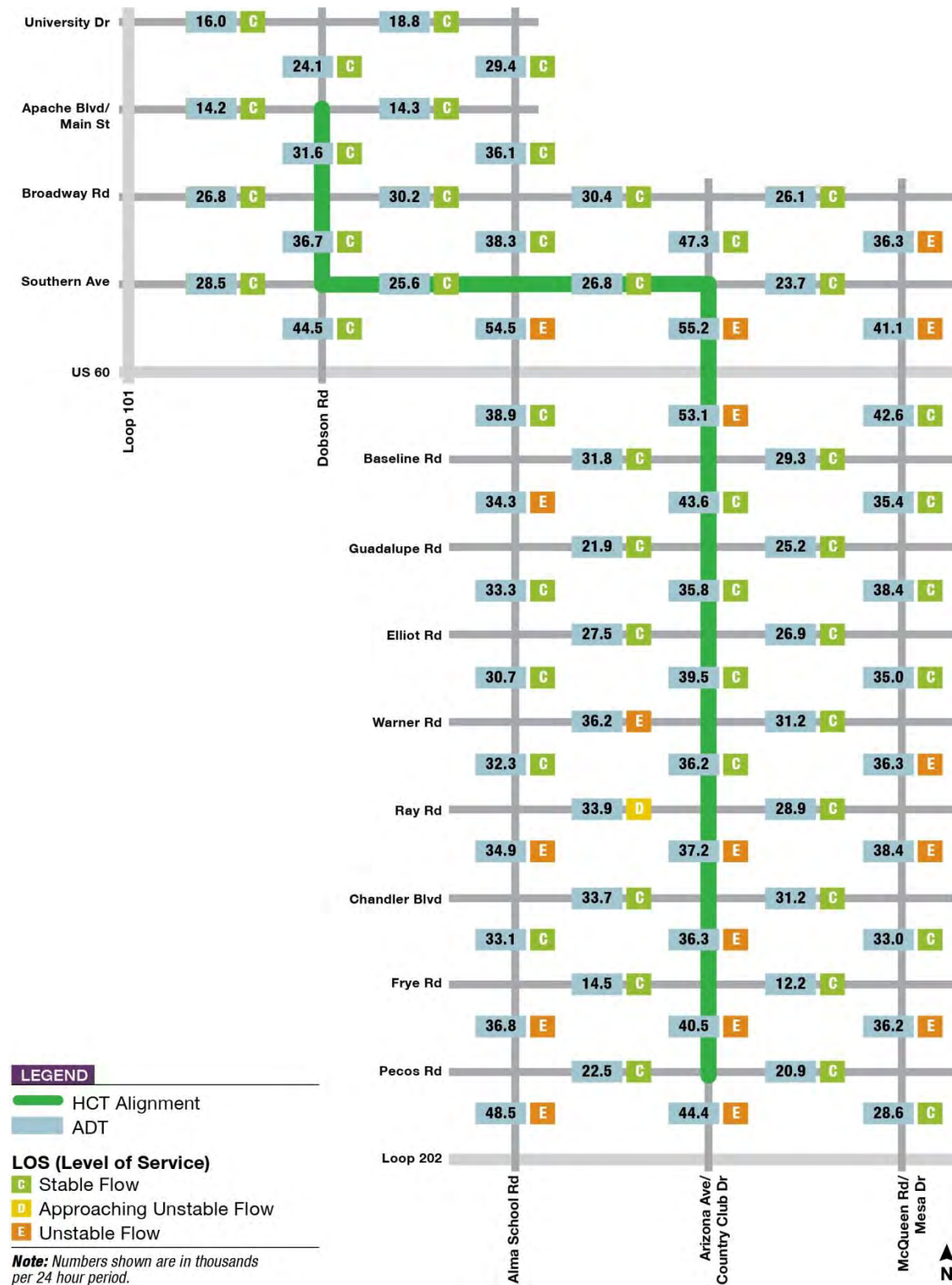
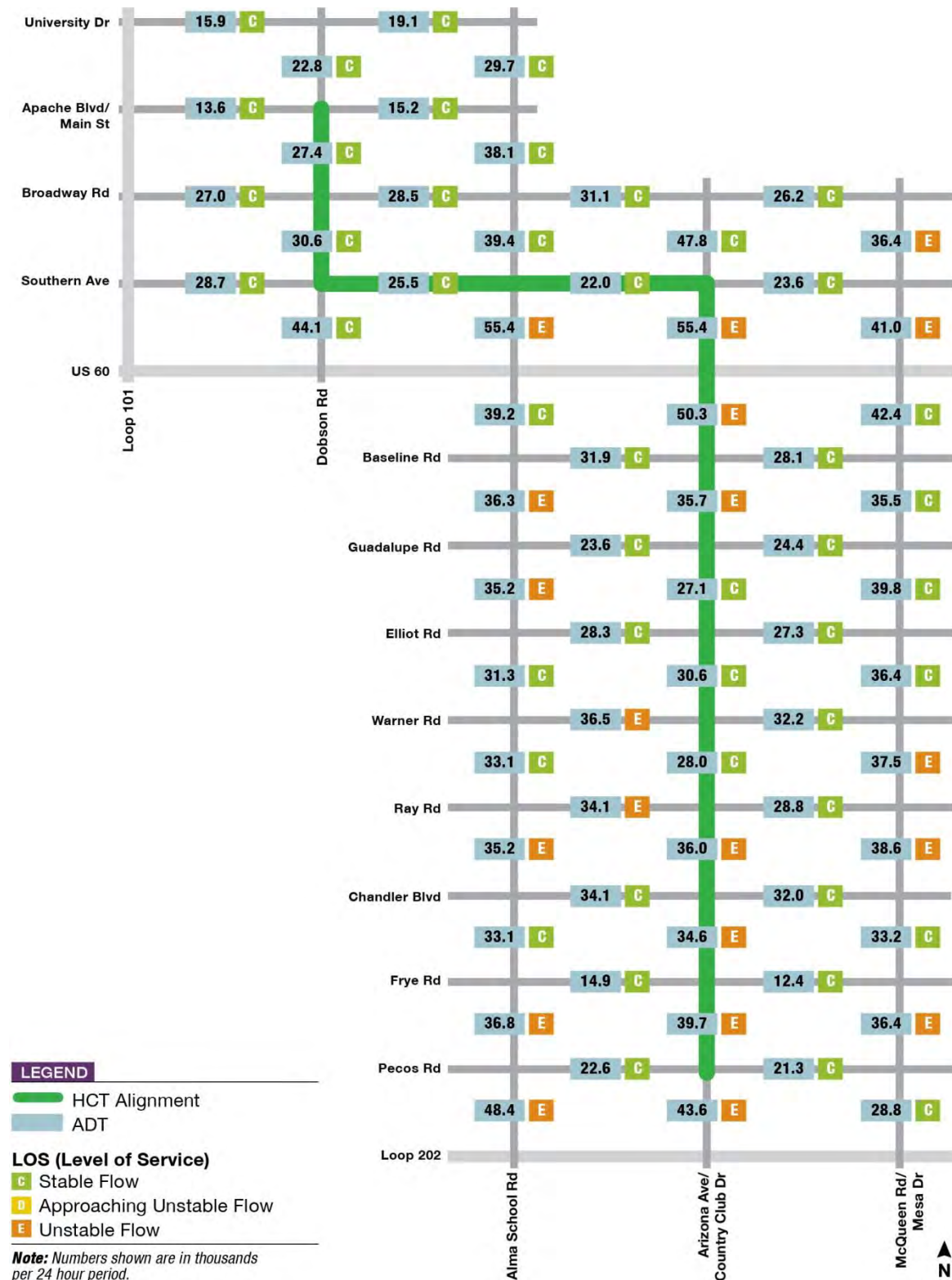


