



NEED AND PURPOSE MEMORANDUM

May 2018

Sonoran Corridor Need and Purpose Memorandum

Contents

1	Summary	1
2	Introduction	1
2.1	Purpose of this Memorandum	1
2.2	Overview	3
3	Background	3
3.1	Planning Context	5
3.2	Study Area	5
3.3	Multimodal Considerations	5
4	Need and Purpose Statement	10
4.1	Need for the Proposed Transportation Facility	10
4.2	Purpose of Proposed Transportation Facility	22
4.3	Other Benefits or Desirable Outcomes	22
5	Summation and Next Steps	25
5.1	Corridor Selection Report (CSR)	26
5.2	Tier 1 EIS	26
6	References	28
	Appendix – Land Use Assumptions for the Sonoran Corridor	I

List of Figures

Figure 1. Study Area Location Map.....	2
Figure 2. Sonoran Corridor Study Area Showing Existing Roadway Network	4
Figure 3. Population Densities in the Tucson Metropolitan Region, 2005 and 2045	11
Figure 4. Population Densities in the Sonoran Corridor Study Area, 2045.....	12
Figure 5. Employment Densities in the Tucson Metropolitan Region, 2005 and 2045	13
Figure 6. Employment Densities in the Sonoran Corridor Study Area, 2045.....	14
Figure 7. Employment Centers in the Sonoran Corridor Study Area.....	16
Figure 8. Levels of Service	18
Figure 9. 2045 Levels of Service on Study Area Roadway Network.....	20
Figure 10. Existing Truck Travel Patterns from Nogales to I-10.....	23
Figure 11. Southern Access to TUS and Future Airport Roadway.....	24

List of Tables

Table 1.Statewide Studies and Analyses Affecting or in the Study Area Vicinity	6
Table 2. Regional Studies and Analyses Affecting or in the Study Area Vicinity.....	7
Table 3. Population Growth in the PAG Region and Sonoran Corridor Study Area, 2015 to 2045	15
Table 4. Employment Growth in the PAG Region and Sonoran Corridor Study Area, 2015 to 2045	15
Table 5. Average Weekday Traffic, Volume /Capacity Ratio, and Level of Service, 2016 and 2045	19

1 Summary

The Federal Highway Administration (FHWA) and Arizona Department of Transportation (ADOT) have developed this Need and Purpose Memorandum for the Sonoran Corridor, a proposed transportation facility, as an early step in preparing a Tier 1 Environmental Impact Statement (EIS). This memorandum provides background information on the evolution and planning context of the Sonoran Corridor. It outlines the factors that contribute to the needs that exist within the Corridor study area (Figure 1) and presents the overall purpose of the Sonoran Corridor.

The Need and Purpose is fundamental to compliance with the National Environmental Policy Act (NEPA) process and provides the basis for identifying, evaluating, and screening alternatives (Code of Federal Regulations Title 40 [40CFR] Chapter 5 §1502.13 [2017]).

The problems and issues that exist within or are influenced by the Sonoran Corridor study are:

- Population and employment growth – projected growth in the study area is predicted to increase travel demand within an area with a transportation network that needs improvement.
- System linkages associated with regional, interstate, and international mobility – lack of a direct connection between Interstate 19 (I-19) and Interstate 10 (I-10) and activity centers including the Tucson International Airport (TUS) and employers, to the south of TUS.
- Congestion and roadway capacity – much of the transportation network within the study area is expected to operate at an unacceptable level of service (LOS) by 2045.

The overall purposes of the Sonoran Corridor are to provide a high-priority, high-capacity, access-controlled transportation corridor that will:

- Accommodate future travel demand associated with the forecast growth by affording better access throughout the study area
- Provide an alternate direct connection between I-19 and I-10 south of TUS that will reduce commercial and commuter travel times and cost
- Improve 2045 LOS within the study area

2 Introduction

2.1 Purpose of this Memorandum

As required by NEPA (42 United States Code [U.S.C.] 4371 et seq.), FHWA and ADOT have developed this memorandum to determine if there is a current and future need for a major transportation facility (40CFR5 §1502.13) within the Sonoran Corridor study area. As a subsequent part of this process, FHWA and ADOT will focus on this geographical area to develop alternatives that would meet the need and purpose of this proposed facility.

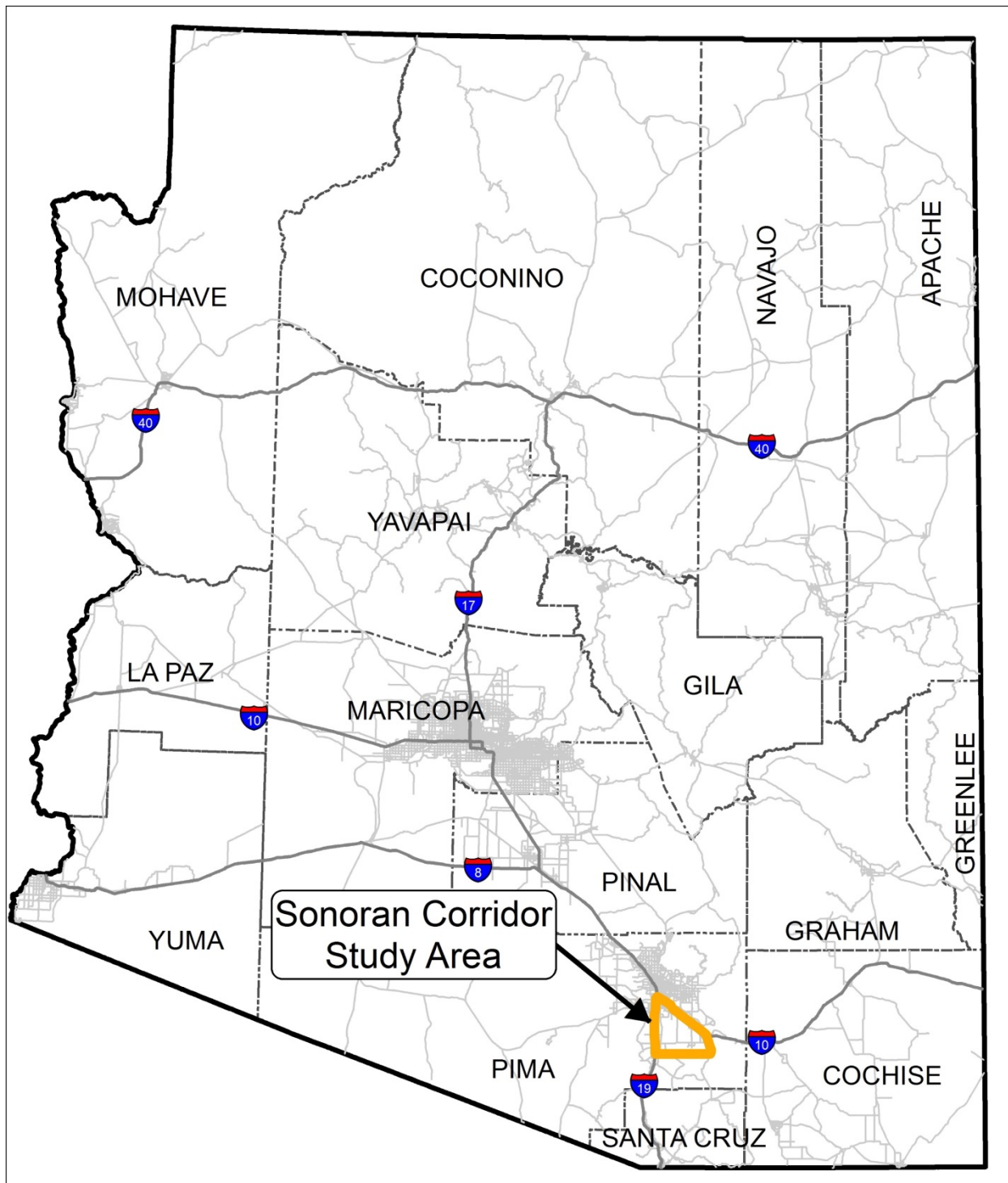


Figure 1. Study Area Location Map

2.2 Overview

FHWA and ADOT are completing a Corridor Selection Report (CSR) and Tier 1 EIS for the Sonoran Corridor south of TUS. A CSR compares all possible alignments at a conceptual level to assemble a Reasonable Range of Alternatives for further environmental analysis in the Draft Tier 1 EIS. The Draft Tier 1 EIS will be prepared in accordance with NEPA and other regulatory requirements, and will disclose a range of possible impacts and mitigation strategies at a corridor level. A Tier 1 EIS is intended provide guidance and preliminary environmental information for future project-level (i.e., Tier 2) studies. The environmental analyses of these future Tier 2 studies would further evaluate impacts to environmental resources and identify specific mitigation actions at a project level to be taken to minimize harm associated with an alignment(s) within the corridor selected in the Tier 1 EIS. If a Build Corridor Alternative is selected in this Tier 1 EIS, a Phased Implementation Plan (PIP) will be developed which identifies segments of independent utility, based on the selected corridor alternative, that can be designed and built as individual transportation projects as funding becomes available. FHWA is the Federal Lead Agency, and ADOT is the Local Project Sponsor under NEPA.

In December 2015, the United States (US) Congress approved the Fixing America's Surface Transportation (FAST) Act (Public Law 114-94), a 5-year legislation to improve the nation's surface transportation infrastructure. Section 1416 of the FAST Act, formally designates the Sonoran Corridor "along State Route 410 connecting Interstate Route 19 and Interstate Route 10 south of the Tucson International Airport" as a high-priority corridor on the National Highway System. Planning and coordination efforts undertaken for this proposed project will be subject to compliance with all federal requirements, which includes a formal process for identifying the need and purpose of the proposed action.

The Need and Purpose establishes a basis for evaluating alternatives, which in the case of the Sonoran Corridor includes a specific Study Area that sufficiently captures the geographical requirements for addressing the need. For this study, FHWA and ADOT are focusing on the developing area in Pima County north of Sahuarita and near TUS, between I-19 and I-10 (Figure 2). Based on previous planning efforts, additional transportation infrastructure will be needed to adequately move people and goods, as well as accommodate future travel demand anticipated in this region in the foreseeable future.

3 Background

Past and current regional transportation planning efforts in Pima County, Arizona have included a major transportation facility in the area south of TUS, between I-19 and I-10, termed the Sonoran Corridor (Pima County, Sonoran Corridor Alternatives Analysis, 2013; Pima Association of Governments [PAG], Regionally Significant Corridors Study, 2014; Pima County, Sonoran Corridor Economic and Revenue Impact Analysis, 2015). These previous studies and others have identified a need for a transportation system that would accommodate future growth and strengthen the growing economy of southern Arizona by improving the connection between Mexico and the US states of Arizona, New Mexico, and Texas.