FIGURE 7: 2040-BUILD ADT AND LOS



Comparison of 2040 No-Build and Build

Between the 2040 No-Build and the 2040 Build, there are three segments that degrade in LOS:

- Arizona Avenue/Country Club Drive from Baseline Road to Guadalupe Road degrades from an LOS C in the 2040 No-Build to an LOS E in the 2040 Build.
- Alma School Road from Guadalupe Road to Elliot Road degrades from an LOS C in the 2040 No-Build to an LOS E in the 2040 Build.
- Ray Road from Alma School Road to Arizona Avenue/Country Club Drive degrades from an LOS D in the 2040 No-Build to an LOS E in the 2040 Build.

The Arizona Avenue/Country Club Drive segment has an 18% decrease in ADT from the 2040 No-Build to Build. However, the number of lanes on the Arizona Avenue/Country Club Drive segment also decreases from six to four lanes in the Build. This brings the ADT to 35,700 vehicles, which is above the LOS E threshold for four-lane segments shown in Table 2.

The Alma School Road segment has a 6% increase in ADT from the 2040 No-Build to Build. Although there are multiple segments with a 6% increase in ADT, which happens to be the highest percent increase in the study area, the Alma School Road segment ADT is only 200 vehicles under the LOS D threshold in the 2040 No-Build. The 6% increase puts the ADT at 35,200 vehicles in the Build, which is above both the LOS D and E thresholds for four-lane segments in Table 2.

The Ray Road segment has a 1% increase in ADT between the 2040 No-Build and Build. Similar to the Alma School Road segment, the Ray Road segment is only 200 vehicles under the LOS E threshold in the 2040 No-Build. With the 1% increase, the ADT ends up being 34,100 in the Build, at the LOS E threshold for four-lane segments.

The anticipated change in LOS at the three above segments is based on corridor trends of diversion away from the alignment segments onto neighboring arterials and a decrease in capacity from the reduction of through travel lanes. Alignment segments in the study area had a percent change in ADT from 0% to 24%, regardless if the segment had a lane drop (although segments with lane drops had a higher percent change). The Arizona Avenue/Country Club Drive segment (four travel lanes) is immediately south of two, six-lane segments that exceed the LOS E threshold in both the 2040 No-Build and 2040 Build. Both the high ADT at these segments to the north and the lane drop from six to four lanes contribute to the degradation to LOS E in the Build Alternative. The Alma School Road and Ray Road segments had increases in ADT from the introduction of HCT in the corridor. Although the increases were relatively small compared to other percent changes along study area segments, they were close enough to LOS E thresholds for four-lane segments in the No-Build Alternative to result in a degradation of LOS in the Build Alternative.

Although no other LOS changes occurred between the 2040 No-Build and Build, there were ADT volume changes. Notable observations from the analysis include:

- Traffic volume decrease of 13-17% on Dobson Road between Apache/Main Street and Southern Avenue due to two-lane reduction
- Traffic volume decrease of 18% on Southern Avenue between Alma School and Arizona Avenue/Country Club Drive due to two-lane reduction.
- Traffic volume decrease of 18-24% on Arizona Avenue/Country Club Drive between Guadalupe Road and Ray Road due to two-lane reduction.
- Traffic volume increase of 1-6% on Alma School between University Drive and Chandler Boulevard.
- Traffic volume increase of 1-4% on Mesa Drive/McQueen Road between Guadalupe Road and Elliot Road.
- The remaining east-west arterials experience volume changes ranging from decreases of 4% to increases of 6%.

For segments that have an LOS E in either the 2015 Existing, 2040 No-Build and Build Alternatives, changes in number of lanes, ADT and LOS between the scenarios is shown in Table 3. In total, there are 20 segments that have an LOS D or worse in any scenario. Three segments in Table 3 have five-lanes (Arizona Avenue/Country Club Drive from Pecos Road to Loop 202; Mesa Drive/McQueen Road from Southern Avenue to US 60; Mesa Drive/McQueen Road from Frye Road to Pecos Road). However, they were analyzed as if they were four-lane segments with an LOS E in all three scenarios, with the exception of Mesa Drive/McQueen Road from Frye Road to Pecos Road which as an LOS C in the 2015 Existing. It is anticipated that these three segments would have more capacity than the LOS shows.