The Sonoran Corridor Tier 1 EIS will consider the findings of previous studies and series of assessments over recent years that evaluated the need for improved transportation options in the area between I-19 and I-10 and south of TUS. The tables in this section include studies and analyses of the area within and

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Need and Purpose Memorandum

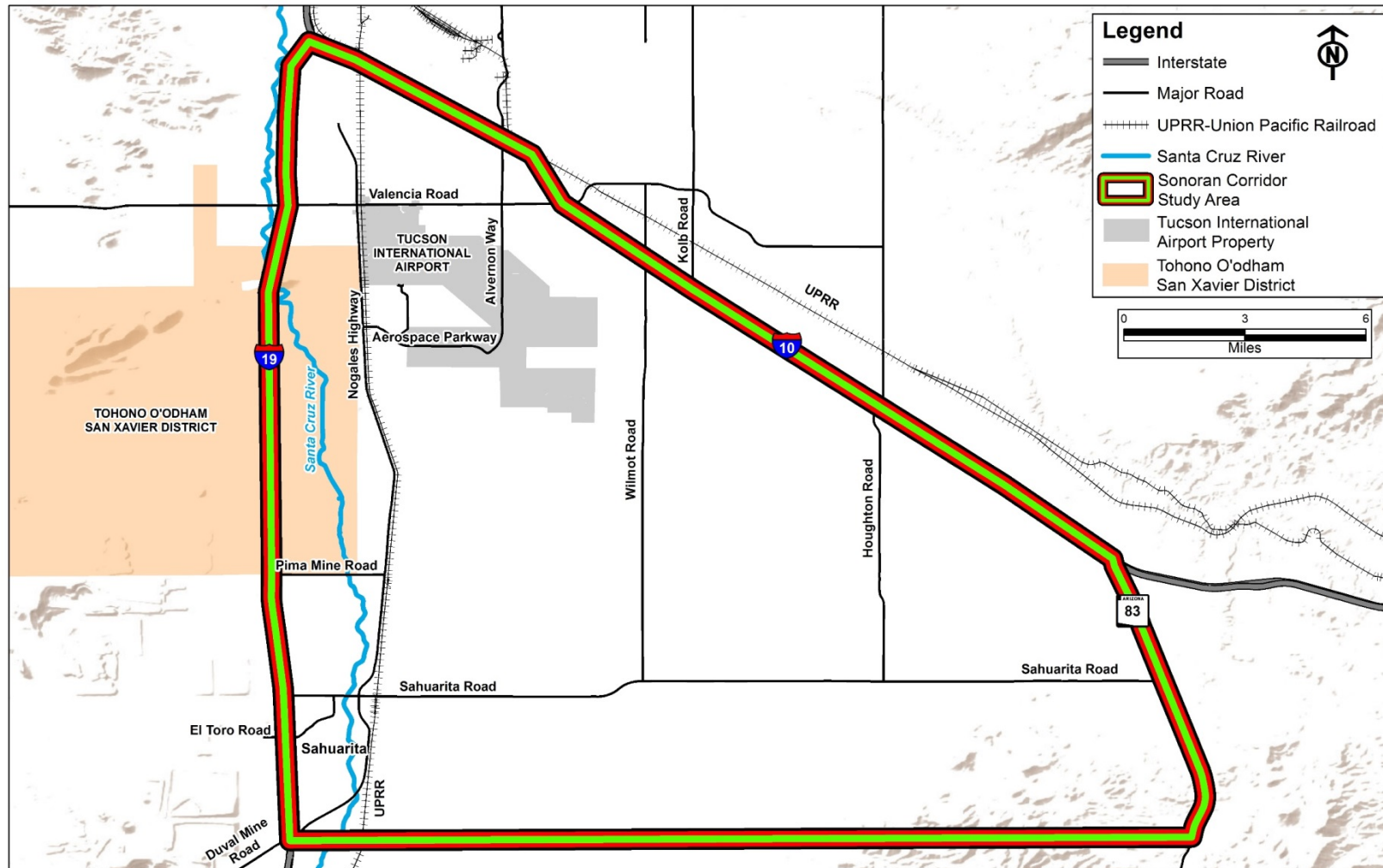


Figure 2. Sonoran Corridor Study Area Showing Existing Roadway Network

surrounding the Sonoran Corridor Study Area that are being considered as part of the Sonoran Corridor Tier 1 EIS.

3.1 Planning Context

The Study Area has been the subject of several investigations over the past years that have helped to shape the context for the Sonoran Corridor analysis. The results of these studies provide insight and data to support the CSR and Tier 1 EIS efforts. Table 1 and Table 2 describe in general terms the work included in each statewide and regional study covering the vicinity of the Sonoran Corridor Study Area.

3.1.1 Statewide planning

Several key statewide studies and plans within the Corridor Study Area include those listed in Table 1. The Sonoran Corridor, in the southeastern Tucson metropolitan area, was also designated as a High Priority Corridor on the National Highway System in the FAST Act based on the evaluation of needs in the Tucson area. In the interest of preserving multimodal options, if a Build Corridor Alternative is selected as a result of this Tier 1 EIS, future Tier 2 projects will not preclude the evaluation of multiple modes to support the objectives and recommendations, as appropriate, in the statewide documents included in the table. These could include freight, passenger rail, bicycles, or other modes.

3.1.2 Regional planning

Several regional plans have been prepared to respond to projected growth and support key corridors for commerce that affect the Sonoran Corridor, listed in Table 2. ADOT has designated the future Sonoran Corridor as a state highway.

3.2 Study Area

The Sonoran Corridor Study Area is in the southern portion of the Tucson metropolitan area, the most intensively developed area in Pima County, southern Arizona. I-19 runs north from the US-Mexico border and terminates at I-10 near downtown Tucson, defining the western edge of the Sonoran Corridor Study Area. I-10 runs southeast from downtown Tucson at its junction with I-19, and forms the northeastern boundary of the Sonoran Corridor Study Area. An east-west line at Duval Mine Road delineates the Study Area's southern boundary, while the eastern edge of the Study Area is represented by the segment of State Route (SR) 83 between this east-west line and I-10. Most of the land within this area remains unincorporated, while portions are incorporated into the City of Tucson and the Town of Sahuarita, and some is held in trust by the US Bureau of Indian Affairs for the San Xavier District of the Tohono O'odham Nation and allottees. The land within this Study Area is largely undeveloped, with sizeable areas of public lands – both unincorporated and incorporated – held in trust by the Arizona State Land Department. A major river, the Santa Cruz, flows north through the Study Area out of Mexico from Nogales through Tucson (Figure 2).

Public and agency input gathered in Scoping activities for this study, in addition to the results of previous planning efforts, have been used to define the Need and Purpose of this effort, as well as the Study Area described above.

3.3 Multimodal Considerations

In a 2016 Long-Range Transportation Plan progress update, Arizona's economic outlook was forecasted to outpace the US in terms of jobs, population, and real income growth (ADOT, 2016). Economic growth on this scale would result in impacts to the existing multimodal transportation system. In addition to highways, rail facilities and services exist within the Sonoran Corridor Study Area, and/or are under

Table 1. Statewide Studies and Analyses Affecting or in the Study Area Vicinity

Plan	Background	Findings and Results
What Moves You Arizona - Long Range Transportation Plan (LRTP) 2016–2040 (ADOT, 2017)	ADOT’s approved statewide, long range plan that is currently being updated.	A goal of this planning effort is to identify transportation investments that support economic growth, improve mobility, and link transportation with land use patterns.
Building a Quality Arizona (bqAZ) Statewide Transportation Framework Study (ADOT et al., 2010)	Addresses projected 2050 population and employment growth	Identifies priorities and strategies for meeting infrastructure needs as part of a comprehensive 2050 vision
Arizona’s Key Commerce Corridors Report (ADOT, 2014)	Supports transportation improvements to enhance economic development	Identifies I-11 as one of six key transportation corridors supporting the greatest economic potential. It also identifies the significance of I-10 and I-19 improvements. While not within the Sonoran Corridor study area, I-11’s southward reach to Nogales and I-10 and I-19 improvements are relevant to this study.
State Rail Plan (ADOT, 2011)	The Arizona State Rail Plan’s (SRP) principle purpose is to convey the magnitude of rail needs in the State and set forth a policy framework through which strategic actions can be taken to realize the full potential of passenger and freight rail transportation.	Rail freight transportation in the corridor is located between the Nogales Branch and the Sunset Route of UP. A possible connection between the Nogales Branch and the UPRR Sunset Route is a consideration for improving freight movement.

Table 1. Statewide Studies and Analyses Affecting or in the Study Area Vicinity

Plan	Background	Findings and Results
State Freight Plan (ADOT, 2016)	The State Freight Plan defines investment priorities and policies to generate the greatest return for Arizona's economy. It provides an overview of broad economic trends influencing freight transportation, the role of freight in Arizona's economy, and a synthesis of how the freight sector uses the transportation system.	The Sonoran Corridor is located between two of the major freight corridors in the state. The link between them could offer significant advantages to freight movement and reduce demand for truck traffic on less desirable and more sensitive routes such as SR 82 and SR 83.
Interstate I-11 Tier 1 EIS – Nogales to Wickenburg (ADOT, underway)	Project is evaluating potential connections for a future interstate highway in central and southern Arizona	Corridor options could become part of the interstate system that will affect how the Sonoran Corridor links to I-19

Table 2. Regional Studies and Analyses Affecting or in the Study Area Vicinity

Plan	Background	Findings and Results
2045 Regional Mobility and Accessibility Plan (PAG, 2016)	Identifies Pima Association of Governments (PAG) region's long-range transportation needs and anticipated revenues. Lays out a blueprint for transportation solutions over the next 30 years.	Projects to improve the performance of the interstate system include reconstruction of traffic interchanges and widening of some segments of I-10 and I-19. An east-west highway connecting I-10 and I-19 was also included in these projects.
Sonoran Corridor Economic and Revenue Impact Analysis (Pima 2015)	Study undertaken by Pima County analyzes potential economic and revenue impacts of the Corridor Study Area based on a land use map planned for the area.	Transportation assumptions include SR 410, a high-priority, high-capacity, access-controlled facility sharing ROW with a new railroad.
Regionally Significant Corridors Study (PAG, 2014)	PAG's technical assessment of existing, planned, and proposed major transportation corridors in and around the PAG region	Identifies a regionally significant corridor within the Sonoran Corridor Study Area, but acknowledges that no specific

Table 2. Regional Studies and Analyses Affecting or in the Study Area Vicinity

Plan	Background	Findings and Results
	that would achieve broad regional objectives.	alignment has been determined.
Sonoran Corridor Alternatives Analysis (Pima County, 2014)	Pima County's planned highway connection between I-19 and I-10 south of Tucson International Airport.	This corridor was planned to accommodate roadway and railway facilities to facilitate the movement of people and goods. The county has studied several alternative routes, and had actively planned for the corridor.
Sahuarita/El Toro Road Corridor Study (ADOT-Town of Sahuarita, 2013)	Feasibility of a transportation corridor to provide for future growth in Sahuarita and Pima County	Town has adopted a position preferring El Toro Road as the main connection to I-19
PAG High Capacity Transit System Plan	Identification of a high-capacity transit system for the Tucson area	Multimodal opportunities in Sonoran Corridor will be linked to the availability of effective transit service in the area

study as part of the State Rail Plan Update and State Freight Plan. These independent study efforts are examining future needs regarding rail service within or near the Sonoran Corridor Study Area, and as a result, the potential of a future rail connection is maintained as an option in the corridor cross-section, though not specifically analyzed as part of the Sonoran Corridor Tier 1 EIS. Nonetheless, FHWA and ADOT will coordinate with these existing rail services and studies, as well as utility and energy stakeholders, to ensure that a multimodal facility (i.e., one that includes rail and/or utilities) is not precluded in the future, to the maximum extent feasible. Doing so would provide the opportunity for multimodal use should needs arise in the future.