MEMO



TABLE 3: COMPARISON OF SEGMENTS IN 2015 EXISTING, 2040 NO-BUILD AND BUILD

Street	Segment	2015			2040 No-Build			2040 Build			2040 Build vs. No-Build		
		Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS	Lanes	ADT ¹	LOS
Arizona Ave/Country Club Dr	Southern Ave to US 60	6	46.0	C	6	55.2	E	6	55.4	E	0	0.2	Similar
	US 60 to Baseline Rd	6	49.2	E	6	53.1	E	6	50.3	E	0	-2.8	Similar
	Baseline Rd to Guadalupe Rd	6	40.3	C	6	43.6	C	4	35.7	E	-2	-7.9	Worse
	Ray Rd to Chandler Blvd	4	32.7	C	4	37.2	E	4	36.0	E	0	-1.2	Similar
	Chandler Blvd to Frye Rd	4	33.7	D	4	36.3	E	4	34.6	E	0	-1.7	Similar
	Frye Rd to Pecos Rd	4	33.7	D	4	40.5	E	4	39.7	E	0	-0.8	Similar
	Pecos Rd to Loop 202	5	37.0	E	5	44.4	E	5	43.6	E	0	-0.8	Similar
Alma School Rd	Southern Ave to US 60	6	41.8	C	6	54.5	E	6	55.4	E	0	0.9	Similar
	Baseline Rd to Guadalupe Rd	4	32.3	C	4	34.3	E	4	36.3	E	0	2.0	Similar
	Guadalupe Rd to Elliot Rd	4	31.0	C	4	33.3	C	4	35.2	E	0	1.9	Worse
	Ray Rd to Chandler Blvd	4	30.8	C	4	34.9	E	4	35.2	E	0	0.3	Similar
	Frye Rd to Pecos Rd	4	30.0	C	4	36.8	E	4	36.8	E	0	0.0	Similar
	Pecos Rd to Loop 202	4	35.3	E	4	48.5	E	4	48.4	E	0	-0.1	Similar
Mesa Dr/McQueen Rd	Broadway Rd to Southern Ave	4	30.7	C	4	36.3	E	4	36.4	E	0	0.1	Similar
	Southern Ave to US 60	5	34.4	E	5	41.1	E	5	41.0	E	0	-0.1	Similar
	Warner Rd to Ray Rd	4	24.0	C	4	36.3	E	4	37.5	E	0	1.2	Similar
	Ray Rd to Chandler Blvd	4	24.7	C	4	38.4	E	4	38.6	E	0	0.2	Similar
	Frye Rd to Pecos Rd	5	22.5	C	5	36.2	E	5	36.4	E	0	0.2	Similar
Warner Rd	Alma School Rd to Arizona Ave/Country Club Dr	4	32.6	C	4	36.2	E	4	36.5	E	0	0.3	Similar
Ray Rd	Alma School Rd to Arizona Ave/Country Club Dr	4	29.6	C	4	33.9	D	4	34.1	E	0	0.2	Worse

Note: Segments in dark gray are along HCT alignment.

¹ Numbers shown are in thousands.

CONCLUSION

Summary

The FDCTCS recommended HCT scenario would reduce lanes in the study corridor along the proposed alignment at seven segments in the 2040 Build. Based on the high-level segment analysis, only one of these seven segments degrades in LOS (Arizona Avenue/Country Club Drive from Baseline Road to Guadalupe Road). These seven segments have ADT volume decreases ranging from 13% to 24%. Other alignment segments where lane reductions do not occur have 0% to 5% less ADT in the 2040 Build.

Segments that are parallel with and perpendicular to the alignment in the study area experienced volume increases of 0% to 6% between the 2040 No-Build and Build. Only two segments' LOS were negatively affected by these volume increases (Alma School Road from Guadalupe Road to Elliot Road; Ray Road from Alma School Road to Arizona Avenue/Country Club Road).

The high-level segment analysis performed in this memo did not use LOS A, B or F. Figure 16-14 in the HCM 2010 does not have thresholds for LOS A, B or F because it is meant for high-level planning purposes. Therefore, in actuality segments may have better or worse LOS than what this analysis showed.

Future Steps

Based on the assessment results, future study phases for this corridor should include the following activities in coordination with advanced engineering design:

1. Perform intersection traffic operation analysis using micro-simulation modeling.
2. Evaluate the turn lane requirements at major intersections.
3. Analyze the lane reduction and potential impacts of the proposed HCT alignment along Dobson Road, Southern Avenue, and Arizona Avenue/Country Club Drive to adjacent east-west and north-south arterials and propose potential mitigation measures, if necessary.
4. Evaluate existing rights-of-way, potential new signal locations, various design alternatives, and impacts on parking, transit routes and local business access.



APPENDIX F

PHASING EVALUATION MEMORANDUM

MEMO



To: Project Management Team

From: Fiesta/Downtown Chandler Transit Corridor Study (FDCTCS) Team

Date: February 24, 2017

Re: FDCTCS – Final Phasing Evaluation Memorandum

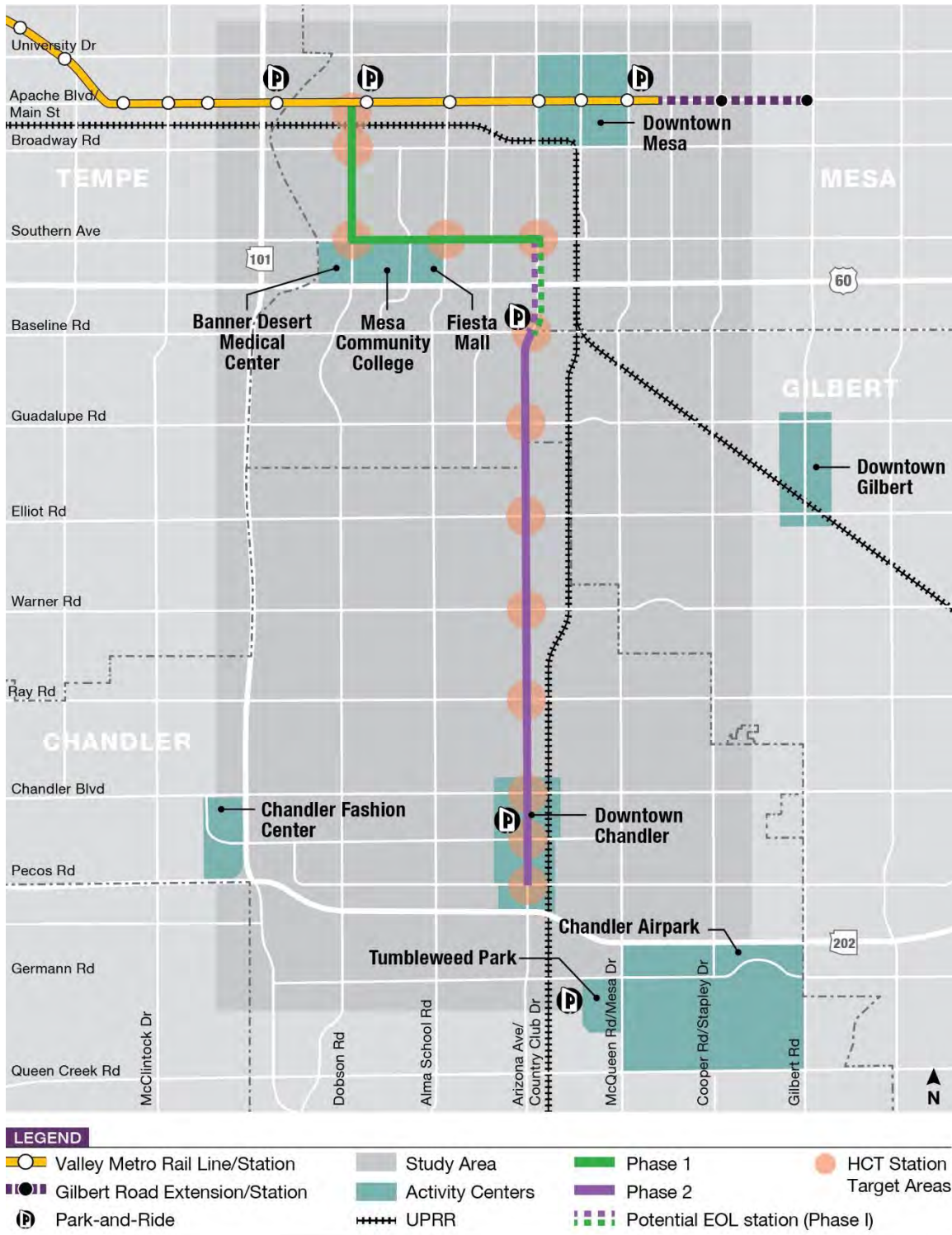
1.0 Introduction

High-capacity transit (HCT) Scenario 1 (Dobson Road, Southern Avenue, Country Club Drive/Arizona Avenue) was identified in Technical Memorandum No. 3 – *Scenario Evaluation* as the preferred HCT corridor for the Fiesta-Downtown Chandler Transit Corridor Study (FDCTCS). The purpose of this Memorandum is to identify potential end-of-line (EOL) stations, capital costs, travel forecasts and preliminary New Starts analysis of Phase I and Phase II for the FDCTCS for consideration of a light rail transit (LRT) scenario.

2.0 Definition of Phase I and Phase II Alternatives

Phase I consists of an approximately 3.5 to 4.5 miles LRT alignment that would travel south from the existing light rail line on Main Street on Dobson Road and then east along Southern Avenue, and travel south on Country Club Drive with a potential EOL station at either Southern Avenue or Baseline Road. Phase II consists of alignment options (depending on the Phase I terminus) that extend south through Chandler along Arizona Avenue to Pecos Road. A detailed evaluation of potential station locations would be included in an Alternative Analysis (AA) if project recommendations move forward for further analysis. Figure 1 outlines the study area including the Phase I and Phase II alignments with potential station locations.

FIGURE 1 STUDY AREA



Source: Valley Metro, 2016

Phase I

For the purpose of this analysis, the LRT trackway is assumed as median-running, maintaining two through traffic lanes in each direction along Dobson Road and Southern Avenue, and three through lanes would remain along Country Club Drive to Baseline Road. Left-turn lanes would be maintained to control traffic flow and allow entrance into local businesses or residential properties. Four to five potential stations have been identified along Dobson Road, Southern Avenue and Country Club Drive through the FDCTCS. The following list outlines the location of potential LRT stations:

- **Dobson Road** – Broadway Road
- **Southern Avenue** – Dobson Road immediately north of Mesa Community College (MCC) and Alma School Road
- **Country Club Drive** – Southern Avenue and Baseline Road (for Phase I, the stations are dependent on the eventual end of line selection)

Phase II

The trackway would be median-running and would reduce the roadway configuration from three through traffic lanes to two through traffic lanes in each direction from Baseline Road to Chandler Boulevard. Two through traffic lanes would be maintained in each direction through downtown Chandler from Chandler Boulevard to Pecos Road, and left turn lanes would be maintained at major intersections to maintain traffic flow and entrances to business and residences along the corridor. There are seven potential stations spaced every one mile between Baseline Road and Chandler Boulevard, and every one-half mile between Chandler Boulevard Pecos Road in downtown Chandler. The following list outlines the location of potential LRT stations:

- **Arizona Avenue** – Guadalupe Road, Elliot Road, Warner Road, Ray Road, Chandler Boulevard, Frye Road, and Pecos Road

3.0 Travel Forecast - FTA STOPS Model

Valley Metro used the Federal Transit Administration's (FTA) Simplified Trips on Project Software (STOPS) application to compare estimated ridership between the two Phase I EOL alternatives (EOL stations at Southern Avenue or Baseline Road), and ridership for the full HCT corridor with an EOL station at Pecos Road in downtown Chandler.