3.3.1 Freight and Rail

The Sonoran Corridor Study Area experiences a high percentage of the truck and rail freight movements to and from the US-Mexico border. The Arizona-Mexico Commission (AMC) and US Department of Transportation (USDOT) Research and Innovative Technology Administration (RITA) indicate commerce in the form of freight trucks, trains, and containers is increasing. Annual freight truck-container crossings numbered 763,000 in 2013, representing a notable 10-year growth from approximately 600,000 in 2003.

If this trend continues, truck-container crossings could more than double over the next 40 years. The AMC also reports that nearly \$28 billion in bi-national commodities trade was conducted through the eight Arizona-Sonora Land Ports of Entry in 2017 (Eller, 2018).

The Arizona State Freight Plan completed by ADOT in 2017 established immediate and long-range plans for freight-related transportation investments. More specifically, it identified freight transportation

facilities that are critical to Arizona's economic growth, and assign appropriate priority to investments in such facilities. In a review of the economic context of freight movement in Arizona, ADOT reviewed key freight sectors and their contribution to Arizona's economy, freight activity and flows, and transportation performance and needs. While the multimodal system in Arizona currently supports efficient freight movements, freight mobility constraints include some that exist within the Sonoran Corridor Study Area, such as freeway congestion bottlenecks, lack of north-south rail infrastructure, and railroads crossing roads at grade (ADOT, 2016), as well as lack of a direct connection between I-19 and I-10 south of TUS.

Union Pacific Railroad (UPRR) operates a Class I railway in the Sonoran Corridor Study Area. UPRR serves the southern half of Arizona with main line service along the east-west Sunset Route that generally parallels I-10, along with branch service on the Nogales Branch from Tucson to the DeConcini port of entry in Nogales. Adequate capacity is available for current and near-term anticipated demand (ADOT, 2011), but the potential exists for improved operations between the Nogales Branch and the Sunset Route within the Sonoran Corridor Study Area. Consequently, discussions were held during an earlier study (Pima County, 2014) with UPRR regarding opportunities for new rail facilities, though a specific plan has not been formulated.

East-west freight movements to and from Mexico may grow in the future in response to regional and global trade patterns. The existing east-west freight rail routes through the Tucson region are not direct, and require traversing a congested urban area. If new rail facilities are identified to address a need for future freight requirements, privately held railroads would be responsible for the needed investments to build additional rail capacity. While discussions have been held, no specific facilities within the Sonoran Corridor Study Area have been studied or funding identified for future development.

FHWA does not have jurisdiction over rail. However, the corridor alternatives for a proposed transportation facility in the Sonoran Corridor will be developed to ensure multimodal options (e.g., rail) are not precluded in the future within the corridor. The Federal Railroad Administration has accepted the role of a participating agency in the development of the Sonoran Corridor Tier 1 EIS. FHWA and ADOT will continue to coordinate with the affected agencies that have jurisdiction over rail throughout the environmental review process.

3.3.2 Utilities

ADOT has engaged utility and energy industry stakeholders in other studies and invited them to provide data and share options and ideas on decision points. Utility providers typically only invest in additional infrastructure as demand merits. The participants indicated that long-range utilities or energy corridors are in development in the Sonoran Corridor Study Area to serve utility and/or energy expansion needs. Thus, long-term flexibility should be considered for a common or consolidated corridor within the Study Area (ADOT, 2014).

As the need for expanded utilities is identified in the future, privately held utility companies will be responsible for such investments. Utility companies have been approached by others about interest in sharing a common corridor within the Sonoran Corridor Study Area. Corridor alternatives will be developed to accommodate collocation of utilities within the overall corridor so they would not be precluded from consideration in future Tier 2 analyses, where possible.

3.3.3 Technology

Technology in transportation is rapidly changing, and the research and development of autonomous vehicles, connected vehicles, and other advancements is ongoing. While some of these technologies

may affect capacity needs, the nature and pace of change is still uncertain. The USDOT's Intelligent Transportation Systems (ITS) Joint Program Office is conducting research to advance transportation safety, mobility, and environmental sustainability through the application of electronic and information technology (USDOT, 2017). Advancement of technology in transportation during the development of Tier 2 projects would be dependent on demand, as identified through regional transportation planning processes. It is expected that volume projections will account for the pace of technological change over time. For example, if technology increases the capacity of the existing transportation network, then the implementation of new facilities – such as the Sonoran Corridor – or expansion of existing facilities, could be reassessed based on the transportation needs.

If one of the Corridor Build Alternatives is selected and demand is warranted, green technologies could also be evaluated during the development of Tier 2 projects within the Study Area, demonstrating innovations that promote sustainability, improve water quality, reduce storm water runoff, save energy, and maintain air quality, while providing educational opportunities and stimulating business and job growth.

4 Need and Purpose Statement

An early step in preparing an EIS is to develop a concise description of a transportation problem(s) or other need(s) existing in a defined study area and the purpose(s) or outcome(s) sought in addressing them. Subsequently, the EIS process continues with identification and evaluation of a reasonable range of alternative solutions that would meet the Need and Purpose of a proposed action. The Need and Purpose effectively provides the basis for developing a reasonable range of alternatives and informing the selection of a preferred alternative that best meets those criteria.

4.1 Need for the Proposed Transportation Facility

Previous studies (see Tables 1 and 2) have identified key transportation needs and issues in the Sonoran Corridor Study Area, which have been further defined through agency coordination and public involvement during Scoping. The problems and issues that exist within the Sonoran Corridor Study Area, detailed in the sections that follow, are:

- Increased travel demand due to population and employment growth
- Increased congestion by 2045
- Insufficient system linkages for regional, interstate, and international mobility to major study area destinations

4.1.1 Increased travel demand due to population and employment growth

Based on transportation plans and proposed development already approved in the Study Area, the existing roadway network (Figure 2) is incapable of supporting the forecasted travel demand.

Projected population and employment growth within the Sonoran Corridor Study Area are indicators of future travel demand. Current and projected population densities for the PAG region and projected population densities for the Sonoran Corridor Study Area are shown in Figure 3 and Figure 4, respectively. Likewise, current and projected employment densities for the PAG region and projected employment densities for the Sonoran Corridor Study Area are shown in Figure 5 and Figure 6.

This is also true of the area served by I-19 near Sahuarita and points south which have extremely limited travel options in and out of the area. With anticipated growth of 50 percent by 2045, travel conditions

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Need and Purpose Memorandum

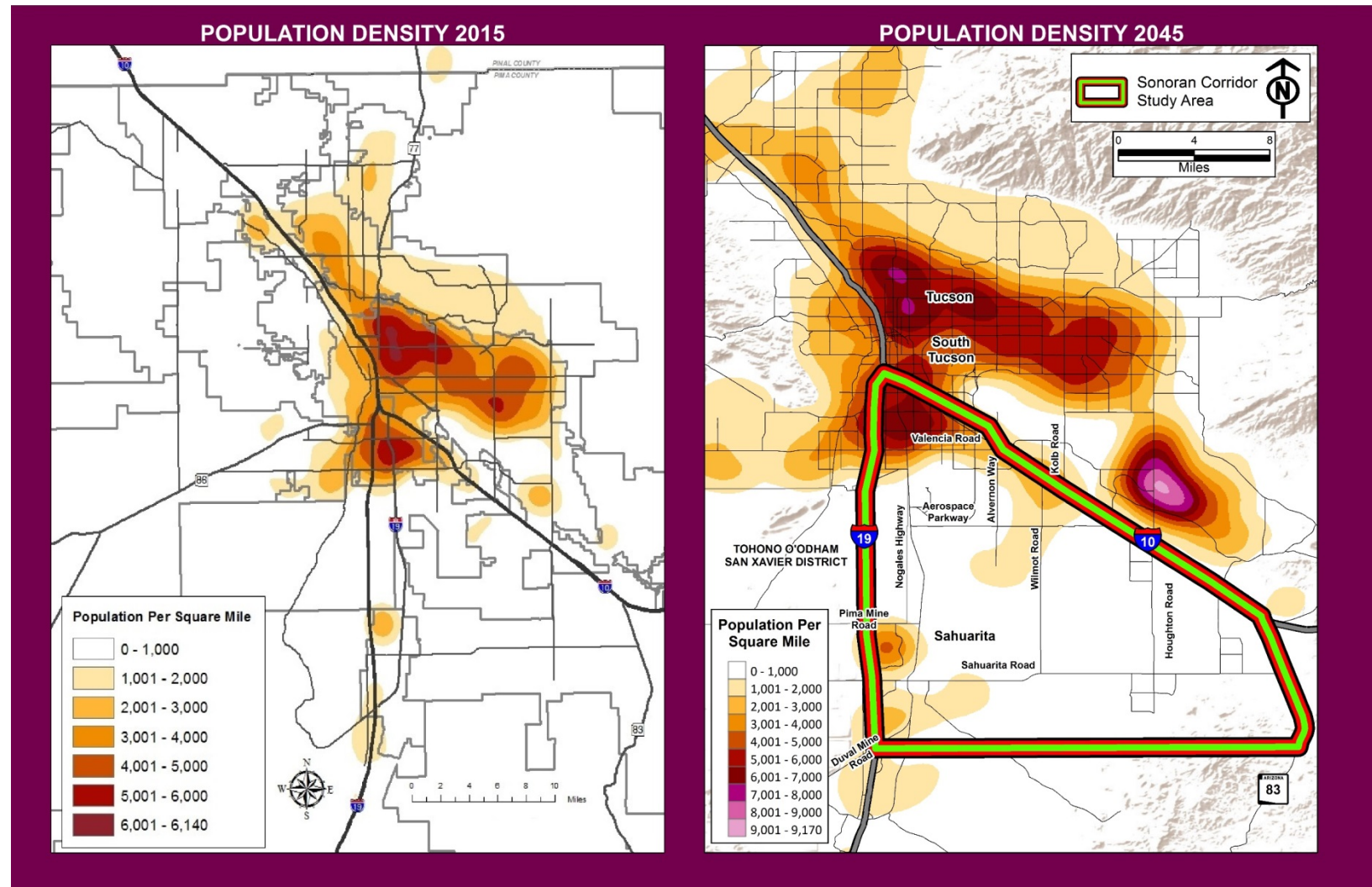


Figure 3. Population Densities in the Tucson Metropolitan Region, 2005 and 2045

Source: <http://www.pagregion.com/Programs/TechnicalServices/GISDataandMaps/tabid/84/Default.aspx>