The MAG 2035 data was the input used in FTA's STOPS model to analyze interlined scenarios in relation to the entire transit system as a whole. As part of the scenario testing for travel forecasting, the project team made some general assumptions about possible interlining options to determine how estimated ridership could be impacted. The 2035 Valley Metro System Configuration Study STOPS application was used for this forecast to evaluate ridership for the entire transit system that would include all other planned light rail extension projects, in addition to the interlined options serving Mesa and downtown Chandler.

Table 1 shows the Pecos Road standalone option using MAG 2035 STOPS boarding forecasts as the base scenario, as well as, the estimated forecasts for interlined service for both Phase I EOL options and the full alignment to Pecos Road. All phasing options would interline with the Central Phoenix/East Valley (CP/EV) LRT line at Dobson Road and Main Street and have a western terminus at the 79th Avenue Park-and-Ride east of downtown Phoenix, the terminus for the Capitol/I-10 West LRT Extension (Phase II), which is planned to operate by 2030.

TABLE 1 PHASE I AND PHASE II INTERLINED SERVICE – ESTIMATED RIDERSHIP FOR DOBSON RD. /SOUTHERN AVE. /ARIZONA AVE. ALIGNMENT

Parameter	Phase I		Phase I/Phase II Combined
	Southern Avenue EOL 3.5 Miles	Baseline Road EOL 4.5 Miles	10.5 Miles
Stations	5	6	13
Average Weekday Boardings (MAG 2035)	6,180	6,650	10,580
Average Weekday Boardings per mile (MAG 2035)	1,765	1,478	1,006

Note: Western terminus of interlined routes options are at 79th Avenue
 Source: MAG, 2035

The high-level analysis for the Phase I interline options demonstrate that both the Southern Avenue and Baseline Road EOL alternatives show similar ridership numbers. The Pecos Road alternative gains approximately 4,000 riders compared to the Phase I options. Comparing boardings per mile, the Southern Avenue option performs better compared to the Baseline Road and Pecos Road options. Note that ridership forecasts assume an interlined HCT service to provide an estimate of the highest ridership potential within the study area.

4.0 Capital Costs

Costs were estimated for the development of a standalone HCT service for the phasing options as defined in Section 2.0. Similar to the methodology to estimate costs for the full alignment options, the costs to implement phased options were calculated for individual expense categories based on the US Department of Transportation Federal Transit Administration Standard Cost Categories (SCC) format. Unit costs for each category were developed based on local data such as recent comparable Valley Metro projects. Valley Metro utilizes industry standards and local unit costs to anticipate and forecast future transit expenditures. This method produces “order of magnitude” cost estimates to provide a general framework for review and planning purposes. These capital costs should not be considered a formal estimate of costs and are not for programming purposes.

Four cost estimates for a standalone HCT service were developed for the phased options. Two for Phase I, depending on the alignment’s EOL, and two for Phase II. Costs were calculated based on the unit costs for each category in current year, 2016 dollars, enabling a comparison of costs across each phase. The Standalone routes assume a hard transfer at Dobson Road/Main Street. Table 2 summarizes the costs estimated for the two Phase I EOL options. Table 3 summarizes the costs to continue the LRT line from the two Phase I EOLs (Southern Avenue or Baseline Road) to Pecos Road/Arizona Avenue. Both tables include costs per mile; however, note that various project elements are held constant and independent of the project length. When evaluating a project on a per mile basis, costs such as bridge structure crossing over the Union Pacific Railroad and US 60 become a greater portion of the overall cost; therefore, increasing the project cost per mile.

TABLE 2 PHASE I CAPITAL COST ESTIMATES (2016)

Cost Category	Phase I Southern/Country Club EOL (3.5 miles)	Phase I Baseline/Country Club EOL (4.5 miles)
Construction*	\$168	\$215
Right-of-Way ¹	\$43	\$55
Vehicles ²	\$58	\$70
Professional Services ³	\$57	\$68
Contingency ⁴	\$94	\$117
Total⁵	\$420	\$525
Total Cost Per Mile	\$120	\$117

Total costs in millions of 2016 dollars. Doesn't include finance costs.

*Fare collection systems, sitework, transit signal priority, operation and maintenance center, LRT stops and guideway are included in the LRT "Construction" cost estimate category.

Assumes existing park-and-ride at Juanita Avenue will be utilized at no additional cost for the Baseline Road option; and a 500-stall park-and-ride is assumed for the Southern Avenue option.

¹ Based on per mile estimate.

² Assumes 10 vehicles for Southern EOL, and 12 vehicles for Baseline EOL.

³ Approximately 30% of construction cost.

⁴ Applied approximately 30% at conceptual stage.

⁵ Assumes an additional station at Broadway Road/Dobson Road, which wasn't assumed in the full alignment estimates in Technical Memo #3.

Source: Valley Metro, 2016

TABLE 3 PHASE II CAPITAL COST ESTIMATES (2016)

Cost Category	Phase II From Southern Ave./Country Club Rd. to Pecos Rd. (7 miles)	Phase II From Baseline Rd. /Country Club Rd. to Pecos Rd. (6 miles)
Construction*	\$301	\$250
Right-of-Way ¹	\$87	\$72
Vehicles ²	\$52	\$41
Professional Services ³	\$93	\$82
Contingency ⁴	\$149	\$125
Total	\$682	\$570
Total Cost Per Mile	\$97	\$95

Total costs in millions of 2016 dollars. Doesn't include finance costs.

*Includes fare collection systems, 500- stall park-and-ride at Pecos Rd, sitework, transit signal priority, operation and maintenance center. LRT stops and guideway are also included in the LRT "Construction" cost estimate category.