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Need and Purpose Memorandum

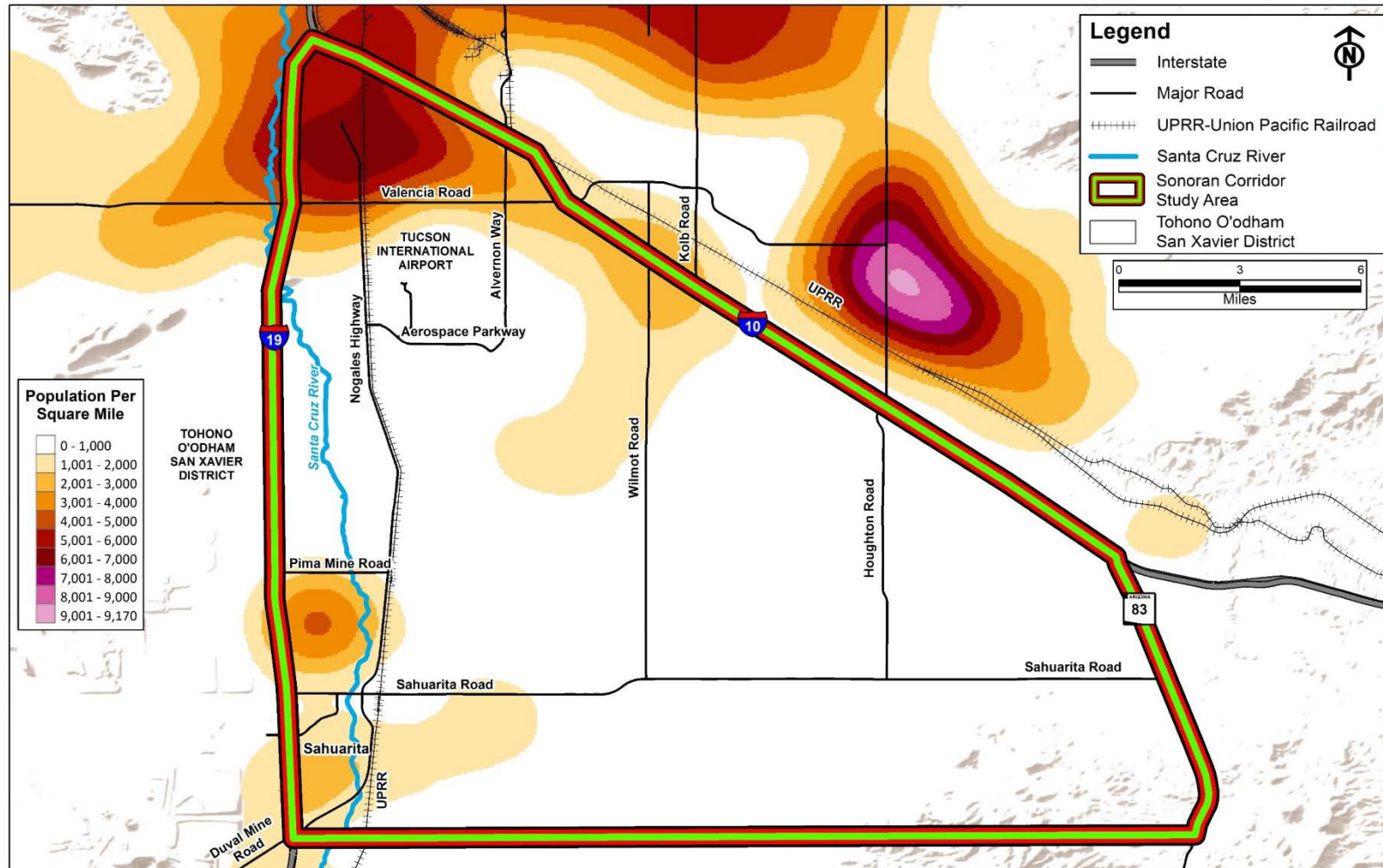


Figure 4. Population Densities in the Sonoran Corridor Study Area, 2045

Source: <http://www.pagregion.com/Programs/TechnicalServices/GISDataandMaps/tabid/84/Default.aspx>

Sonoran Corridor Tier 1 Environmental Impact Statement
Need and Purpose Memorandum

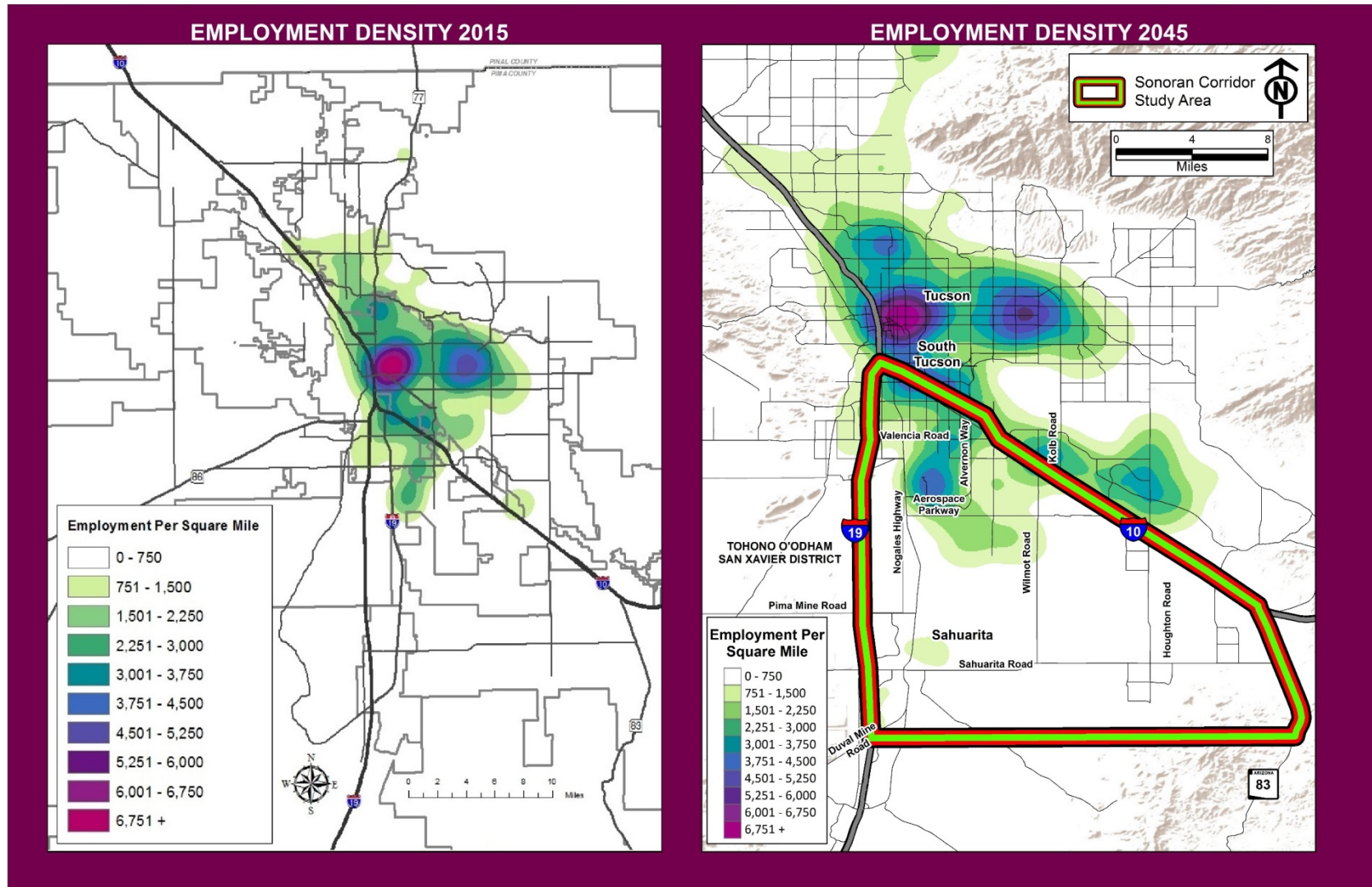


Figure 5. Employment Densities in the Tucson Metropolitan Region, 2005 and 2045

Source: <http://www.pagregion.com/Programs/TechnicalServices/GISDataandMaps/tabid/84/Default.aspx>

Sonoran Corridor Tier 1 Environmental Impact Statement
Need and Purpose Memorandum

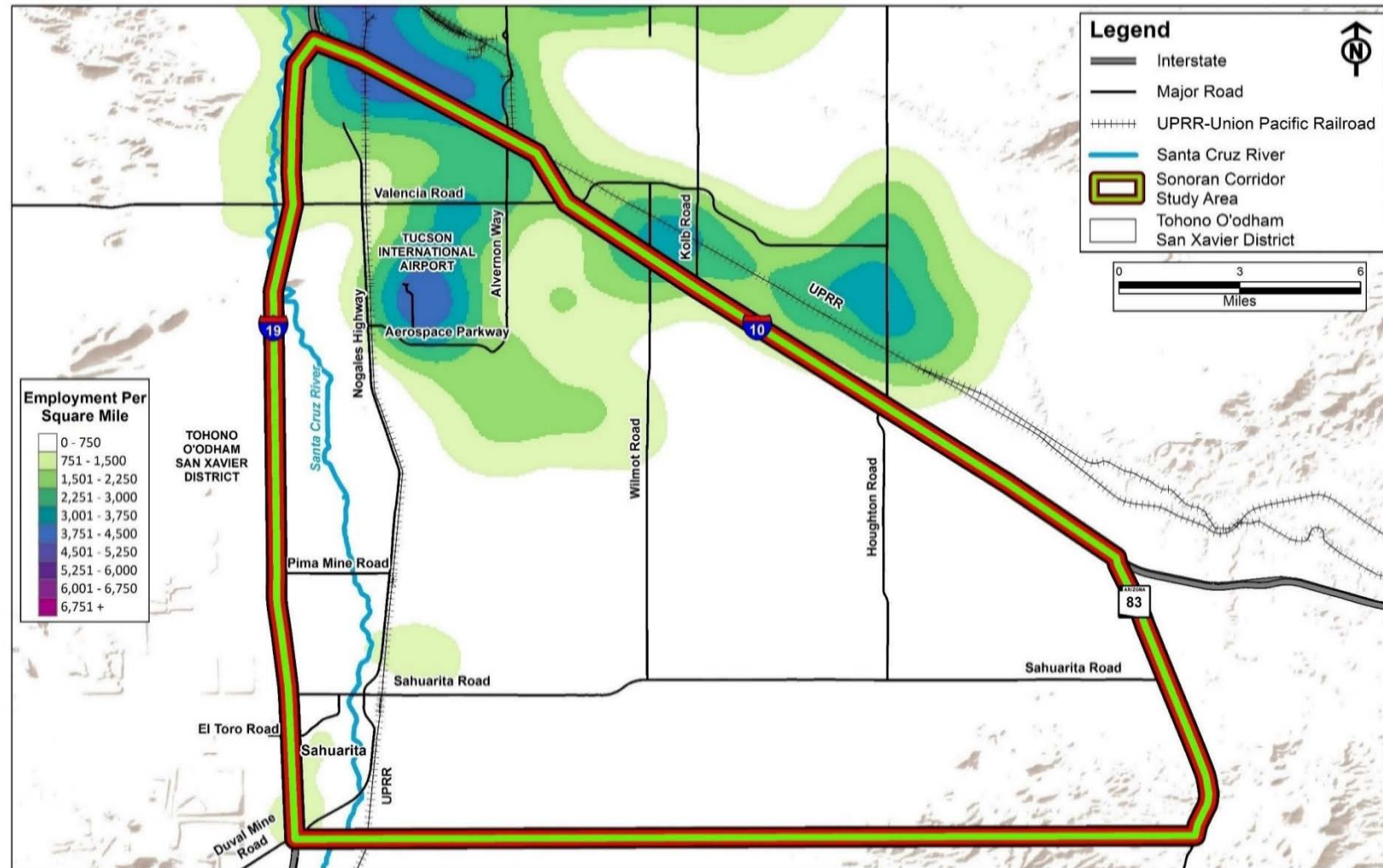


Figure 6. Employment Densities in the Sonoran Corridor Study Area, 2045

Source: <http://www.pagregion.com/Programs/TechnicalServices/GISDataandMaps/tabid/84/Default.aspx>

along I-19 will be substantially worse without more and better linkages to carry people and goods into and out of the area.