¹ Based on per mile estimate.

² Assumes an additional 9 vehicles for Southern Avenue and 7 for Baseline Road.

³ Approximately 30% of construction cost.

⁴ Applied approximately 30% at conceptual stage.

Source: Valley Metro, 2016

5.0 Federal Funding Competitiveness

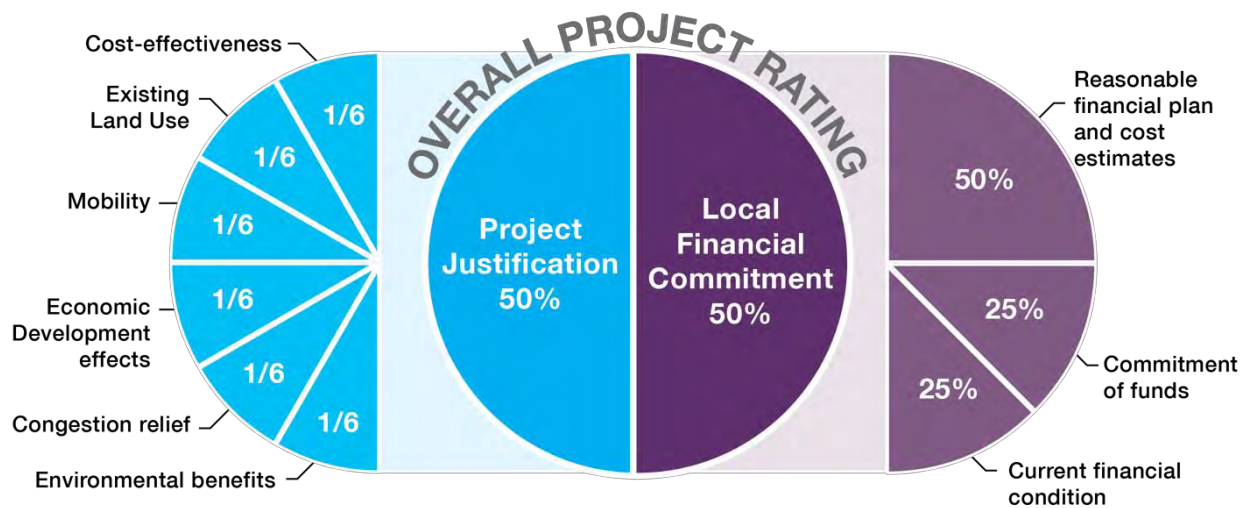
Overview of Capital Investment Grant Program

The FTA administers the Capital Investment Grant (CIG) Program that offers competitive grants for HCT corridor projects across the country. This grant program is authorized under the Fixing America's Surface Transportation (FAST) Act, which was signed into law in December 2015. Within the CIG program, three separate types of projects can be awarded federal funding: New Starts, Small Starts and Core Capacity. New Starts and Small Starts projects include any new fixed-guideway HCT project (as defined by FTA), while Core Capacity projects focus on expanding the capacity of existing fixed guideway HCT projects by 10%. The primary difference between New Starts and Small Starts projects is the overall project cost and amount of CIG funding requested. A project qualifies for New Starts if its overall cost is \$300 million or greater, or it is seeking more than \$100 million in CIG funding. A project qualifies for Small Starts if its overall cost is less than \$300 million and it is seeking up to \$100 million in CIG funding.

In order to administer this program, Congress empowered the FTA to evaluate HCT projects based on a legislatively directed rating process that includes multiple project development steps and usually takes many years. FTA issued a Final Interim Policy Guidance in June 2016 to explain the project development process, individual rating criteria and evaluation procedures for New Starts, Small Starts and Core Capacity projects. FTA also provides reporting instructions, rating templates and cost worksheets to assist project sponsors in the evaluation of their project.

FTA's rating system provides five separate sequential ratings: Low, Medium-Low, Medium, Medium-High and High. FTA requires that any HCT project must receive an overall project rating of Medium in order to receive CIG funding. FTA uses two major criteria, each comprising 50% of the final rating, to determine the overall project rating: Project Justification and Local Financial Commitment. These criteria are further broken up into sub-criteria that are individually rated. Project Justification includes Cost-Effectiveness, Existing Land Use, Mobility, Economic Development Effects, Congestion Relief and Environmental Benefits, each of which comprise 1/6 of the Project Justification rating. Each one of these criterion analyze whether the proposed project is located in an area that is going to be transit-supportive. Specifically, these criteria look at ridership forecasts, socioeconomic conditions, environmental benefits, capital and operating costs and the likelihood for economic development. Local Financial Commitment includes Reasonable Financial Plan and Cost Estimates (50% of the rating), Commitment of Funds (25% of the rating) and Current Financial Condition (25% of the rating). These criteria analyze whether the project sponsor can deliver the project financially, specifically whether the expected costs are reasonable and if the sponsor has the necessary funding in place to deliver the project on-time and on-budget. Figure 2 provides a summary of the overall rating process.

Figure 2 CIG PROGRAM PROJECT RATING SUMMARY



In order to apply for CIG funding, FTA mandates that the project follow a development process. Although the process slightly differs depending on the type of project (New Starts, Small Starts or Core Capacity), generally all projects must select a preferred route, adopt that corridor in the metropolitan planning organization's transportation plan, complete all environmental clearances, finish engineering to a certain level, submit all necessary application materials (cost estimates, scopes, schedules, etc.), apply for funding, receive a project rating and then a funding recommendation, which then must be passed in the legislative budget for that fiscal year. Only after this process, which can take many years of planning, would a project receive the federal grant to begin construction.