Table 3 shows the population growth anticipated in the PAG Region and Study Area, while Table 4 shows employment growth in these areas for both RMAP and revised Sonoran Corridor assumptions. The PAG Region is forecast to have high growth in both population and employment – an additional 425,000 people and 210,000 jobs (PAG, 2016). Per Pima County’s Comprehensive Plan Update, significant growth is projected within and surrounding the Study Area, as shown in Figure 3 through Figure 6. This growth has been incorporated into the Sonoran Corridor Study forecasting model. The employment forecast for the study area has been updated since the adoption of the RMAP based on input from the City of Tucson, Pima County, Town of Sahuarita, San Xavier District of the Tohono O’odham Nation, Arizona State Land Department and Tucson International Airport. This revised dataset will be used in the analysis to represent the updated land use plans. (The development of the revised land use forecast is presented in the Appendix.) The RMAP dataset will also be used to reflect the current regional plan, pending approval of new regional data for the RMAP Update currently under development.

Table 3. Population Growth in the PAG Region and Sonoran Corridor Study Area, 2015 to 2045¹

YEAR	REGIONAL POPULATION	INCREASE	%	STUDY AREA POPULATION	INCREASE	%
2015	1,022,079			7,187		
2045	1,447,043	424,964	42%	42,097	34,910	586

Source: PAG

*Table 4. Employment Growth in the PAG Region and Sonoran Corridor Study Area, 2015 to 2045
RMAP and Sonoran Corridor Study (TAC) Scenarios*

YEAR	REGIONAL EMPLOYMENT	INCREASE	%	STUDY AREA EMPLOYMENT	INCREASE	%
2015	425,000			15,232		
2045 RMAP	635,000	210,000	49%	37,479	22,247	146%
2045 TAC	635,000	210,000	49%	73,160	57,928	380%

Source: PAG

The Sonoran Corridor Study Area is also a growing center of technology for the region and the state, with several high-tech industries already in the corridor. The Aerospace Research Campus at TUS and the UA Tech Park, two critical employment centers within the Study Area and the region, are home to many of the high-value, high-tech jobs in the region that share facilities and resources (Figure 7). TUS and the UA Tech Park currently employ about 18,000 workers, with expected growth in the Aerospace Parkway area immediately south of TUS alone projected to expand to 35,000 workers².

¹ The figures in these tables will be updated with figures PAG develops for the 2020 RMAP Update.

² This forecast was developed using figures contributed by each of the communities in the Sonoran Corridor. The figure will be updated once PAG develops a number for the 2020 RMAP Update.

Sonoran Corridor Tier 1 Environmental Impact Statement
Need and Purpose Memorandum

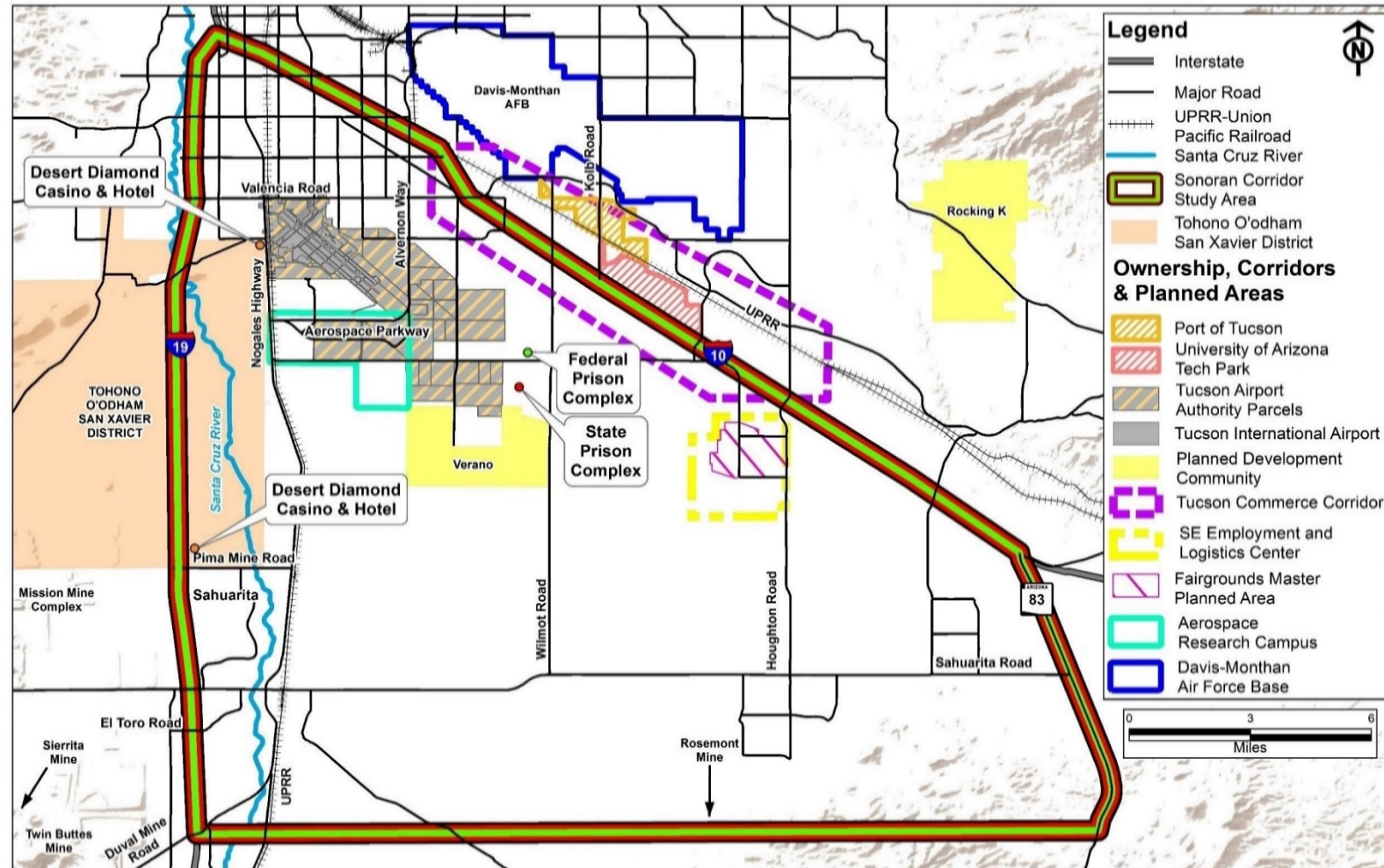


Figure 7. Employment Centers in the Sonoran Corridor Study Area

The Sonoran Corridor is also a center for mining activities with at least three major mines in operation within or just outside the study area. These locations represent over 2,000 employees who have limited access in addition to the movement of mining materials and equipment add to the travel demand within the Sonoran Corridor.

In addition, two major prison facilities (one state and one federal) and proposed residential and industrial development in the Verano community immediately south of the airport will contribute more jobs and travel demand as the plans for the area take shape.

Current transportation plans indicate that access to the employment centers in the Study Area would consist only of a system of arterial roads. Both industry and employment in the primary growth areas in the region are planned to expand rapidly over the 2045 planning horizon for this Study Area. As shown in Table 3 and Table 4, the rate and location of this population and employment growth will generate more travel demand in an area with a limited transportation network.

4.1.2 Increased congestion by 2045

Traffic congestion is expected to worsen by 2045 and be a detriment to the existing environment within the study area. Traffic congestion can be quantified in terms of levels of service (LOS). LOS is graded using six letters, A through F, with LOS A being the best and LOS F being the worst. The LOS of a roadway segment is a quantitative measure used to evaluate traffic congestion and delays. LOS is a measure of driver delay, and a function of traffic volumes, traffic composition, roadway geometry, and the traffic control of an intersection. LOS designations range from A to F, which are illustrated in Figure 8.

Even with the transportation improvements included in PAG's Regional Mobility and Accessibility Plan (RMAP) (PAG, 2016) the LOS on arterial roadways in the study area will deteriorate to LOS F in many segments (Table 5) due to travel demand that is expected to increase, which can also be correlated with the projected increase in freight movements alluded to in Section 3.3.1, based on current trends. Currently, the only options for eastbound commuter and commercial movement coming out of Nogales, AZ that avoids travel through downtown Tucson are I-19 to Valencia Road or Sahuarita Road, or State Routes 82 and 83, which lead northeast from Nogales, AZ. Valencia Road is an urban six-lane arterial immediately north of TUS, while Sahuarita Road is mostly a two-lane rural roadway near the southern boundary of the Study Area. While Sahuarita Road currently holds capacity with a traffic volume of 5,000 vehicles per day, average weekday traffic is projected to increase by 2045 to 26,907 vehicles per day between Old Nogales Highway and Wilmot Road, and 16,518 vehicles per day between Wilmot Road and Houghton Road, partly due to the increase in freight movement and because of the projected increase in population. Old Nogales Highway, itself a primary north-south route, is highly congested because of the access it provides to the major employment centers at and near TUS.

Table 5 provides congestion information for an average weekday between specific segments, and indicates that some sections of the existing roadway network within the Sonoran Corridor study area that currently operates at an acceptable LOS (LOS D or better) but will deteriorate substantially by 2045. Valencia Road and Sahuarita Road, the primary east-west arterial roadways in the study area, are consistently at LOS F in 2045. The Nogales Highway running north-south parallel to I-19 will be highly congested and operating at LOS F as well (Figure 9).



LOS A: Traffic flows at or above the posted speed limit, and all motorists have complete mobility between lanes. LOS A occurs late at night in urban areas and frequently in rural areas.



LOS B: Traffic is slightly more congested, with some constraints on maneuverability. Two motorists might be forced to drive side-by-side, limiting lane changes; however, traffic speeds are not reduced.



LOS C: Congestion is greater than LOS B, where ability to pass or change lanes is not always assured but the posted speed is maintained. Most experienced drivers are comfortable, and roads remain safely below but efficiently close to capacity.



LOS D: Vehicle speeds typically are below the posted speed limit, and motorists' ability to change lanes is reduced due to congestion.



LOS E: Flow becomes irregular, and speed varies rapidly but rarely reaches the posted limit. This represents a marginal service state, where some roadway congestion is inevitable, and is consistent with a road at or approaching its designed capacity.



LOS F: Facilities operating at LOS F generally have more demand than capacity. LOS F is the lowest measurement of efficiency for a road's performance. Traffic flows below the posted speed and all motorists experience increased travel times due to heavy congestion.

Figure 8. Levels of Service

**Sonoran Corridor Tier 1 Environmental Impact Statement
Need and Purpose Memorandum**



Table 5. Average Weekday Traffic, Volume /Capacity Ratio, and Level of Service, 2016 and 2045

ROAD	FROM	TO	2016 ADT	2016 V/C ¹	2016 LOS ²	2045 ADT	2045 V/C	2045 LOS
I-10	Exit 260	Exit 261A	111,380	1.03	F			
I-10	Alvernon	Valencia	69,285	0.96	F	145,488	1.00	F
I-10	Valencia	Kolb Rd	63,016	0.88	D	114,859	0.79	C
I-10	Kolb Rd	Rita Rd	56,520	0.77	C	122,541	0.84	D
I-10	Rita Rd	Houghton	47,327	0.66	B	116,719	0.80	D
I-10	Houghton Rd	Wentworth/Vail Rd	39,768	0.55	A	91,495	0.63	B
I-19	Sahuarita	Pima Mine	41,590	0.58	A	58,815	0.82	D
I-19	Pima Mine	Papago Rd	44,870	0.62	B	63,627	0.88	D
I-19	Papago Rd	San Xavier	44,674	0.62	B	63,627	0.44	A
I-19	San Xavier	Valencia	49,736	0.69	B	60,039	0.41	A
I-19	Valencia	Irvington	71,706	1.00	F	75,290	0.52	A
Valencia	I-19	Nogales	41,800	0.77	C	46,600	0.86	D
Valencia	Nogales	S Tucson	32,500	0.60	B	47,700	0.88	D
Valencia	S Tucson	Alvernon	28,000	0.52	A	54,000	1.00	F
Nogales	Valencia	Los Reales	27,000	0.75	C	40,400	1.12	F
Nogales	Los Reales	Aerospace	10,800	0.30	A	40,760	1.13	F
Nogales Hwy	Aerospace Pkwy	Pima Mine Rd	11,400	0.71	C	16,800	1.05	F
Nogales	Pima Mine	Sahuarita	7,400	0.46	A	9,000	0.56	A
Sahuarita Rd (4 Ln)	I-19	Nogales Hwy	7,840	0.49	A	28,000	0.90	D
Sahuarita³	Nogales	Wilmot Rd	7,200	0.45	A	27,000	1.75	F
Sahuarita⁴	Wilmot Rd	SR 83	5,000	0.31	A	16,500	1.03	F

¹ I-10 and I-19 V/C assume improvements identified for each freeway are in place by 2045

² LOS calculated based on V/C ratios of A<0.60; 0.61<B<0.70; 0.71<C<0.80; 0.81<D<0.90; 0.91<E<1.00; and F>1.00

³ Assumes this segment of Sahuarita Road is 2 lanes in 2016 and 4 lanes in 2045

⁴ Assumes this segment of Sahuarita Road is 2 lanes in both 2016 and 2045

ADT = Average Daily Traffic Blvd = Boulevard Hwy = Highway LOS = Level of Service Pkwy = Parkway Rd = Road

SR = State Route V/C = Volume / Capacity (ratio)

Source: PAG

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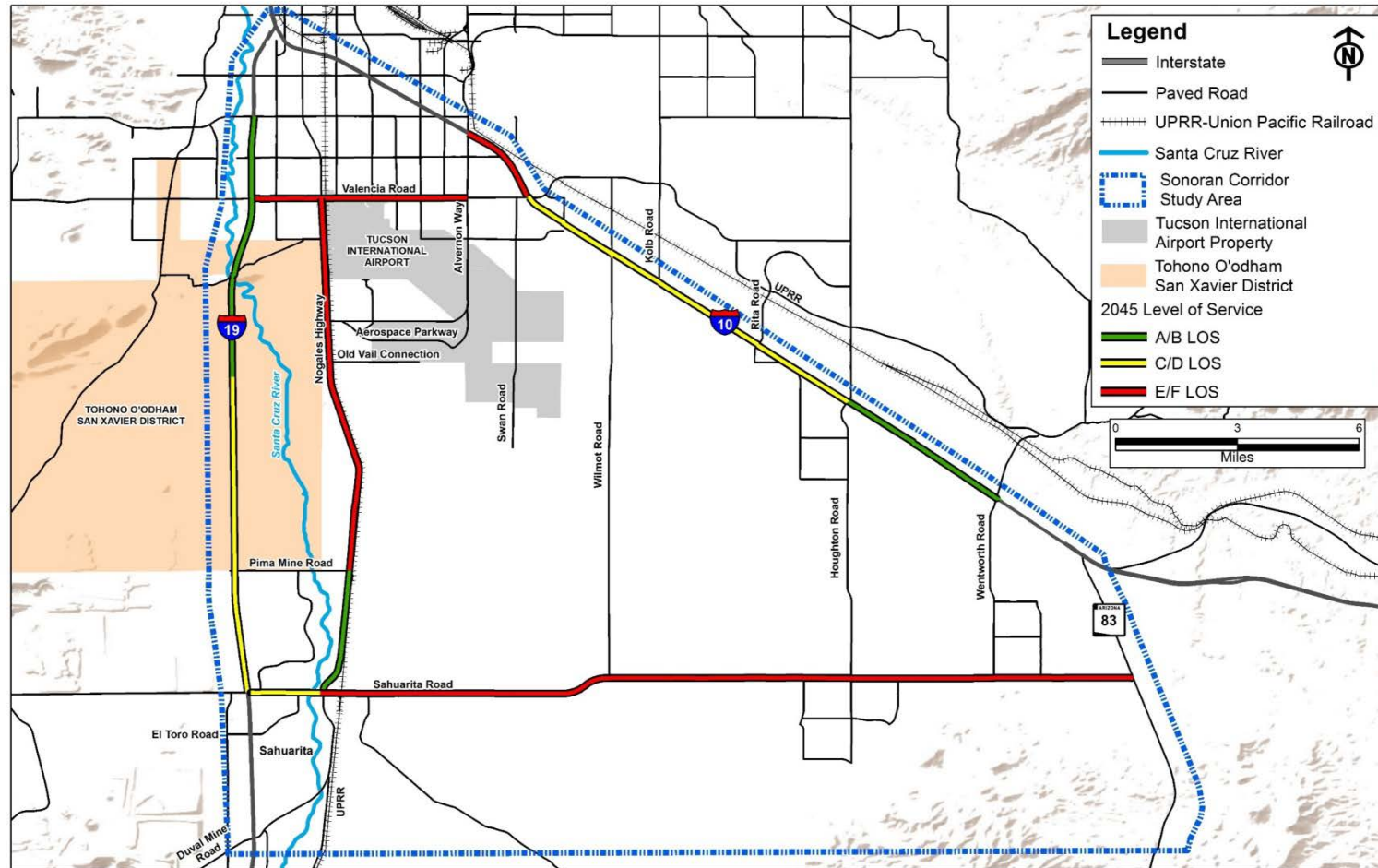


Figure 9. 2045 Levels of Service on Study Area Roadway Network

Source: PAG

4.1.3 Insufficient system linkages for regional, interstate, and international mobility

The designation of the Sonoran Corridor as a high-priority corridor in the FAST Act indicates that there is a need to evaluate the possibility of a new transportation link connecting I-19 and I-10 south of TUS. As stated in the Arizona State Freight Plan, the Sonoran Corridor study area is located in between two major freight corridors in the state and having another connection link between I-19 and I-10 in the Study Area enhances trade and mobility, and provides an alternative route for both commercial and commuter movement, which is vital for this part of Arizona.

Commercial movement coming from Mexico and points south of Tucson headed to destinations east of Tucson must travel north on I-19 to the existing I-19/I-10 traffic interchange (TI), adding as many as an extra 10 miles to the trip to continue east on I-10 compared to a more direct route across the Study Area between Pima Mine Road on I-19 and Houghton Road on I-10. For the trucking industry, this additional out-of-direction travel can add over \$40 million a year to the cost of freight goods carried (The Truckers Report, 2018). In addition, routing freight trucks through the I-19/I-10 TI during peak hours not only increase travel times but exposes freight trucks to areas of recurring congestion delay as they travel through or near downtown Tucson. As shown in Figure 10, of the approximately 1,400 trucks a day coming into the US from Mexico at Nogales and traveling to or from the east, 45 percent (approximately 630 trucks) take I-19 north to Tucson and I-10 east toward New Mexico or Texas.

The results from previous planning efforts and input provided by the public during scoping indicated that traffic, particularly freight trucks from Nogales, heading to points east of Tucson, often use routes other than I-19 to avoid added distance and congestion near downtown Tucson. In fact, more freight trucks rather travel on local roads that were not built to handle heavy truck traffic than use I-19 and I-10 because of the out-of-direction travel required to use the interstate system. This causes these local roads to deteriorate at a faster rate and lead to maintenance implications. For example, 30 percent of the east-destined or originating trucks to and from Nogales avoid traveling through Tucson altogether and use SR 82 and SR 83/SR 90 to access I-10, reducing total distance travelled by 52 miles compared to traveling up to the I-19/I-10 TI. Although SR 82 is located outside of the study area, it is often used by freight trucks as a bypass to avoid the need to travel through Tucson. SR 82 is a two-lane rural highway that travels through small residential communities such as Patagonia and Sonoita so the use of SR 82, as well as SR 83, for commercial traffic to and from Mexico is undesirable because of the character of the roads (SR 82 and SR 83 are designated scenic routes) and the small communities through which they travel. Furthermore, 18 percent of eastbound trucks were found to exit I-19 at Sahuarita Road or other local roads to travel 22 miles east to access I-10 from SR 83, rather than traveling 37 miles to the same point by taking I-19 to I-10.

Even though these heavy trucks save driving distance by using local roads when compared to traveling through the existing I-19/I-10 TI, these roads typically have only one travel lane in each direction and offer limited passing opportunities, which has the potential to create safety concerns, and the lower speed limits on these local roads preclude any potential for significant travel time savings. The exposure to urban congestion and local traffic controls along these routes, such as traffic signals, also generates more air pollution emissions that can contribute to worsening ambient environmental conditions in those areas.

Also, an alternate route that would complement TUS and its surrounding area by providing better connectivity that reduces commuter travel times is needed due to a limited transportation network

within the study area. Commuters traveling to TUS often experience increased travel times because they must use arterial roads like Valencia Road, which is projected to be highly congested by 2045, and Tucson Boulevard. They are the primary links between TUS and I-10 and I-19, and only provide a connection to the north. Furthermore, there is no southern airport connection. Commuters from the south trying to access TUS can take Nogales Highway but this route is not a direct connection and relies on Valencia Road to gain access into the airport proper.

TUS is a major airport that serves Southern Arizona. An estimated 3.4 million passengers were served in 2017, an increase of 3.4% over 2016³. That number is expected to grow to over 4.3 million by 2045 based on recent conservative Federal Aviation Administration forecasts (These numbers will be updated soon by new Airport Master Plan forecasts). The 2014 Tucson International Airport Master Plan Update (Plan Update) identified future expansion and other several long-term plans for TUS. These plans include an additional runway and a special planning area to the southeast of the current runway that has the potential for another future runway. The master plan also includes considerations for nearly six thousand acres of developable land that are under the purview of the Tucson Airport Authority (TAA). In an effort to address future demand, the Plan Update identified a plan that consist of connecting the recently constructed Aerospace Parkway to a proposed future airport I-10 access to the north on South Country Club Road (Figure 11). A plan that consists of improving airport connection to the south does not exist.

In conclusion, as commodity flows to and from Mexico grow over the years and truck traffic increases accordingly (as much as 40 percent by 2045), conditions will become that much more difficult to manage without a viable travel alternative. Also, the current transportation network within the study area will not serve the TUS and its surrounding area very well by 2045 because of the future expansion and airport activity that is expected to increase in the foreseeable future.