FDCTCS Federal Competiveness Analysis

Using the existing CIG program guidelines for New Starts projects, multiple options for the Dobson Road – Southern Avenue - Arizona Avenue scenario were analyzed to determine the probability that they would be competitive for federal funding. It is important to note that this analysis is purely conceptual at this point in the process. Certain assumptions and datasets were used that would not be eligible for inclusion in an actual grant application, such as long-range socioeconomic projections, enhanced land use figures and bus routes that do not currently exist. It is also very likely that by the time this project would begin a formal application, the process will have changed. FTA continually updates the relative guidance to improve rating processes or other components of the law, while Congress may pass new legislation that changes eligibility requirements. As such, this analysis only provides a general idea of relative strengths and weaknesses of each criteria for each corridor for federal funding. In areas of weakness, this analysis also recommends certain actions that would improve its standing within these criteria.

One general corridor was analyzed for a standalone option for the FDCTCS: the Dobson Road Alternative, which is the Complete Project alignment along Dobson Road, Southern Avenue, and Country Club Drive/Arizona Avenue. A separate analysis was also performed on this corridor to determine if phasing the project may be beneficial. The two standalone EOL options for Phase I were analyzed, which include Southern Avenue/Country Club Drive and Baseline Road/Country Club Drive. Lastly, a separate analysis was performed on the Phase I options to determine if interlining them into a future light rail corridor running from Main Street/Dobson Road, where the FDCTCS meets with the existing CP/EV line, to 79th Avenue/I-10 freeway, the future end-of-line station for the Capitol/I-10 West project, would make the FDCTCS project more competitive. The results of the analyses are provided in Table 4.

TABLE 4 SUMMARY OF NEW STARTS ANALYSIS RESULTS

Categories	Phase 1/Phase 2 Combined	Phase I	
		Southern Avenue EOL	Baseline Road EOL
Mobility	●	●	●
Cost Effectiveness	●	●	●
Congestion Relief	●	●	●
Env. Benefits	●	●	●
Land Use	●	●	●
Econ. Dev.	●	●	●
Competitiveness:	●	●	●

- = Favorable
- = Needs Improvement
- = Not Competitive

Generally, the entire 10.5-mile scenario from Main Street in Mesa to downtown Chandler does not rate competitively as a light rail project. Both the Mobility and Cost-Effectiveness ratings do not rate well, while the other criterion are somewhat lower in their ratings. Both phased options show a large improvement in their ratings and would seem to perform well enough to be favorable. Although the Mobility and Cost-Effectiveness ratings are still somewhat lower, the improvements to the other ratings, especially Congestion Relief, Land Use and Environmental Benefits help make the overall project more favorable.

In place of specific numerical values, some general recommendations to improve the federal competitiveness of the FDCTCS scenarios can be determined based on previous experience. Across the board all of the options rated lower on Economic Development, which is an assessment of the project’s existing land use policies and potential economic impact to the community. These ratings can be improved by establishing policies that promote higher residential and commercial densities, greater development intensity, complete streets and walkability, while also providing incentives for the development of legally binding, affordability restricted housing. The implementation of Mesa’s *Central Main* and updated Form Based Code demonstrate their community’s commitment to bringing about these improvements, as addressed in the next section. Chandler, Gilbert, and Mesa can also pass more restrictive parking requirements, charge higher rates for downtown parking and discourage the development of projects that are “over parked.” These types of policies can be implemented using a variety of land use and zoning tools. The most common tool is an overlay district; overlay districts do not change the underlying zoning of the property. Most overlay districts in Arizona provide incentives to developers if they follow certain transit-supportive guidelines.

FDCTCS communities can also restrict certain types of land uses, such as auto-oriented facilities, and provide design guidelines for streetscapes and building facades. Form-based codes, similar to Mesa’s, or development of a zoning code designed strictly for transit areas, such as Phoenix’s Walkable Urban Code, can improve the Economic Development rating. Lastly, communities can provide development the opportunity to develop land using a Planned Unit Development (PUD) or Planned Area Development (PAD) designation, which allows the

developer the flexibility to set their own design guidelines in a way that meets the goals of the community.

Since ridership forecasts influence the overall rating, any actions taken now that will improve transit ridership in the future will be beneficial. This includes establishing higher transit rideshares along the corridor and improving transit routes that intersect the corridor. This can be done through a combination of the land use enhancements previously discussed and by improving connecting local bus frequencies, providing new services (such as limited stop or express service) and providing better amenities, such as bus stops with passenger amenities, clean buses and state-of-the-art technology (Wi-Fi, real-time bus tracking, etc.). Lastly, and somewhat intuitively, decreasing the project's capital and operating costs will have a positive impact on the Cost-Effectiveness and Environmental Benefits criterion.

Although the future configuration of the system has yet to be determined, it would appear based on initial plans developed in Valley Metro's ongoing *System Configuration Study* that there will be opportunities for interlining light rail service in the future. As these future system plans are further defined, the FDCTCS should look into the possibility of interlining services to increase ridership forecasts.

6.0 Phasing Justification

Based on the analyses completed through the FDCTCS and the existing conditions of the project corridor, splitting the entire 10.5-mile scenario into two phases is recommended. As shown in Figures 3 and 4 depicting average weekly boardings, the travel forecast results show that a significant portion of the projected ridership along the entire corridor is focused on the northern portion of the corridor, especially along Southern Avenue. This is attributed to the activity centers along the arterial including the Banner Hospital, Mesa Community College, and the Fiesta Mall. By phasing the proposed HCT investment along the Fiesta/Downtown Chandler corridor, should light rail be selected as the transit mode, a first phase could expedite this service to serve the northern portion, while providing the southern portion of the corridor time to establish increased transit-supportive policies and development. The preliminary New Starts analysis also shows that the first phase of the project is more competitive for federal funding, increasing the likelihood that this project could advance as a light rail project.