4.2 Purpose of Proposed Transportation Facility

The overall purpose of a transportation facility within the Sonoran Corridor is to provide a high-priority, high-capacity, access-controlled transportation corridor that will:

- Accommodate increased travel demand due to projected growth by affording better access to different areas throughout and near the study area
- Improve 2045 LOS within the study area
- Provide a direct controlled-access connection between I-19 and I-10 south of TUS that will reduce commercial and commuter travel times and cost

The objective of providing a high-priority, high-capacity, access-controlled facility is consistent with federal legislation, including the 1995 National Highway System Designation Act (Public Law [P.L.] 104-59) and Section 103 of the 2012 Moving Ahead for Progress in the 21st Century Act (or MAP-21, P.L. 112-141).

4.3 Other Benefits or Desirable Outcomes

While not part of the fundamental purpose for the proposed Sonoran Corridor, there are several other desirable outcomes for consideration:

³ Tucson International Airport

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Need and Purpose Memorandum

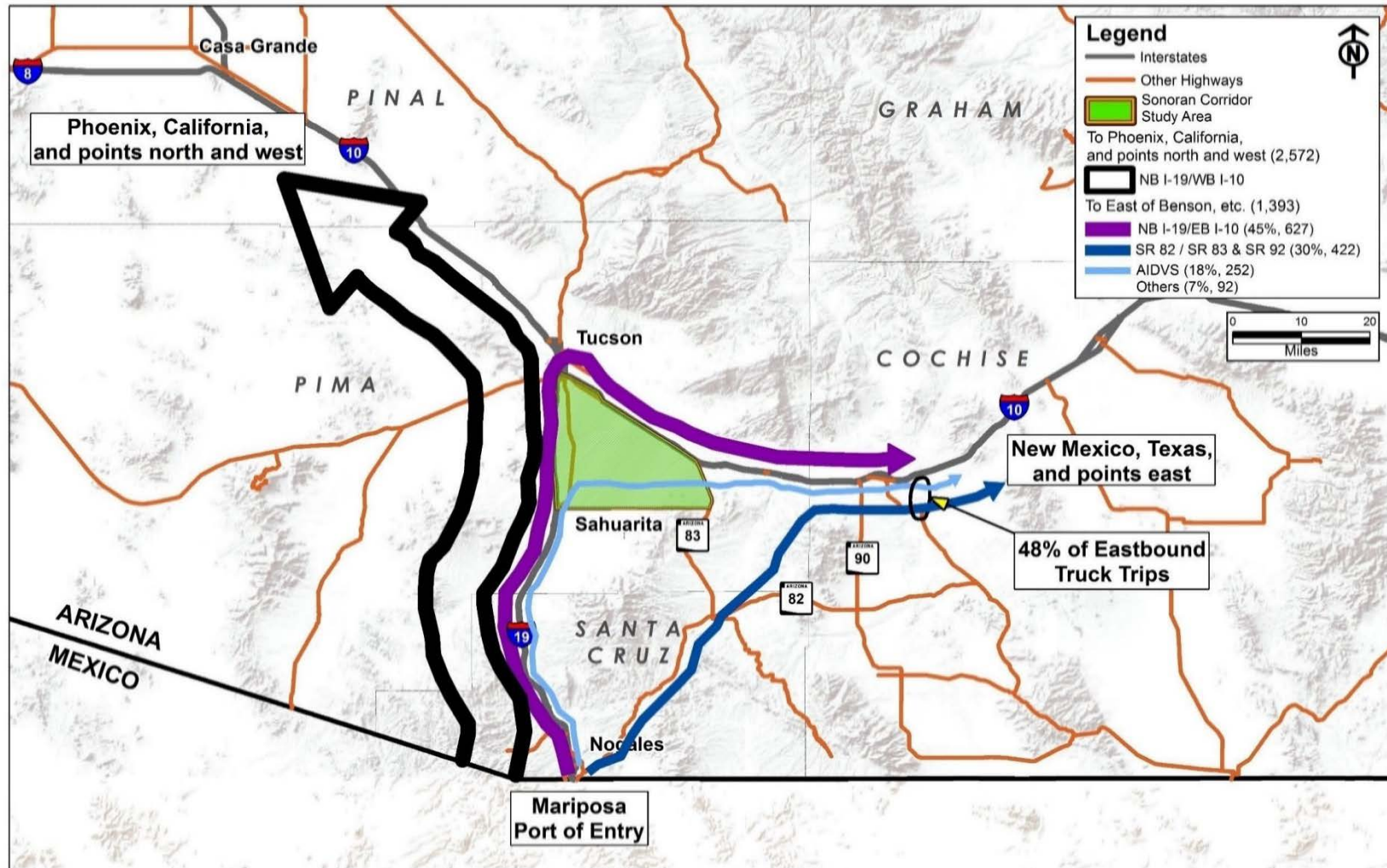


Figure 10. Existing Truck Travel Patterns from Nogales to I-10 (PAG)

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Need and Purpose Memorandum

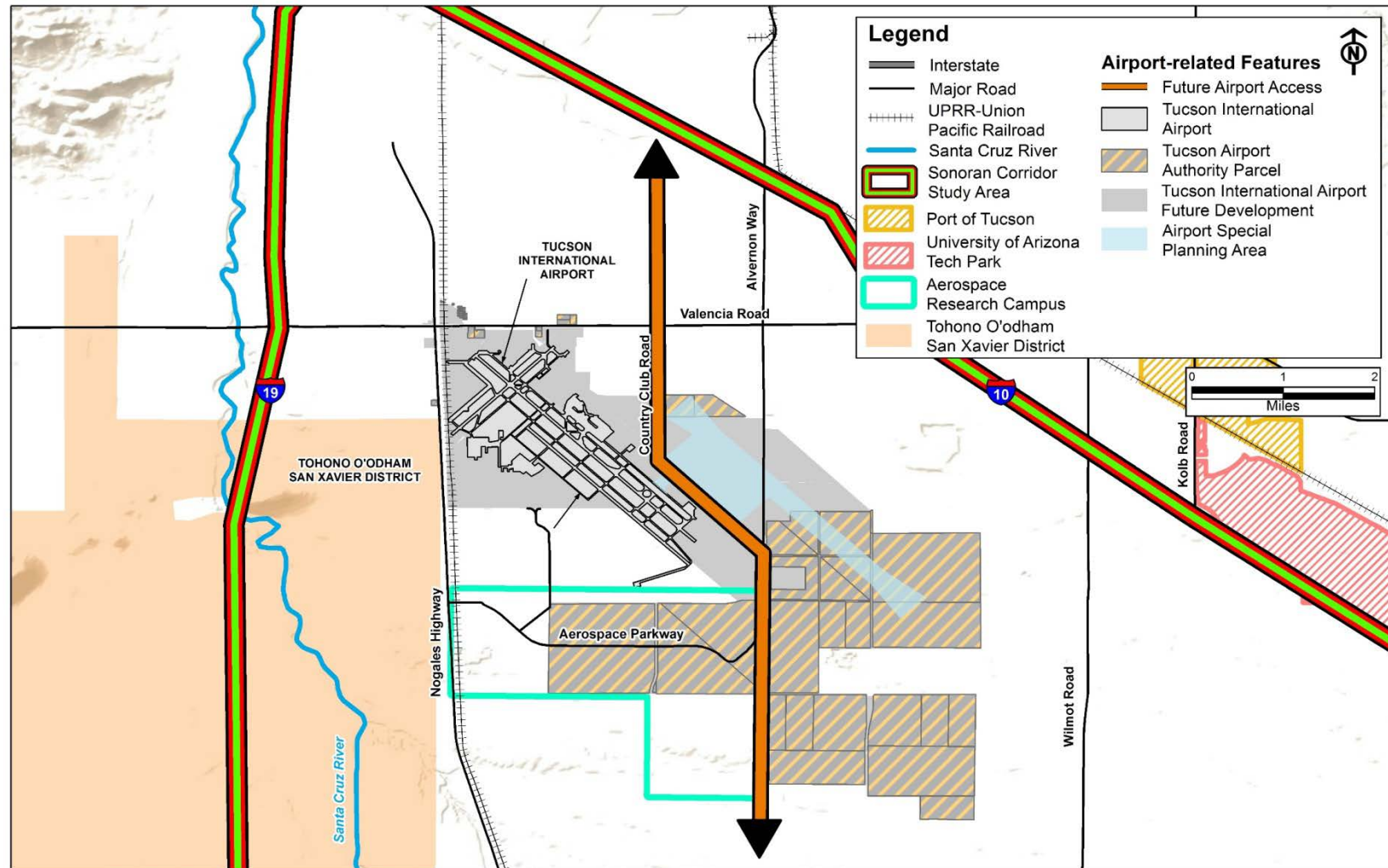


Figure 11. Future I-10 Airport Access Roadway

4.3.1 Provide the opportunity for multimodal and utility use where appropriate, should needs arise.

Some utility corridors have already been identified to support planned growth in the Sonoran Corridor Study Area. Combining development of such linear infrastructure with a transportation facility would provide the potential for economies of scale related to costs for right-of-way and, depending on the timing, construction.

The same would be true for a rail line connecting the Nogales Branch of the UPRR with the Port of Tucson along the UPRR Sunset Route. A link between the two lines would be able to provide a higher speed of operation and faster access to the Port of Tucson or the UPRR Tucson Rail Yard while avoiding operating in residential areas along the South Tucson segments of the Nogales Branch.

The Sonoran Corridor could provide a unique opportunity to introduce the most cutting-edge highway infrastructure and vehicle technologies to assist in reducing crashes and ensuring smooth operation of the facilities. Some of the high-tech companies already located in the corridor are playing a part in the development of autonomous and connected vehicles. The U of A is also a participant in the latest transportation science. A transportation facility within the Sonoran Corridor Study Area would offer the chance to both test and, ultimately, demonstrate the performance benefits of these systems for more broad application around the state and the country.

4.3.2 Support the protection of environmental resources in accordance with applicable regulations and policies.

Any new transportation infrastructure introduced to the Study Area would be planned to be compatible with local and regional transportation and general plans, and to avoid or minimize adverse impacts to the natural, built, and social environment, in compliance with NEPA and the numerous regulations, executive orders, and policies put in place to ensure the consideration of specific environmental resources.

4.3.3 Limit freight traffic on inappropriate routes (e.g., SR 82 and SR 83)

By providing a more convenient route for major trucking operations, the Sonoran Corridor would encourage truck traffic to stay off the smaller roads to and from Mexico that they currently use to avoid congestion in and near downtown Tucson. The redirection of truck traffic would also protect the small communities along SR 82 which are heavily dependent on the main roadway for access and transportation.

5 Summation and Next Steps

The Sonoran Corridor Study is intended to identify and evaluate alternatives for a high-priority, high-capacity, access-controlled transportation facility that would improve regional mobility of goods and people through the south Tucson area and points east with associated markets in Mexico; improve connectivity to TUS; and accommodate economic vitality. The needs associated with a proposed transportation facility within the Sonoran Corridor Study Area include addressing projected population and employment growth, managing congestion anticipated by 2045, providing a system linkage that promotes regional and interstate mobility, and improving access to TUS.

In summary, the key factors that support the need for a transportation facility in the Sonoran Corridor Study Area include:

- Substantial population and employment growth placing higher demands on the currently limited local transportation network
- Interstate and local arterial roadways expected to operate at an unacceptable LOS by 2045
- Lack of an alternate connection between I-19 and I-10 contributing to out-of-direction travel and use of local arterial roads
- Poor access and travel times to TUS due to a limited transportation network

5.1 Corridor Selection Report (CSR)

The Need and Purpose will guide the development of a comprehensive range of corridor alternatives for consideration during the development of the CSR. The corridor alternatives will be evaluated and screened based on corridor selection methodology and criteria that will be reviewed by the Cooperating and Participating Agencies, including consistency with the Need and Purpose. Potential evaluation and screening criteria could include connectivity, economic vitality, congestion and capacity, engineering constraints, environmental impacts, community acceptance, and other potential considerations. The screening will enable FHWA and ADOT to eliminate corridor alternatives that are not possible or practical, as well as to refine and further consider corridor alternatives that are more likely to meet the identified Need and Purpose of the proposed Sonoran Corridor. Ultimately, the screening process will yield a reasonable range of Corridor Build Alternatives and a No Build Alternative (i.e., do-nothing option) that will be advanced into the Draft Tier 1 EIS for a programmatic-level environmental review.

5.2 Tier 1 EIS

5.2.1 Draft Tier 1 EIS

FHWA and ADOT will prepare a Draft Tier 1 EIS to more fully assess the reasonable range of Corridor Build Alternatives that emerge from the CSR, in addition to the No Build Alternative. The Draft Tier 1 EIS will:

- Demonstrate the Need and Purpose for a Sonoran Corridor transportation facility
- Document the screening process and each of the Corridor Build Alternatives for a proposed transportation facility
- Evaluate the affected environment and potential environmental impacts of alternatives based on agreed-upon assessment methodologies for the environmental resource areas
- Identify a Preferred Corridor Alternative that best meets the Need and Purpose
- Provide an opportunity for the public, agencies, and Tribal communities to review and comment on the Sonoran Corridor Tier 1 EIS

The Draft Tier 1 EIS will be circulated for public and agency comment over a 45-day review period. During this time, hearings will be held to present the findings of the Draft Tier 1 EIS and formally record all comments received.

5.2.2 Final Tier 1 EIS and Record of Decision (ROD)

FHWA and ADOT will complete the environmental review process with the preparation of a combined Final Tier 1 EIS and Record of Decision (ROD). After consideration of comments received, FHWA will issue the combined Final Tier 1 EIS and ROD document pursuant to MAP-21 and the FAST Act, unless FHWA determines that statutory criteria or practicability considerations preclude a combined document.

The Final Tier 1 EIS and ROD will document a Selected Corridor Alternative (which could be the No Build Alternative if selected); present the basis for the decision; describe the alternatives considered; and identify approaches to avoid and minimize potential environmental impacts associated with implementation (i.e., construction and operation of a transportation facility within the Study Area). Any considerations for compensation for potential environmental impacts will be included in future Tier 2 studies. As the Federal Lead Agency under NEPA, FHWA will ultimately approve the Final Tier 1 EIS and issue the ROD.

The primary goal of the study process is to determine what the Selected Corridor Alternative will be, either a Corridor Build alternative (2,000 feet in width) or the No Build Alternative. The Tier 1 EIS will include information on the potential social, economic, and natural environmental impacts of the corridor alternatives advanced through the CSR, as well as the No Build Alternative. If a Corridor Build alternative is selected, the Tier 1 EIS will also include information on:

- The 2,000-foot-wide corridor identified for a proposed transportation facility
- A Phased Implementation Plan (PIP) allowing the full-length facility to be built as multiple projects

The Tier 1 EIS will provide a roadmap for advancing the PIP projects Tier 2, or project-level, NEPA review. During future Tier 2 environmental reviews, ADOT and FHWA would conduct detailed environmental and engineering studies for the projects proposed on specific alignments within the 2,000-foot-wide Selected Corridor Alternative.

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Appendix – Land Use Assumptions for the Sonoran Corridor

SONORAN CORRIDOR TIER 1 EIS

LAND USE ASSUMPTIONS FOR TRAVEL DEMAND MODELING

Introduction

As part of the Tier 1 Environmental Impact Statement (EIS) for the Sonoran Corridor, the project team will soon begin the process of developing and evaluating route alternatives for the study area depicted in Figure 1. Part of that effort will require use of the Regional Travel Demand Model (TDM) maintained by the Pima Association of Governments (PAG) to determine future travel volumes associated with the potential alternatives. In turn, the TDM is based on underlying land use (population and employment) assumptions that were last reviewed and adopted as part of the *2045 Regional Mobility and Accessibility Plan* (RMAP).

The objective of this paper is to summarize, explain and document the land use assumptions developed by the jurisdictional team supporting the Sonoran Corridor EIS. The jurisdictional team included Pima County, the City of Tucson, the Town of Sahuarita, the San Xavier District of the Tohono O’odham Nation (T.O. Nation), the Tucson Airport Authority (TAA), the Arizona State Land Department, the Arizona Department of Transportation (ADOT), and the Environmental Impact Statement (EIS) consultant team.



Figure 1. Sonoran Corridor Study Vicinity

Need for Revisions to Land Use Assumptions

The population and employment assumptions in the RMAP are based on the best information available at the time the model was prepared. However, most of the datasets used in the model are from the 2013-2015 time period. Since then, important and significant changes have taken place in the Sonoran Corridor study area. Although those changes have minimal anticipated effects on population projections, they can have significant impacts on the anticipated employment numbers. Some of the changes in the area include:

- **Infrastructure Investment** - Starting with the construction of the Aerospace Parkway in 2015, the region has been focused on improving and extending infrastructure in the area south of the airport to facilitate development. These efforts include the construction of the following major projects:
 - The Old Nogales Interceptor / Aerospace Corridor and Park Avenue Augmentation Sewer; a 36-inch trunk line extending from Old Nogales Highway to Wilmot Road expected to commence Phase I construction in 2018.
 - The Santa Cruz County Water Production Facility by Tucson Water. This facility, currently in design, is expected to be completed in 2019 and will substantially upgrade water capacity in the area of the aerospace corridor.
 - Recently completed paving improvements on Wilmot Road north of Sahuarita Road as part of the current Regional Transportation Authority's (RTA) roadway element program.
- **Land Use Changes** – Several jurisdictions have developed or created plans to position the area as a major employment corridor. Some of those changes include:
 - The Pima County Board of Supervisors changed the designation of more than 1,800 acres near the Pima County Fairgrounds from resource sensitive/resource conservation to industrial zoning. (October 2017)
 - The Tucson Airport Authority (TAA), as part of a strategy to assess development potential of their underutilized/undeveloped properties, is in the feasibility stage for developing 550 acres in the vicinity of Aerospace Parkway in order to have “shovel ready” sites for logistics, defense, technology, retail, office and industrial uses.
 - Diamond Ventures refocused the master plan for Verano, a 3,200 acres master planned area, from a primarily residential to more of a mixed-use development with particular emphasis on industrial/employment opportunities.
 - The Town of Sahuarita adopted FICO's *Sahuarita Farms* for approximately 7,000 acres in the vicinity of Nogales Highway between Pima Mine Road and Duval Mine Road. The plan includes thousands of acres for employment including an employment campus, mixed use areas and an industrial campus.
- **Job Creation** – As a result of the infrastructure investment and the regulatory/zoning changes, the area has been successful in attracting major employment centers. Specific examples include:
 - In late 2016, Raytheon announced it would add 2,000 at its site near the Tucson International Airport.

- World View located their Space Port along the Aerospace Parkway. World View is expected to generate approximately 500 jobs when fully operational.
- In late 2016 Vector Space Systems announced it would construct a headquarters building and a manufacturing plant in the vicinity of the Aerospace Parkway. The plan calls for employing 500 people within five years.
- The Town of Sahuarita recently advertised for the design and construction of the Sahuarita Advanced Manufacturing and Technology Center (SAMTEC) near Sahuarita Road and I-19, and has already attracted two tenants to the project. The PAG Subarea Allocation Model (SAM) anticipates that Sahuarita will have the highest employment growth rate in the region at 4.1% between now and 2045.

In addition, although the RMAP identifies the Sonoran Corridor as a potential improvement, a road facility (link) is not included in the TDM to provide access to the lands east of I-19 and south of I-10 in Pima County.

The jurisdictional team believes that the completion of the Sonoran Corridor would accelerate the development in the area and create more jobs than in the scenario forecasted in the RMAP. The job growth expected in the Sonoran Corridor by the jurisdictional team is assumed to be outside the scope of the projected regional employment originally used by PAG's land use model as a control total to guide and constrain forecasts of sub-regional job growth. Specifically, this new job growth in the Sonoran Corridor would not entail that other areas receive less growth, which would ordinarily follow from the operation of PAG's land use model. Therefore, the revised assumption will not reduce the number of jobs in any other areas of the region; instead it will add jobs in the vicinity of the Sonoran Corridor to reflect the economic development benefits associated with this important trade, logistics and regional mobility corridor. Having shovel ready sites with efficient access to infrastructure such as highways, airports, rail lines and utilities will help attract businesses that would otherwise have located somewhere else.

Proposed Land Use Projections

Based on the considerations discussed above, the jurisdictional team agreed that while population projections should remain as outlined in the RMAP, the employment projections for the area should be revised.

The process of evaluating the appropriate levels of employment for each TAZ included both quantitative and qualitative analyses based on the collective judgement of the jurisdictional team and the Sonoran Corridor consultant team. Specific elements within the process included:

- Four workshop-style meetings at PAG to review the recent planning efforts from the member jurisdictions and to discuss opportunities and constraints for the various areas impacted by the project.
- Evaluation of how developable each TAZ is based on constraints such as drainage (floodplains), cultural resources, biological resources and opportunities such as available/projected infrastructure, zoning, etc.
- Assessment of the maximum levels of development (buildout) for TAZs. In this area, the team agreed that TAZs with relatively minor development constraints could be urbanized with a Floor

Area Ratio (FAR) of 0.25. The employment density was then estimated at 20 jobs per developed acre. The above assumptions result in a buildout employment level of 3,200 jobs per square mile (640 Ac x 0.25 FAR x 20 jobs/ Ac). For comparison, the TAZs for Raytheon (479) and the Port of Tucson (258) have employment densities of approximately 4,000 and 2,500 jobs per square mile.

- The team then used the collective judgement of the experts in the room to estimate the 2045 employment level at the various TAZs based on how developable each TAZ was judged to be (ability to develop) and the percentage of development that is likely to occur by 2045 (likelihood of development).
 - Ability to develop – TAZs with minimal development constraints were assessed a buildout capacity of 3,200 jobs/square-mile. TAZs with more constraints were assigned a portion of the maximum development level, typically 1,600 jobs/square-mile for average-level constraints and 800 jobs/square mile for significant constraints.
 - Likelihood of development (by 2045) – TAZs close to existing employment centers, with zoning entitlements, close to existing infrastructure, and other appealing attributes were assigned a higher likelihood of development than TAZs that did not fit those criteria. Although TAZs with less accessibility may develop to high employment levels, the anticipated timeline is significantly longer than for those with more desirable attributes.

Upon considering the two items in this category (ability to develop and likelihood of development), the jurisdictional team assigned employment projections for each of the TAZs in 2045. The outcome of the process was that areas near the airport, the Aerospace Parkway and the Sahuarita Road/Nogales Highway intersection ended up with higher employment levels than other areas near the project