To further support the phased approach for this corridor, the City of Mesa recently completed significant streetscape improvements along Southern Avenue to make it more walkable and transit-supportive. These improvements include the removal of traffic lanes between the Tempe Canal Road and Alma School Road, the expansion of the sidewalks, significant landscaping improvements, new bus stops and various public art pieces. The development community has responded to these public improvements with various developments and proposals, including the recently constructed Southern Avenue Villas Apartments complex and the adaptive reuse of over 100,000 square feet of former big box retail into Centrica, a new Class A office space. These new developments go hand-in-hand with the existing activity centers in the Fiesta District, including Mesa Community College, Fiesta Mall and Banner

Desert Medical Center, to create a vibrant, walkable and transit-friendly environment that support a future high-capacity transit investment.

Figure 3 Standalone vs. Interlined Projected Ridership per Station (2035)

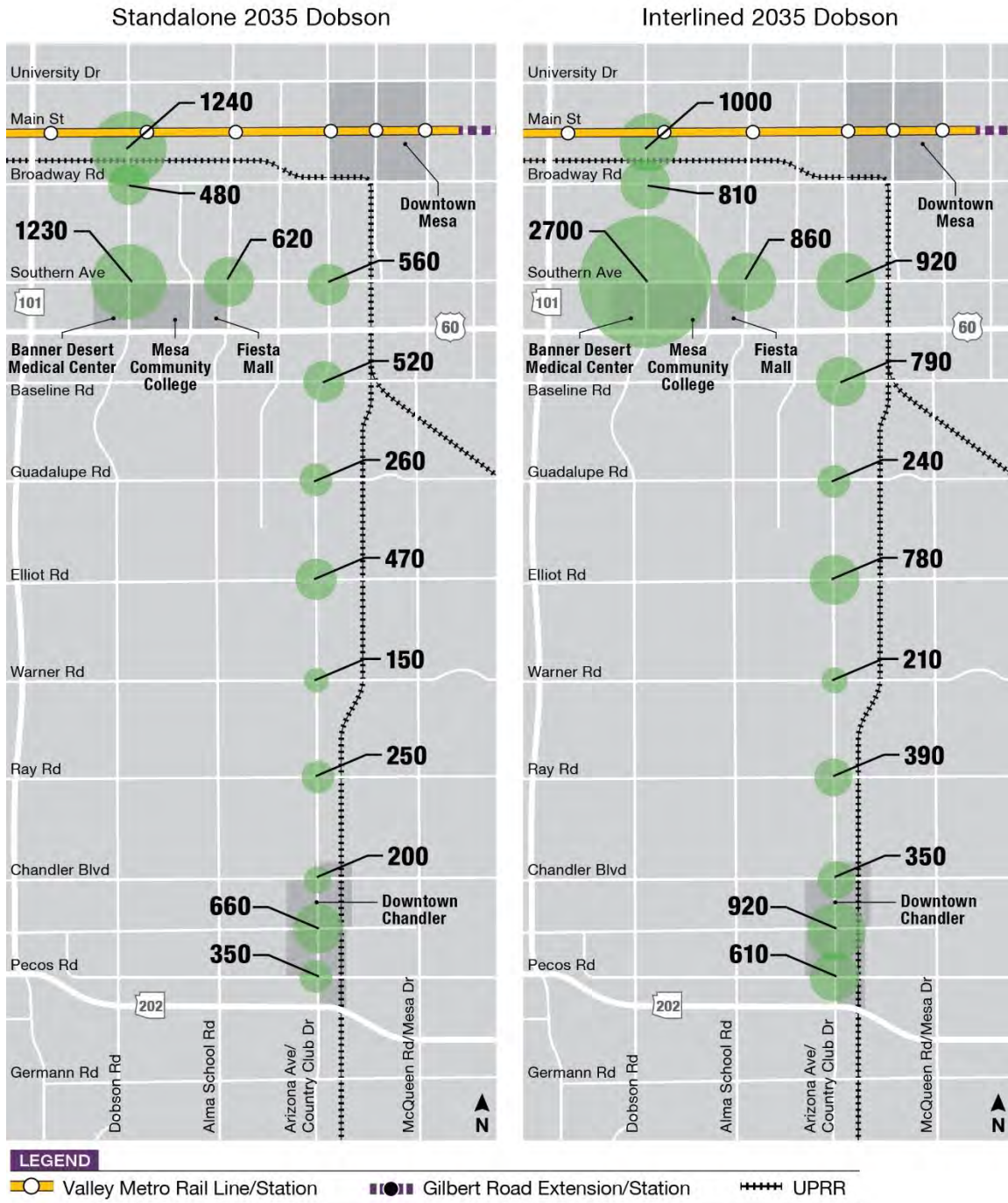


Figure 4 Projected Ridership per Station for Phase I Interlined Options



7.0 Conclusion

In conclusion, should the communities involved in the FDCTCS decide to phase a HCT investment in the Dobson Rd. – Southern Ave. – Arizona Ave. corridor, the results presented in this memo confirm this as a reasonable approach. From a projected ridership standpoint, the travel forecasts estimated for the interlined options in 2035 show the highest boardings per mile occurring with an EOL station at Southern Avenue, and the highest total boardings with an EOL station at Baseline Road.

The capital cost estimates for both Phase I EOL options demonstrate the Baseline Road EOL option has higher capital cost compared to the Southern Avenue EOL. This is due to the costs associated with crossing the US 60 bridge, which would not be necessary for the Southern Avenue EOL option. In comparison, capital costs calculated for Phase II demonstrate higher capital costs if the alignment continues from the Southern Avenue EOL option as opposed to the Baseline Road EOL option. This is due to added costs for crossing the US 60 bridge. Note capital costs for Phase II only include the remaining costs of implementing the remainder of the LRT alignment from each of the Phase I EOL options (Southern Avenue/Baseline Road).

The Preliminary New Starts Analysis for both Phase I options show investment along the corridor is necessary to improve projected ratings for Mobility and Cost Effectiveness, and Economic Development categories in order to make the project federally competitive. Both Southern Avenue and Baseline Road EOL options perform well in the Congestion Relief, Environmental Benefits and Land Use categories if the system is interlined, in comparison to the entire alignment extending from Main Street to Pecos Road.